PACKING APPLES IN BARRELS AND BOXES

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FRUIT BRANCH
G. E. McINTOSH, Commissioner

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FIG. 1.—Careful handling commences in the orchard. Note—(a) type of ladders, (b) picking bags, (c) orchard boxes—they all lend themselves to minimum bruising.

Apple Packing in Barrels and Boxes

The future of the Canadian apple industry depends entirely upon quality production and the merchandising of well graded, standardized packs. Experienced fruit growers no longer fear the competition of well packed fruit, but carefully consider the effect of large quantities of poor fruit being dumped on the markets. This bulletin has been prepared with the object of instructing the packer to recognize certain principles in barrel and box packing that are of primary importance in maintaining uniformity. It should be remembered that the quality and standard of fruit maintained in the packages under a recognised trade mark is the foundation on which increased consumption and permanent business relationship is established.

CAREFUL HANDLING

The carrying and keeping qualities of apples and other fruits are directly dependent on the care exercised to prevent mechanical injuries in harvesting and preparation for shipment. The present commercial handling practices are unnecessarily rough and are responsible for a large amount of decay and deterioration in transit and after arrival at market. It is estimated that from 10 to 15 per cent of the fruit wastage is traceable to rough handling in picking and packing which means a direct financial loss to the grower.

To appreciate the great need of judicious care in handling orchard products, every picker, packer and shipper should bear in mind that a fruit is a living organism which breathes and has a definite life-cycle. The entire fruit is made up of delicate tissue, and undue pressure and abrasions will cause an ultimate breakdown of the flesh. From the standpoint of minimizing bruising, or other mechanical injury, many faults in present handling practices may be corrected readily by reasonable attention to equipment and handling. Precautions should commence with the harvesting by instructing the pickers in the correct method of picking in order to avoid finger bruising and the pulling of the apples with the spur adhering to the stem, the latter being a frequent cause of skin punctures. Apples should be pulled by utilizing the full hand and giving a combined twist and upward motion to separate from the spur with the stem intact. The regulation picking basket should be properly padded to avoid bruising and should be carried in front of the picker at all times.

Metal picking bags with shoulder straps (fig. 1) are preferred to the baskets in some districts, while the cloth bag, which hangs in front of the picker, is not very popular as it crushes against the ladder, causing the fruit to become bruised.

Orchard crates and barrels being handled to the packing house should not be filled to project above the upper edges. If this precaution is neglected it will inevitably cause serious bruising to the fruit in the lower tiers of the containers when stacked.

The loading and unloading of containers to and from the wagons and packing houses should be done without dropping or jarring the packages. Sorting tables should be well padded with soft material to prevent bruising. In packing operations if the apples are overpressed they become bruised and spoilage results. Injury caused by over-pressing the apples in boxes or barrels can be prevented if the packers exercise care and judgment in filling the containers to the right height before pressing.

It is of equal importance to carefully handle the packages after packing as it is to take every precaution in gently handling each specimen in the process of their preparation. Whether they are boxes or barrels being stacked or loaded in cars, they should not be thrown into their place, but gently placed into position,

Similar precautions should be exercised during all stages of distribution from the car, through the trade to the consumer, in order to reduce loss from rough handling to a minimum.

BARREL PACKING

Barrels

The Canadian standard apple barrel is required by the Fruit Act to have a capacity measurement of 7,056 cubic inches and of the following specifications:–

Apple and Pear Barrels, Section 10-1-(a)—

Length of stave	28½	inches
Diameter of head	17⅛	"
Distance between heads	26	"
Circumference at bulge, outside measurement,	64	"

Many packing organizations economize by purchasing the barrel stock and cooperirg their own barrels, while the majority of packers buy their barrels complete from the coopers ready for nailing.

Equipment

Although the equipment required for barrel packing is not very elaborate it is necessary to have good, well made modern appliances in order to withstand reasonable usage and to afford efficient packing. In the following paragraphs a list is given of the different supplies and equipment necessary to commence barrel packing, together with a few comments on the main points of economical interest concerning each:—

Sorting Table

The sorting table ought to be fairly large in order to give the sorters ample room for selecting the apples according to grades. A table 3 feet by 6 feet, made of lumber with 6-inch board sides, has been found to be a very convenient size. The entire table is padded and lined with some kind of material, preferably burlap, to keep the fruit from bruising. For convenience the table is set on two horses, or four apple barrels, which may be easily transported in the orchard or packing house and stored away when not in use. In order to dispose of the culls quickly during the process of grading, a hole at each corner of the table measuring 4 inches by 4 inches, and properly protected, has been found to expedite packing operations. Another sorting table frequently used is one made of canvas stretched on collapsible supports which fold up into a convenient size. This table is very light, easily carried by one person and offers protection against bruising.

Racking Board

A plank 2 inches by 10 inches, (Fig. 5) any length desired, is required for the purpose of racking the barrels during the process of filling. This is very important to insure a tight package.

Barrel Press

There are several kinds of barrel presses. The screw press is the style generally preferred by the regular barrel packers, together with the circular iron follower. The iron follower, which is 14 inches in diameter, offers a more even pressure on the entire circumference of the barrel head and less pressure on the centre of the package.

Hatchet

A good, sharp hatchet is an essential tool in packing. It should have a heavy head for driving a light nail with one blow and a corrugated face which

insures perfect contact with the nail. Care should be taken in selecting a hatchet that is made of well-tempered steel and properly notched to stand the hard usage of pulling nails.

False Padded Head or Racker

The false padded head is a round piece of board slightly smaller than the barrel and padded on one side. Its purpose is for pressing the apples down when the barrel is nearly full in order to get a level surface on which to lay the "tail" or last layer of apples.

Stemmers

Stemmers are used to remove the stems from the apples of the "face" layer.

Stencil

A good, strong stencil to mark the heads with an attractive brand is essential in order to comply with the Fruit Act regulations, and to give the package a good appearance. Stencil ink can be made by mixing lamp black and ordinary coal-oil. This should not be too thick. For use, keep in a tin can large enough to admit a stencil brush. By placing a fairly large sponge in the can the proper quantity of ink will be ready for the stencil brush at all times.

Baskets

The half-bushel basket of the round type, properly padded, as used for picking receptacle, is also used for the sorting table and for placing the different grades of apples in before emptying in the barrel.

Calipers

A very useful tool that every packer should be equipped with is the boxwood rule caliper, or a set of apple rings, to measure the diameter of the apples and insure the proper size for the grade being packed.

Nails

Always have a good supply of $1\frac{1}{4}$-inch nails on hand for coopering purposes.

It is most important that all equipment is available and in good working condition before the packing season commences.

Preparing the Barrel for Packing

In preparing the barrel to receive the apples the smoothest head piece is selected for the face end so that the stencil will leave a clear distinct marking. The face head should be securely nailed and the quarter hoops driven down firmly and held in position with from four to six nails. Before removing the tail head the quarter hoops should be driven down in order to avoid trouble in placing the head piece back in the barrel. Thoroughly clinch the nails on the inside, for should they be allowed to protrude they are apt to seriously injure the apples. From four to six nails are sufficient to hold the end hoops, especially when head liners are used. It is advisable to use head liners at all times in order to hold the head securely in place. Liners are made of the same material as the hoop, 6 inches long and $3\frac{3}{8}$ inch wide. They should be soaked in water prior to using in order to be made pliable, as dry liners are easily broken. The nailing of the barrel is dealt with on page 14. The head liners are placed at right angles to the sections of the head for the purpose of strengthening and making the barrel more secure to withstand handling.

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Grading and Packing

Quality grading is the fundamental basis of good barrel packing and means the exercising of reasonable care in the sorting of the apples and placing each specimen in its respective grade—No. 1, No. 2, Domestic or No. 3, the requirements of which are clearly defined in the Fruit Act.

In order to perform adequate grading it should be carried out in a packing house where it is possible to give proper supervision to the labour and maintain uniform packs. Orchard packing is followed extensively in the eastern barrel districts and is generally commendable in small orchards.

Fig. 2—Orchard Packing.

The orchard system of packing is usually carried out by gangs of six men who are divided up into pickers, sorters and packers and under average conditions they can put up a pack of ten barrels per man or sixty barrels per day. A portable sorting table, (fig. 2), is conveniently set up in the orchard and as the apples are picked they are emptied on the table, sorted according to quality grades, and the packing of the barrel completed. Although successful packing is done in the orchard it is difficult for large growers with scattered packing gangs to maintain a uniform pack, which is an important feature in modern marketing. The packing house system is used practically entirely in the western box districts and is becoming more generally favoured in the barrel sections as it lends itself to the use of mechanical graders and labour saving devices which are considered necessary equipment in reducing packing costs.

Facing

The facing of a barrel of apples is a very important operation in packing, as the face represents the merits of the entire contents of the barrel. Packs put up by reliable packers are usually sold on the appearance of the face, while with indiscreet packers, whose reputation is soon known to the trade, this valuable selling feature is not taken into consideration. The apples selected for the face should be uniform and no larger than the average size being packed, while the colour should be representative of the grade and the balance of the barrel. To practise overfacing with fruit above the average quality of the barrel, in order to deceive and defraud the buyer, is a serious violation of theFruit Act and should be strictly guarded against by the packer.

Fig. 3—Packing Apples for Store.

The first step in packing a barrel is to lay a face by placing the apples in concentric rings on the bottom of the barrel. Select uniform apples from the packing table or grader and remove the stems by use of a stemmer. The apples are now gently placed in the barrel and arranged in rings with the stem end down and each apple firmly touching, but not tight enough to cause bruising.

There are two kinds of faces recognized in packing: the regular and the off-face. In arranging a regular face the number of apples on the outside ring

is followed by a definite number in the second and third rings. There are four regular faces commonly used which are made up of the following number of apples:—

Outside Ring	*Middle Ring*	*Centre Ring*	*Figure 4*
12	6 or 7	1	(c)
15	9	3	
16	10	4	(b)
18	12	6×1	(a)

In all these faces the outer ring may contain one more apple than mentioned above, namely 13, 16, 17 and 19 respectively, without detracting from the appearance of the face.

What is known as an off-face is where the third ring of apples cannot be filled in with uniform sized fruit to correspond with the outer rings. In this case one apple is placed in the centre of space with as many apples wedged around it as are necessary to hold it in place.

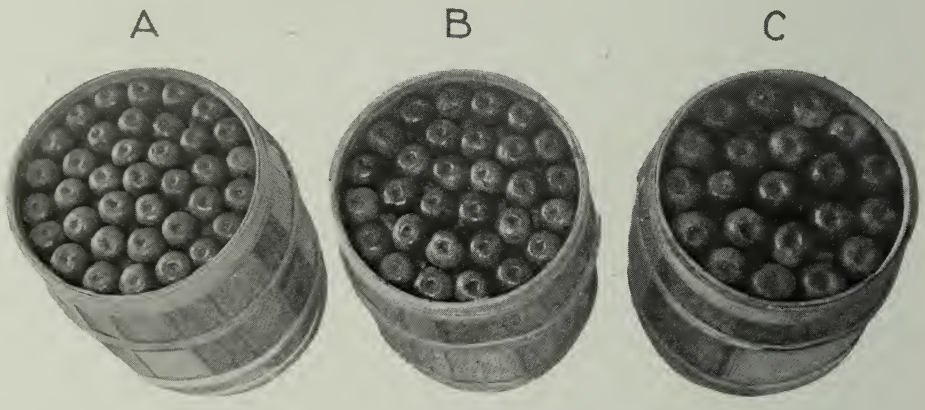

Fig. 4—Three Styles of Facing for (a) Small Apples $2\frac{1}{2}$" (b) Medium $2\frac{3}{4}$" (c) Large $3\frac{1}{4}$".

Always avoid finishing the centre of the face with apples turned on their side, or with two apples. In no case should the face be finished with one very large apple or with one very small specimen. As mentioned above the centre ring should finish with either one, three, four or six apples.

To complete the laying of the face it is customary to back the first layer by placing apples into the intervening spaces so as to hold the face intact on pouring the remainder of the stock into the barrel. By following up the single face with red cheeked apples they will show through the face to splendid advantage on opening the barrel, greatly adding to the attractiveness of the pack.

A round thin cardboard pad is usually placed in the head of barrel before laying the face in order to avoid damaging the appearance of the apples with cuts and bruises through coming in contact with rough and uneven pieces of head lumber on applying pressure to the barrel.

Filling

Upon laying the face the barrel is placed on the racking plank ready to receive the remainder of the apples. It is always advisable to allot a separate racking plank or floor space for each grade and to designate same with a sign nailed in a conspicuous place marked with the name of the grade (No. 1, No. 2, Domestic or No. 3) so as to avoid any possibility of mixing the grades on filling the barrels.

The whole process of filling is one of precaution on the part of the packer in upholding the quality of the grades and preventing the fruit from being bruised through careless handling.

Filling is proceeded with by lowering each basket of fruit in the barrel until the bottom is reached and then carefully emptying the contents. Rough handling at this stage is often the cause of considerable waste at a later period.

The racking of the barrels (fig. 5) during the process of filling is the most important feature in packing to safeguard against "slack" packs. Export shipments arriving on the British markets showing slacks have from 50 cents to $1 per barrel knocked off their price which is too much to lose through any preventable cause. A good pack is recognized by the quality and tightness of pack on arrival at destination. The barrel should be racked when one-third full, and again after emptying each basket until full.

Fig. 5— Racking.—Note plank 2″ thick by 10″ wide and method of racking the barrel

Racking should be done on a solid foundation, such as a plank 10″ wide by 2″ thick (Fig. 5) or a concrete floor, by giving the barrel a slight, quick jar after each basketful is placed in the barrel. It is a common practice in many packing houses to allow the barrel to be filled and to give one final rack before making a jumble tail and pressing. This procedure invariably results in the tail apples being bruised and split and the barrels arriving on the market slack, indicating the lack of sufficient racking and poor packing.

Tailing and Pressing

The operation of levelling the apples on top of the barrel before pressing and heading up is known as "tailing". There are several ways to tail a barrel of apples, but the method known as "ring tailing" is the most popular system followed by the majority of apple packers. This practice enables the packer to make a tight pack without injury to the fruit from the pressure of the head. In addition the pack is given a more attractive appearance, a point worth while considering for the better grades.

FIG. 6—Two barrels properly racked and tailed ready for pressing, (a) showing apples too high, (b) correct height.

FIG. 7—"Pressing Barrel of Apples."

The "ring tail" is done by filling and levelling the apples before racking within one inch of the top of the barrel. The racker or circular, false padded head, is placed on the fruit, and with a long heavy stroke from side to side, with the packer bearing firmly upon the racker, (fig. 5) a firm level surface is obtained. A number of apples are now emptied on the surface according to the size being packed and placed in concentric rings one row deep similar to the face. In this case the apples are usually placed with the calyx end up, although they may be placed on side if it is necessary to bring the pack up to the right height.

On completing the tailing the surface should be level, with or slightly below, the top of the barrel and each apple capable of bearing equal pressure. It is rather difficult at first for an inexperienced packer to arrange the "ring tail" successfully, but after a little practice the average person can become quite efficient. Another system of tailing in common use is known as "jumble tailing", which is carried out by roughly levelling the apples before applying the head and pressure. This is most unsatisfactory in obtaining a tight pack and is to be discouraged for commercial purposes.

With the tail finished the barrel is ready to be headed. In order to do this a barrel press is required which should be operated so as to carry out the work with the minimum of bruising. The most convenient and efficient type is the screw-press, shown in figure 7, which is capable of applying a steady pressure and regulating the head by degrees instead of the severe jerking that usually accompanies other types of presses. The head is forced into place by loosening the hoops and applying a steady pressure together with a little tapping with the hatchet.

With the head in position the hoops are driven down tight ready to be nailed and headlined.

Fig. 8—Liners properly placed.

Nailing

After the head has been pressed firmly into the croze of the barrel, the upper hoops are tightened down and held in position by driving from five to six nails into the top hoops. The nails should be $1\frac{1}{4}$ inches long and driven to catch the ends of the pieces making up the head.

It is a common mistake for inexperienced packers to use a large number of nails in the head. This practice should be avoided as it adds nothing to the strength of the barrel and makes the work of opening at a later date extremely disagreeable.

The liners, which have been allowed to soak in water in order to make them more pliable, are set at right angles to the head pieces. Five to six nails should be driven in each liner at such an angle that the point will just pass through the stave and reach the second hoop.

Nails projecting upon the outside should always be withdrawn and redriven in order to protect the hands of those who may have to handle the barrel.

The use of liners is recommended at all times especially when the barrels are to be transported long distances as they are a safeguard against the head springing out of the croze, besides adding considerably to the strength of the barrel.

Fig. 9—The Trade mark should contain the words "Canadian Apples" in $\frac{3}{4}$-inch lettering.

Marking Barrels

The establishing of a trade mark is essential in successful marketing. The mark should be attractive and representative of good quality uniform packed fruit. A shipper watching his pack carefully can quickly gain a reputation with the trade. According to the Fruit Act* all barrels are required to be marked on

*Apply Fruit Commissioner, Ottawa, for copies of the Fruit Act.

the face end with the name and address of the shipper, together, with the grade and variety, in letters not less than three-quarters of an inch (fig. 9). The marking is usually done by means of brushing black ink over a specially designed thin copper stencil. A reliable stencil ink is prepared by mixing lamp black and ordinary coal oil so that it runs freely. The use of lithographed labels on barrels is to be discouraged as they are easily torn off and spoilt by dampness.

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FIG. 10.—A conveniently well built box packing and storage warehouse. The other side of the building has a similar platform for receiving fruit.

BOX PACKING

There is every indication, in studying the trend of the domestic and export markets, that there is a steadily growing demand for apples packed in boxes. This may be explained by the fact that the box is a convenient package containing a definite number of apples and meets the requirements of the wholesale and retail trade, as well as the consumer. British Columbia and the Western States already pack their entire apple crop in boxes, and this has developed into an important industry within the past twenty-five years. In Eastern Canada box packing is becoming more popular every year and there is every indication of a larger portion of the better varieties being packed in this manner. Successful box packing depends upon the production of good quality fruit, careful grading and accurate sizing. There is nothing complicated or difficult in packing; it is merely necessary to have a knowledge of the fundamental principles, together with practice in the actual operations. Every year the western packers have to instruct hundreds of new packers to meet their needs and this is carried out by the aid of packing schools held prior to harvesting the crop.

The following paragraphs have been purposely arranged to convey the necessary instruction to the beginner in order to make box packing easy to acquire

Packing House

A packing house should be conveniently located to transportation facilities and constructed so as to afford economical and uniform packing. The size of packing house depends primarily upon the tonnage to be handled, but should be built to accommodate an adequate storage for incoming fruit, packing room and storage for packed fruit. Where it is necessary to pack and store during periods of low temperature it is advisable to have the building constructed with insulated, frost-proof walls. A lighting system in the packing room is essential and should consist of windows along at least three sides and several skylights over the sorting table and grader, in addition to artificial light when neceassry. Special attention should be given to the ventilating system in the storage rooms to maintain a moderate temperature about the fruit. The kind of construction should depend entirely upon the choice and cost of material in different localities.

Mechanical Equipment

Whether a packing house is equipped with grading machines and other labour saving devices depends upon the size of house and the quantity of fruit to be packed. There are many designs of power-driven graders on the market, but the most popular type is that which sizes by weight and is equipped with spiral sorting tables and belt conveyers for delivering the different grades of apples to their respective bins. Graders vary in capacity ranging from 20 to 180 boxes per hour, and usually several medium sized machines are installed in preference to the large type as they are considered more economical to operate. The advantage of the mechanical grader is the speed accomplished in sorting, uniformity in sizing and that packing is rendered a simple operation owing to the fruit

FIG. 11—Modern machinery greatly reduces handling costs and avoids congestion. Conveyors over the grader allow a constant supply of boxes while gravity and belt conveyors conveniently situated to the packers keep the packed boxes constantly moving towards the lidder and to the car or storage.

Fig. 12—Well arranged packing house for hand grading.

being sized for the packer. The installation of gravity and belt conveyors in a packing house greatly reduces handling costs as it provides a systematic movement of empty boxes to and from the grader and platform, and the transfer of packed boxes from the packer to the lidding press, also to storage. Gravity conveyors are practically indispensable in large packing houses as they avoid confusion and minimize costs.

Packing Tables

There are many packing house operators who prefer to grade and size by hand as they maintain the cost of packing is lower and the fruit receives less

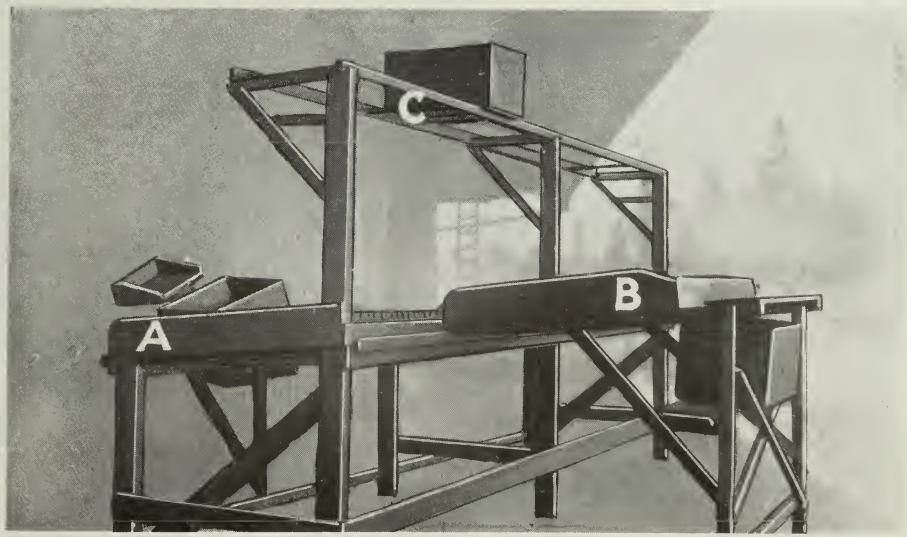


Fig. 13—Packing table for two packers, (A) Packing table, (B) Sorting table. Note groove for sliding table and cull box. (C) Rack for empty boxes.

bruising from more careful handling. Where this method of packing is followed it is necessary to provide conveniently arranged sorting and packing tables. An excellent system is to grade for quality and size from one table, and transfer the fruit to another from which the apples are packed. A suitable packing table to accommodate two packers (fig. 13) is one 8 feet long, 4 feet wide and $2\frac{1}{2}$ feet high with 6-inch sides and a solid top, well padded to protect the fruit. The sorting table is built about 5 feet long and 3 feet wide and is covered with double canvas. The advantage of the packing table is that the packer is only required to pack one or two boxes at a time. Another system very often followed, where expert packers are available, is to pack four boxes at once, placed in a line on a bench. The bench is built alongside a wall provided with ample light and the same height as the table, with the back raised 6 inches to allow a slope for the boxes. The fruit is graded for quality from the sorting table into orchard boxes and placed on the bench with two boxes on either side. (Fig. 14.) The packer grades for size as he packs. Whatever system is followed in packing it is essential that the fruit be carefully graded for quality and strict supervision given to sizing in order to maintain uniformity.

Fig. 14—Packing bench allowing four boxes to be packed at once. (A) graded apples in orchard box; (B) paper holder; (C) paper needle.

Standard Box

The apple box is a standardized package in Canada under the Fruit Act and is required to have a capacity measurement of approximately 2,174 cubic inches without the bulge and to measure $10\frac{1}{2}$ inches deep by $11\frac{1}{2}$ inches wide by 18 inches long, inside measurement. This package is identical in every respect with the standard apple box used in the United States. The dimensions of the box have been arrived at after considerable experimental work and are specially adapted to receive all the different sized apples from the smallest to the largest of the various counts with a tight, well finished pack. It is important

that the kind of wood from which the boxes are made should be void of knots in order to insure strength. Manufacturers supply the boxes in shook or bundle form with definite counts of end, side, top and bottom pieces and cleats with one side of the material dressed ready to be nailed together by the packer. Cleats are necessary on every properly packed box to strengthen the top and bottom pieces, which are likely otherwise to split and break where the nails are driven.

FIG. 15—An easily made box-making bench. On the upper left hand corner is nail stripper conveniently situated.

BOX-MAKING BENCH

In order to assemble boxes rapidly it is essential to have convenient and well built equipment. A box-making bench, as illustrated in fig. 15, is a solid and satisfactory bench for a small packing house, and with it a workman is

capable of making from 500 to 700 boxes per day. This bench which contains approximately 33 feet of lumber, board measure, made up of 5 feet of 2 inch by 4 inch, 17 feet of 4 inch by 3 inch and 10 feet of 12 inch by 1 inch, can be easily and quickly constructed.

Box-makers provided with proper equipment are usually paid by piece work at the rate of ninety cent to $1 per hundred, which is equivalent to approximately one cent per box. The nails cost approximately another cent making a total cost for assembling of two cents per box.

A nail stripper, as shown on the left of the bench (fig. 15), will be found to greatly facilitate the making of boxes. The object of the stripper is to have a constant supply of nails convenient to the workman, allowing the nails to be conveyed to position and driven home with one motion. There are thirty-two six-penny ($1\frac{1}{2}$ inch) cement-coated nails to a box. In addition a broad-headed hatchet is essential for speed. Before nailing the cleats it is advisable to soak them in water and to drive the nails through both the cleats and covers in order to avoid splitting the wood.

Apple Packs

There are three styles of packs that are generally used in commercial practice known as the 2-1, 2-2 and 3-2 diagonal packs. These packs when properly used with well sized apples will take care of practically all the sizes from 36 to 213 counts inclusive to a box. Sometimes a 3-3 pack is substituted for the 3-2 pack in counts from 198 to 225 while it is always used for the smaller sizes down to 252.

Determining Packs

In order to determine which pack to follow with any size apple the beginner can easily figure it out by selecting uniform sized fruit and placing same across the bottom of the box. For instance, upon placing two large sized apples alongside of each other, and the third apple will not fit in, it is a 2-1 pack taking three layers to fill the box. On the other hand, if three apples of the same size fit loosely across the box and the fourth will not slide into place, the pack is 2-2 with four layers deep. The same practice applies in determining a 3-2 pack, five layers deep, in the event of five apples not fitting across the box.

Two–One Pack

This pack contains three tiers of apples and takes care of the very large sizes with 36 to 54 counts and is recognized when three apples are too large to fit across the box. To commence this pack, place two apples one in each corner of the box, followed by one apple which will slip down half way between the two and continue with two and then one until the tier is finished. The succeeding tiers are carried out in exactly the same manner except that the apples are placed over the spaces of the tier below. The apples should be packed on their sides with the calyx towards the packer and placed in position loosely to insure finishing with the desired height.

Two–Two Pack

In order to make sure the apples are suitable for a 2–2 pack, it is advisable to try out four apples across the box. The fourth apple should not fit in for this pack. To start the 2–2 pack, place one apple in the right hand corner of the box and the other half way between this apple and the other corner. The third apple is placed in the space between the second apple and side of box, the fourth between the second and first apples (fig. 16). Continue this order throughout the tier taking care to place the two apples of each line at right angles to the side of the box to insure proper alignment. The packer should note that each

of the remaining tiers finishes over the spaces left by the apples in the under tier. That is to say on no account should the apples of one tier ride the apples of the tier below, but fit snugly into the spaces made by the diagonal placing of the apples.

Fig. 16—Diagram showing the order in which the apples should be placed in starting a 2–2, 3–2 and 3–3 pack.

It takes four layers of apples packed on side to complete a 2–2 pack. This pack contains nine sizes and includes the counts from 48 to 112 inclusive. The necessary bulge in packing these counts is secured by placing the large sized apples loosely in position while the smaller sizes are kept pulled down tight in position in the box.

DIAGRAM OF PACKS SHOWING PRINCIPAL COMMERCIAL SIZES

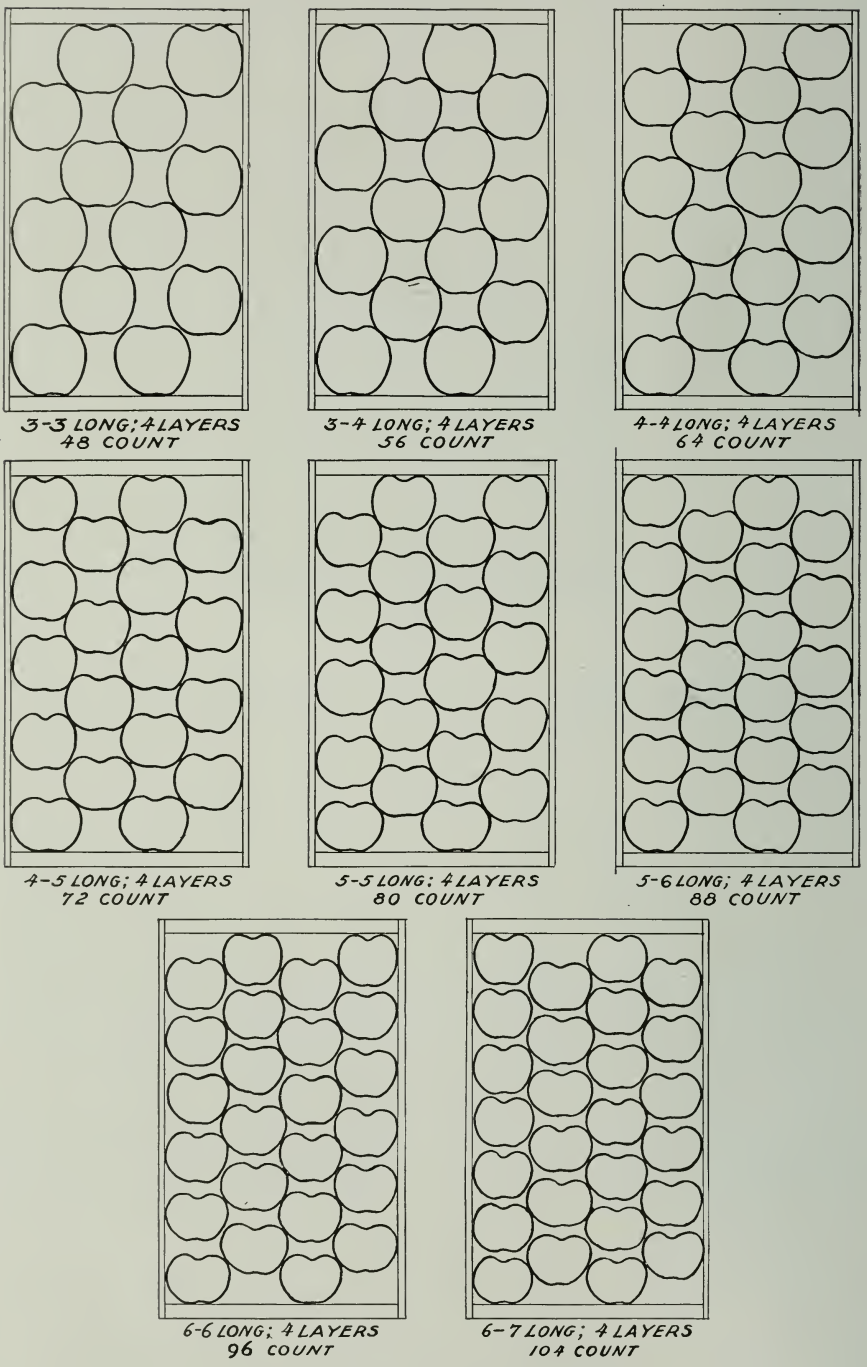


FIG.17—Principal Counts in the 2-2 pack.

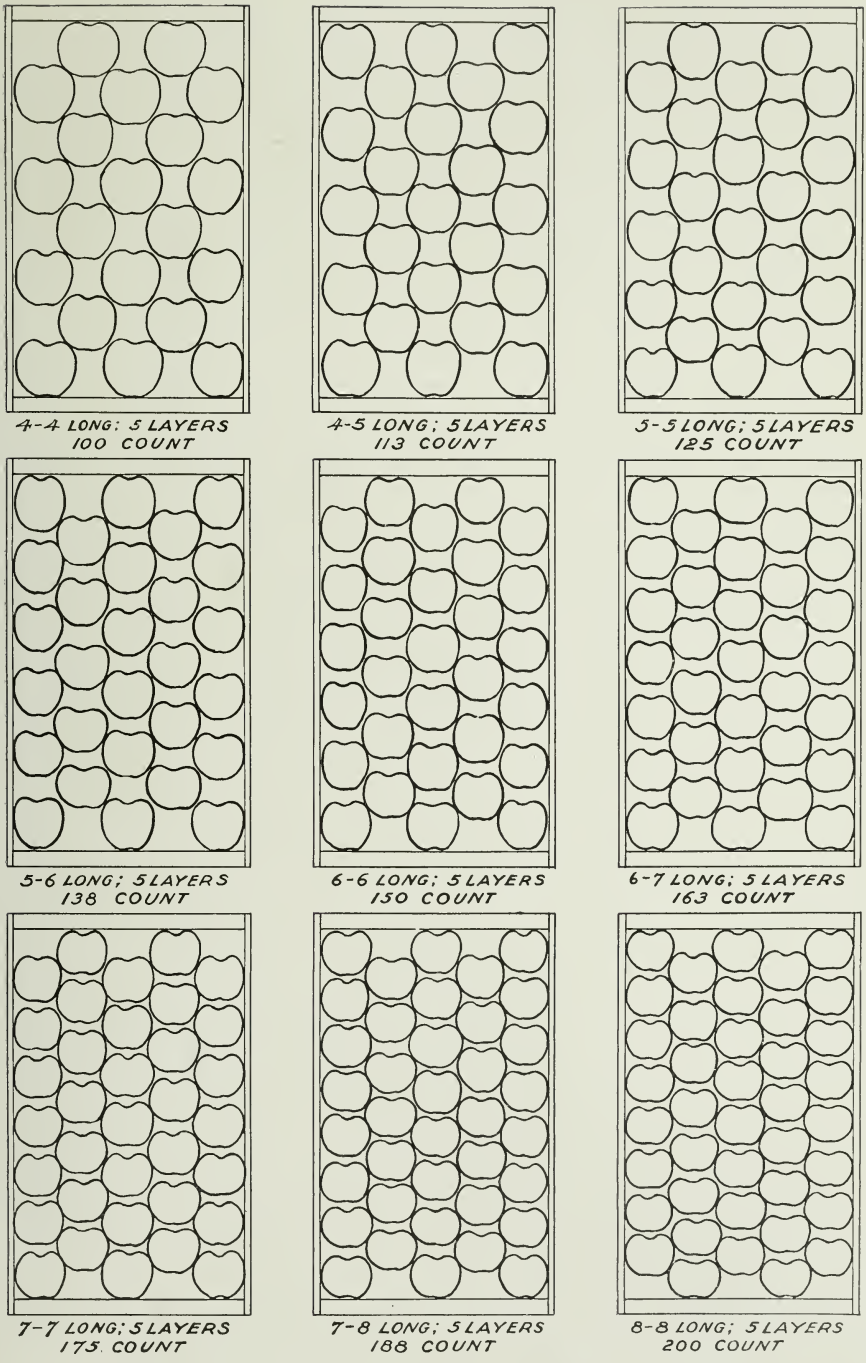


FIG. 18—3-2 Packs—Counts 100–200 inclusive.

Three–Two Pack

Five layers of the 3–2 pack fill the box of sizes ranging from 100 to 213 counts. To start this pack an apple is placed in each lower corner of the box and a third exactly half way between the two. Two more apples are placed in the spaces created by the first three (fig. 16). This is followed up with three apples and then with two until the bottom layer is completed. As stated in the previous packs the small sized apples should be pulled firmly into position while packing the first tier in order to secure a firm pack of the correct height. The second layer is started by placing two apples over the spaces in the first layer at the end nearest the packer and continuing as outlined for the first layer. The third and fourth layers are carried out in the same manner. Confusion in packing may be avoided by exercising care in selecting uniform sized apples and keeping the rows straight across the box. Apples are packed on their side.

Three–Three Pack

The 3–3 pack contains six layers of apples packed on side to fill the box and takes care of the smaller sizes. It is started by placing an apple in the lower right hand corner of the box and dividing the remaining space with two more apples, leaving a space in the opposite corner across the box. Three other apples are placed to fit half way down in spaces made by the first three, completing the bottom layer with apples in the same relative position. The succeeding layers are packed in the same manner as the first, placing the apples over the spaces in the layer below.

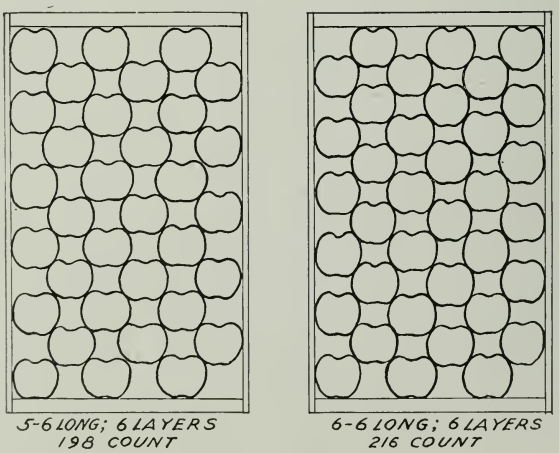


Fig. 19—3–3 Packs.

Standard Apple Packs

Style of Pack (width)	Number in Rows (length)	Number of Tiers (depth)	Number Apples in Box (count)
	2–1 Diagonal Pack		
2–1	4–4	3	36
2–1	4–5	3	41
2–1	5–5	3	45
2–1	5–6	3	50
2–1	6–6	3	54
	2–2 Diagonal Pack		
2–2	3–3	4	48
2–2	3–4	4	56
2–2	4–4	4	64
2–2	4–5	4	72
2–2	5–5	4	80
2–2	5–6	4	88
2–2	6–6	4	96
2–2	6–7	4	104
2–2	7–7	4	112
	3–2 Diagonal Pack		
3–2	4–4	5	100
3–2	4–5	5	113
3–2	5–5	5	125
3–2	5–6	5	138
3–2	6–6	5	150
3–2	6–7	5	163
3–2	7–7	5	175
3–2	7–8	5	188
3–2	8–8	5	200
3–2	8–9	5	213
	3–3 Diagonal Pack		
3–3	5–5	6	180
3–3	5–6	6	198
3–3	6–6	6	216
3–3	6–7	6	234
3–3	7–7	6	252

The above apple packs are the principal commercial packs followed by most packers. In the 2–2 pack counts 120 and 128 might be added; 3–2 pack might include 225 count, but these are not used to any great extent.

Packing

The position of the box in relation to the packer is the same, both in packing from the bin of a grading machine or off a table or bench. That is to say, the box should be in a sloping position so that when the packer is standing easy his fingers will just touch the bottom of the box nearest him without having to bend the back. This is an important consideration as if affords the packer a free and easy motion, which is the secret of efficient packing. When packing from a grading machine or table it is customary to have stands built 2 feet 6 inches high in front, 3 feet high at the back, and wide and deep enough to accommodate one or two boxes. This allows the stand to be moved to wherever there are apples ready to pack, whether on tables or in bins. Wrapping paper is placed in a holder equipped with a "paper needle" on the left of the packer. With the bench system of packing, the paper may be placed to the left and on a shelf

2–2 Pack

5–5 long—4 tier deep
80 count.

6–7 long—4 tier deep
104 count.

3–2 Pack

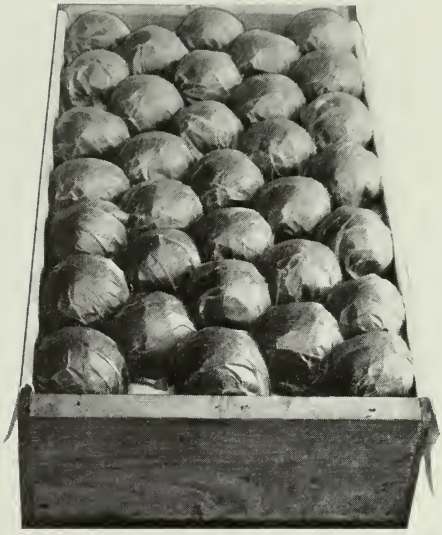
4–5 long—5 tier deep
113 count.

5–5 long—5 tier deep
125 count.

FIG. 20—Illustrations of the principal counts in the 2–2, 3–2 packs showing how they should look when properly wrapped and packed. Counts 138 and larger are best suited for the domestic markets.

3–2 Pack

6–6 long—5 tier deep
150 count.



6–7 long—5 tier deep
163 count.

7–8 long—5 tier deep
188 count.

8–8 long—5 tier deep
200 count.

FIG. 20—Apples properly packed in boxes. Counts 150–188 best sizes for British markets.

3-2 Pack

8-9 long—5 tier deep
213 count.

3-3 Pack

6-7 long—6 tier deep
234 count.

FIG. 20—Most packers prefer the 3-3 pack six tier deep to the 3-2 pack for sizes 200 and smaller. The 3-3 pack commence at 180 count. Small sizes, however, should be discouraged as they usually sell at a discount over the medium and large sizes on most markets.

in front of the packer. The "paper needle" fastened to the holder is a useful device to deliver one sheet of paper at a time. Racks with supplies of wrapping paper should be conveniently located to the packers.

LINING PAPER

It is a customary commercial practice to line the boxes with paper which adds to the attractiveness of the package. Two sheets 18 inches by 26 inches are required for each box. The sheets are placed in the box on each side, lapping over the bottom slightly and having a fold in the lower corners so as to avoid tearing the paper when pressure is put upon it when nailing on the cover. The box is filled and the two sheets lapped over the top.

WRAPPING PAPER

Apples packed in boxes are wrapped in individual papers as a safeguard to the fruit in transit and to insure best possible condition on arrival at markets. Experience has shown that wraps protect the apples from bruising, add to the attraction and are a means of preventing the spread of disease. In addition, it is easier to pack a box of apples with wraps than without. The strength and smooth appearance of the wraps is important and for this reason it is advisable to use twelve-pound sulphite paper glazed on one side. Although the quantity of paper varies with the number of apples in a box, it is estimated that fifty pounds of paper will wrap one hundred boxes. The following sized wraps are recommended for the different counts:—

Size wraps (inches)	Number of apples in box
8 x 8	188 – 216
9 x 9	113 – 175
10 x 10	88 – 112
11 x 11	56 – 80
12 x 12	32 – 50

Oiled wraps are rapidly taking the place of ordinary paper for storage apples, as they have been found a scald preventative. According to experimental data the paper should contain at least 17 per cent mineral oil content which should be both tasteless and odorless.

Fig. 21—Interior packing house showing grader and position of packer. Note paperholder is always on left of the packer. The empty boxes are being labelled and lined on the top floor. As boxes are packed they are placed on gravity conveyor on packer's left and pass on to the lidding presses.

Wrapping

Quickness in wrapping is the result of practice in handling the fruit with as few movements as possible. The paper should be placed conveniently in a paperholder with the smooth side up, on the left of the packer. A rubber finger-stall is worn on the middle finger of the left hand to facilitate lifting the paper. With everything in readiness, the beginner should practise wrapping until an easy and quick method is acquired, as most packers have their own particular style of wrapping. However, the following description and illustrations (fig. 22) of an easy and efficient wrap, as practised by a large number of packers, should prove a useful and practical guide. The first movement is to pick up the paper (*a*) with the middle finger and thumb so that it is centred over the palm of the left hand. The hand should be partly closed (*b*) so that when the apple strikes the paper the corners will be turned upwards. The apple is thrown into the paper on its side with the stem end pointing midway between the thumb and index finger (*c*). It is necessary at this stage to have the apple in correct position so that when the

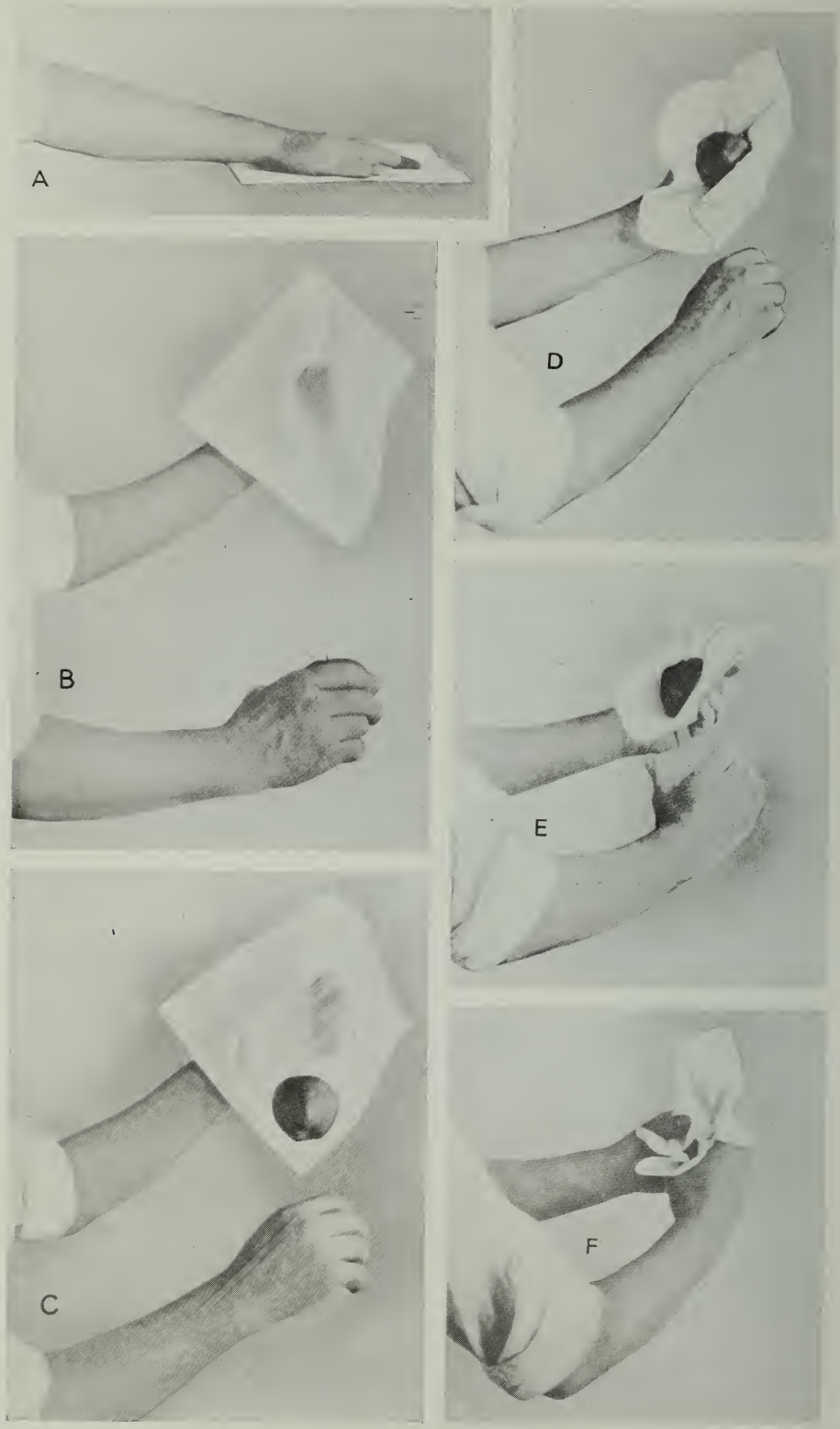

A
B
C
D
E
F

FIG. 22—Method of wrapping an apple: (a) picking up the wrap; (b) picking up the apple; (c) throwing the apple into the wrap; (d) position of apple upon striking the wrap; (e) wrapping process, first stage; (f) wrapping process, second stage; (g) apple held tightly in right hand, pressing apple against cup formed by left hand; (h) apple turned within cup formed by left hand, both wrists turning toward right; (i) hands turning over completely; (j) back of left hand upward, back of right hand downward; (k) apple ready for placing in box, right hand reaching for next apple; (l) placing wrapped apple in box.

Photographs by courtesy of Bureau of Agricultural Economics, Washington, D.C.

wrap is completed it will be placed in the box on its side with the stem end away from the packer. The left hand is closed (*d*), enveloping the paper about the fruit. With the right hand, slide the index finger and thumb wide apart over the apple from below (*e*), closing the ends of paper together so that the right hand has a firm

grasp of the paper (*f*). The left hand should be free to move although the apple still remains against the palm of the hand (*g*). The right hand should now be twisted with a wrist movement away from you so that the fingers are pointing downwards (*h*) while with the same motion the left hand gather the other two ends of the paper tightly over the apple so that they envelope the fruit. Removing the right hand the left hand carries the apple and downwards into the box (*kl*). The wrap, as just described, is carried out in three movements and after a short practice the packer will carry them out automatically. That is to say, the paper and fruit will be picked up simultaneously and the latter thrown into the wrap in the palm of the left hand in correct position and the paper twisted about the fruit with the greatest of ease and speed.

Bulge

The bulge, or height, of pack is one of the most important factors in commercial box packing as it is the means of holding the pack rigid following the natural shrinkage of the fruit during storage and transportation. The packer upon completing the top layer of apples should finish with the height at the ends

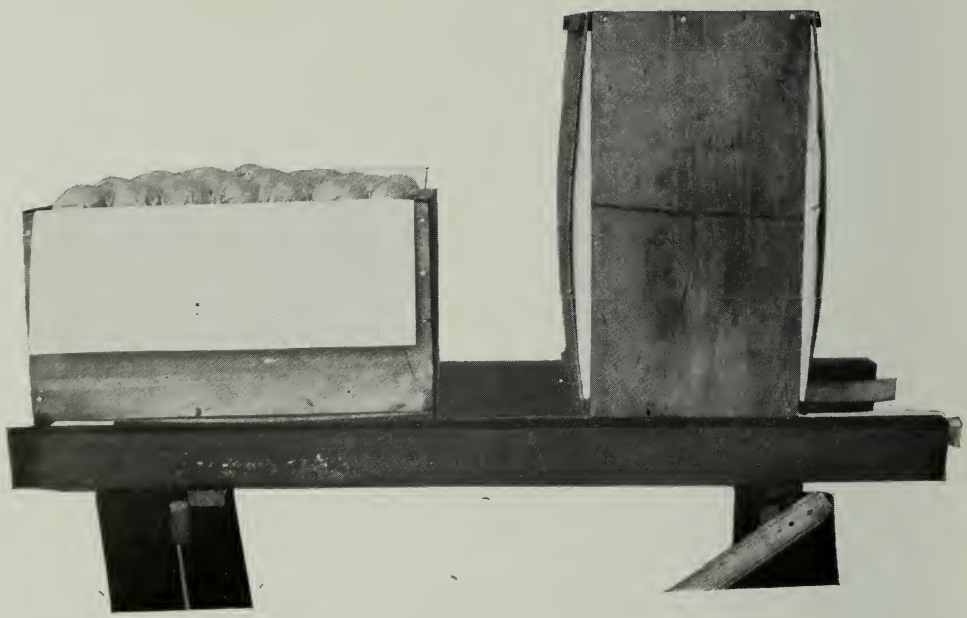


Fig. 23—Bulge is controlled by regulating the tightness of the layers according to size of apples. The box on the left shows the proper height before pressing while the other box show the bulge equally distributed after pressing.

about one-half to three-quarters of an inch above the edge of the box, and with a bulge of approximately one and one-half inches in the middle; upon pressing the fruit, this will allow an even bulge of three-quarters of an inch both top and bottom of the box. Packers will find no difficulty in controlling the height of the pack providing the tightness of the layers are regulated according to the size of the apples. The smaller the apples in the pack of each class (2–2, 3–2) and the 3–3 pack, the tighter the layers should be drawn down in the box, and this should be done when half the apples have been placed in the first layer. The largest sizes in the 2–2, 3–2 packs, such as 48 and 100 counts, should be packed loose, otherwise the pack will come too high above the box. The reason for

drawing the apples tight in the smaller sizes is quite obvious, as the tighter the apples are packed in each layer, the smaller is the pocket for the apple above to fit into, resulting in a higher pack. It is also important to keep the rows across the box straight and not to pack apples that vary materially in size.

Box Press

Upon completing the packing of a box, it is removed to a press to receive the lid, and nailed ready for shipping. The lid is drawn into position by means

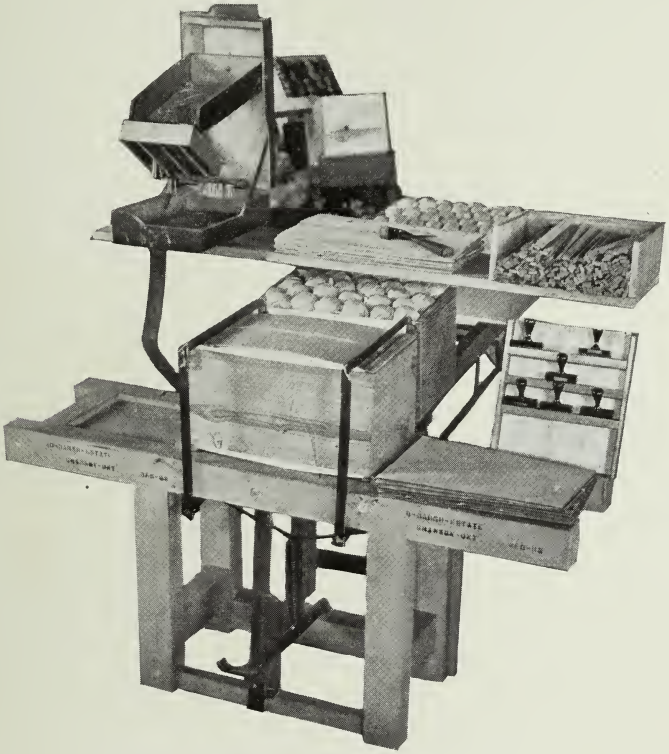


Fig. 24—A convenient box press showing nailing equipment for small packing house.

of two iron clamps operated by the foot (figs 24, 25) and secured by driving four five-penny nails at each end through both the cleat and cover. There are several types of presses on the market but the one shown in fig. 24 is a very serviceable kind that can be made by anyone handy with tools. The shelves are made a convenient height to accommodate the nail stripper, covers and cleats. A nail stripper and box hatchet are indispensable for rapid nailing.

Marks

The trade demands an attractive and neatly labelled package. Some shippers stencil the markings on the end of the box but a lithographed label is generally preferred. Whatever method is followed it is essential that the contents uphold a good reputation for the trade mark. In addition to a shipper's trade mark, the Fruit Act requires the count or number of apples, variety and the grade to be plainly indicated on the end of the box. This is usually done by the lidder, who has

a supply of rubber stamps conveniently located on the side of the press (fig. 25). Some packing houses use a stamping machine for this purpose which is located alongside the press and is also operated by the lidder, or a person especially allotted to the work. The grade and count should be in letters not less than

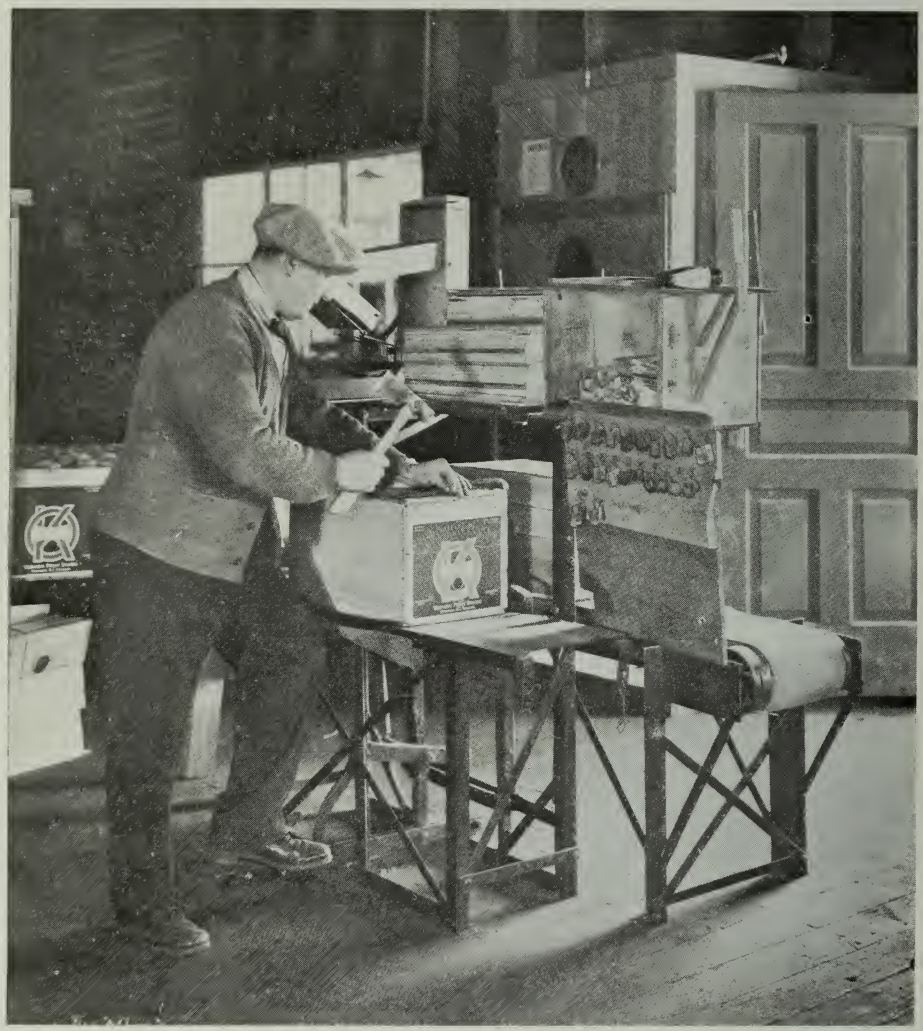


FIG. 25—Box press showing box in process of lidding, pressing and nailing. The press is operated by the foot. When the box is completed it is placed on the belt conveyor at the back of the press.

one-half inch in length and stamped within $1\frac{1}{2}$ inches from the top in order to clear the label. Where the brand is stencilled this is usually done by the box manufacturers. Labelling is carried out either in the storage or just prior to loading into the car. All boxes for export must be securely wired, the wire being fastened inside the cleats at both ends of the box.

FIG. 26—Another view of interior of packing house. On the left is the belt conveyor behind the box presses.

Standard Half Box

The half box measuring 18″ x 11½″ x 4½″ is a standard package in Canada having been made a legal carrier by Order in Council, August, 1926. This package has been specially selected to pack high quality fruit to meet the demands of the apartment house and small family trade on our Canadian and export markets and it is hoped that it will be the means of increasing the consumption of Canadian grown apples.

Packers will find no difficulty in packing the half box as every operation is carried out in exactly the same manner as described in the previous chapters for the standard box. Apples are sized, wrapped and placed diagonal pack in the box, but they are only two layers deep. The bulge is regulated in the same manner as the standard box by keeping the smaller counts pulled down tight in the bottom layer which allows the apples to be raised to the proper height by regulating the size of pocket for the top layer to rest in. It is not desirable to pack sizes 104 and larger or 188 and smaller in this package as it is meant for a particular trade requiring high quality apples of medium size.