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# New York State Agricultural Experiment Station

Geneva, New York

## PREPARATION AND PRESERVATION OF FRUIT AND VEGETABLE JUICES



FIG. 1.—HOMEMADE FRUIT JUICE PRESS IN OPERATION. ALSO SEE FIG. 4.

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## HOME PREPARATION AND PRESERVATION OF FRUIT AND VEGETABLE JUICES

**A**LTHO grape, apple, pear, berry, and other fruit juices have been known for many centuries, methods of preserving them are of relatively recent origin. Prior to 1869 when Welch first applied the principle of heat sterilization to the preservation of grape juice, fermentation was the only method of preserving fruit juices.

A generation ago cider was preserved by boiling it on the stove or in an iron kettle over a wood fire until a sirup was obtained. While still hot, the sirupy product (boiled cider) was run into glass jars or tin cans which were tightly sealed immediately. Some cider is still preserved in this way, but improved methods of preservation now enable the housewife to preserve fruit and tomato and other acid vegetable juices in such ways that they can scarcely be distinguished from freshly prepared products. If carefully prepared and preserved, home-canned or home-bottled fruit juices retain their palatability, appearance, and nutritive values.

Canned and bottled juices may be consumed as pure juices in the first course of a meal or as an evening drink. They may be blended to make excellent cocktails, punches and other fruit drinks. They may be used for making jellies or for flavoring ice cream, ices, puddings, and other desserts such as those made with gelatin, as well as for many other culinary purposes such as salads.

Vegetable juices are much more recent in origin than fruit juices. About 25 years ago, sauerkraut juice was canned, but unfortunately, the character of the juice was often changed in processing from a sparkling, carbonated, light-colored juice as obtained from the kraut vat to a flat but acid and salty juice. Prior to 1928 tomato juice was prepared in homes by straining juice from canned tomatoes. Some of the first juices canned consisted of the yellow clear liquid obtained after separating the red solid or more or less fibrous portions from the juice. Improvements in methods of preparation and processing have resulted in greatly improved products until today tomato juice holds a leading position in the juice industry.

Juices may be classified according to the amount of suspended matter which they contain. Clear juices, such as clarified apple and cherry juices, contain none of the solid portion of the fruit in suspension. Cloudy juices, like freshly pressed apple juice, sometimes called

natural juices, contain much colloidal material (finely divided solid portions of fruit) and usually some coarser particles, in suspension. Pulp juices, such as tomato juice, contain all or nearly all of the solid part of the fruit or vegetable with the exception of the skin, seeds, and coarse fibrous materials. Vegetable juices are generally prepared as pulp juices. When pulp juices stand, much of the suspended matter settles to the bottom of the container leaving nearly clear juice above.

### EQUIPMENT REQUIRED FOR PREPARATION OF JUICE

Clear fruit juices are made by the treatment and filtration of cloudy juices. Since special equipment not ordinarily available on the farm or in the home is needed for the clarification of juices, clarification methods will not be described here.

Cloudy or natural juices are ordinarily prepared by pressing mashed, ground, or crushed fruit. Orange and other citrus juices are exceptions. These juices are obtained either by reaming or by pressing between metal forms. Pulp juice is usually prepared in special equipment which forces the entire fruit or vegetable, with the exception of the seeds, skins and fibrous portions, thru a fine metal screen.

All equipment which comes in direct contact with fruit, tomato, rhubarb, and sauerkraut juices, e.g., fruit crushers, extractors, presses, and containers, should be constructed of corrosion-resistant metals and/or wood. Aluminum and stainless steel are superior to other common metals, and if the juice is not permitted to remain in contact with the metal for more than a few moments, extractors constructed of heavily tinned steel may be used. Fruit juices should not be allowed to stand in tin or copper containers unless properly lined. The acid of some fruit juices rapidly corrodes iron and steel with the exception of stainless steel. During contact of juice with iron, some iron is dissolved in the juice, discoloring it and usually imparting an unpleasant flavor to it. White enamel may be used if the enamel is not chipped, but gray or blue enamelwares are unsatisfactory because the fruit acids attack this enamel, causing it to scale off.

Cloudy or natural juices are usually made commercially by pressing the ground or crushed fruit in coarse cloths with powerful hy-

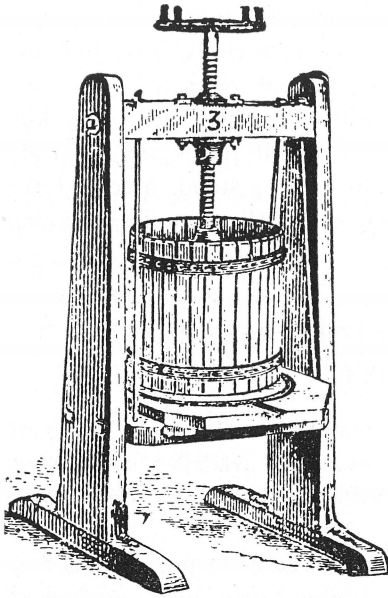


FIG. 2.—A SMALL TYPE SCREW PRESS.

draulic presses sometimes called cider presses. Owing to the high pressure exerted, this type of press gets a larger yield of natural juice than any other. In many communities there are cider mills which do custom grinding, e.g., they will wash, grind, and press apples and pears in a hydraulic press for a moderate charge. If juice is prepared in such a mill, the same care should be used to handle the juice rapidly as will be described for home-prepared juices.

The most common type of press employed for making apple and grape juice in the home is the barrel press (Fig. 2). This consists of a barrel-like compartment

built in a heavy framework to which a heavy screw with ratchet is attached. In operating this type of press, the fruit is first ground or crushed in a fruit grinder or crusher. The crushed fruit is put into a bag made of coarse cloth which in turn is put into the "barrel", then the screw is turned down, thus pressing the fruit and causing the juice to flow thru the cloth and cracks between the staves or the perforations in the barrel. Barrel presses are available in several sizes, varying from the small table size commonly used for lard to large floor presses holding several bushels of ground fruit.

If only small quantities of fruit are to be pressed at a time, a simple "nutcracker" type of press (Fig. 3) may be used. The construction of this press is so simple that it may be made at home from two large wooden paddles. The rope hinge should be long enough so that it may be adjusted to fit the bulk of the bag.

For larger quantities of fruit, a simple press may be constructed utilizing an ordinary hydraulic automobile jack and other materials usually available on the farm (Figs. 1, 4, and 5). Approximately a bushel of fruit may be pressed at one time from which 3 to 4 gallons of juice may be obtained. This is a larger yield than can be obtained

from the screw or nutcracker press since greater pressure can be exerted. In addition, the ease of operation speeds up the process so that 2 to 3 bushels or more may be pressed in an hour.

Pulpy juices are ordinarily prepared by forcing the pulp and the juice of the fruit thru a corrosion-resistant metal screen (Fig. 6). A common type is a tapered press or extractor which resembles the common meat grinder in outward appearance (Fig. 7). The smaller types are turned by hand, while the larger ones are operated by electric motors. The softer fruits sometimes are pressed by hand thru an ordinary collander or strainer, but ordinarily the more fibrous portions pass thru such devices. The tapered screw forces both pulp and juice thru a screen which fits snugly over it. The skin and small seeds and fibrous material do not pass thru the screen but are forced out at the small end of the tapered screw. Large seeds, such as those of the cherry, peach, and plum must be removed before the fruit is put into the extractor.

Recently, centrifugal extractors (Fig. 8) have come into use for making small amounts of juice for immediate consumption from the more solid vegetables and fruits. This extractor consists of a small carefully machined metal basket which is revolved at high speed by

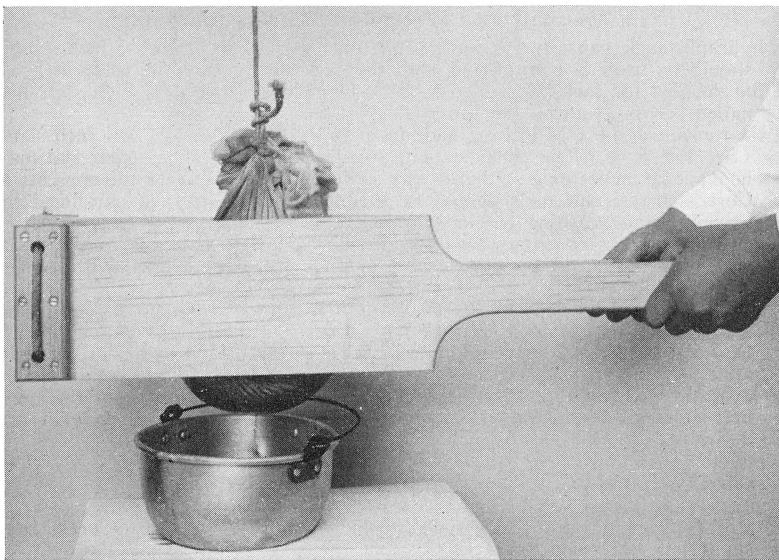
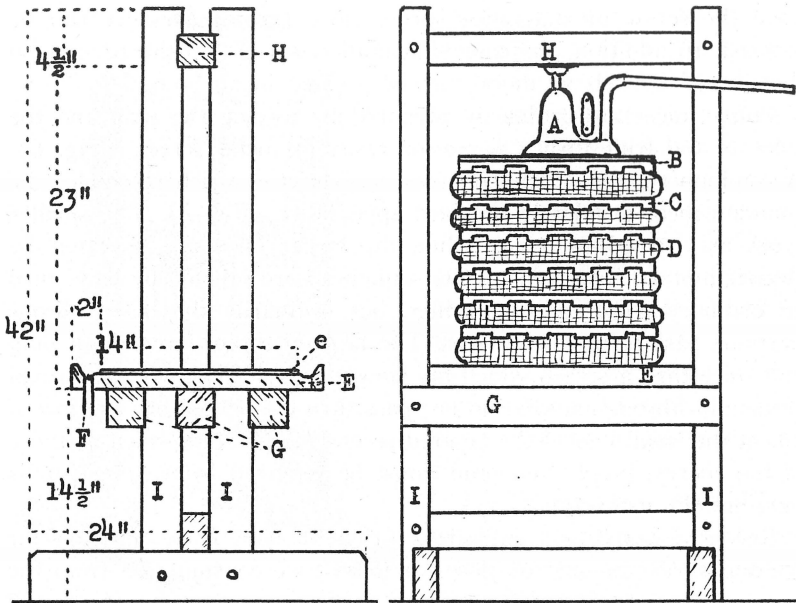


FIG. 3.—A SIMPLE HAND PRESS OF THE NUTCRACKER TYPE.  
Made from  $1 \times 8$  inch boards 28 inches long.



Side Cross Sectional View

Front View

FIG. 4.—CONSTRUCTION AND DIMENSIONS OF HOMEMADE FRUIT JUICE PRESS WITH APPROXIMATE CAPACITY OF 1 BUSHEL OF FRUIT.

- A, hydraulic jack, capacity  $1\frac{1}{2}$  tons, 5-inch lift. A  $4 \times 4$  inch block 5 inches high should be used in conjunction with the jack to increase the total lift.
- B, flat support for jack,  $\frac{3}{4}$  inch oak,  $14 \times 14$  inches. Six  $1 \times \frac{1}{4}$  inch slats are nailed across grain on the lower side.
- C, six racks, oak  $14 \times 14$  inches, made from  $\frac{1}{4} \times 1\frac{1}{2}$  inch and  $\frac{1}{4} \times 1$  inch slats. (See Fig. 5, A.) The wider slats are used at the edges. The center slat may be made 20 inches long so that it may serve as a guide between the uprights I. Corrosion-resistant nails should be used. The racks may be paraffined by warming and brushing on hot paraffin.
- D, press cloths  $24 \times 24$  inches. Heavy twisted cotton of open weave. White grain sacking or white duck cloth may be used. These may be lined with muslin cloth for certain fruits, e.g., berries.
- E, press base. Careful and sturdy construction is most essential to a good press. Hard close grained wood such as maple is desirable. A  $\frac{3}{4} - 17$  inch  $\times$  17 inch base has a  $\frac{1}{2} \times 2$  inch inside bevelled edge around it. This is securely attached to base support G. A  $\frac{1}{4} - 14$  inch  $\times$  14 inch board (e) is placed over the main base and a  $\frac{1}{2}$  inch groove is cut around it so that the juice may flow to the outlet F. A smooth surface and a coat of paraffin are desirable.
- F, outlet for juice,  $\frac{3}{4}$  inch pipe of corrosion-resistant metal.
- G, support for press base.
- H, press top, a metal plate at point of contact of press is desirable.
- I, uprights. Two uprights used on each side to allow more sturdy press base support G and guide for racks C.
- J, Cheese form  $14 \times 14$  inches square, 2 inches high, made with 1 inch board. (See Fig. 1, A.)

In using this press the fruit should be crushed, berries and other soft fruit may

be put thru a grape crusher but apples should be sliced before crushing. The crushed fruit should be placed in the press immediately. Place cheese form J squarely on press base E. Place press cloth diagonally over the form, the corners to fall down over the sides of the form. Place crushed fruit in cloth. (See Fig. 5.) Fill the corners, i.e., do not round out the form. Fold the corners of the cloth over the fruit, not too tight, remove the form and place a rack C on the cloth. Place cheese form J squarely on rack C and continue until the press is filled. Jack A is placed squarely on support B and pressure is applied uniformly. If twisting occurs, the cheeses have not been built uniformly. When full lift of jack A is used, lower and use a block to obtain additional lift.



FIG. 5.—FILLING THE HOMEMADE FRUIT JUICE PRESS.



FIG. 6.—A SMALL TYPE EXTRACTOR FOR PULPY JUICES.

means of a motor. The bottom of the basket is rough like a coarse rasp, while the sides are finely perforated. In extracting juice by means of this machine, pieces of the fruit or vegetable are pressed down against the bottom of the rapidly revolving basket, thus converting them into pulp. The pulp is thrown up against the perforated sides by centrifugal force thus extracting the juice which passes thru the perforations into the curb. The product usually contains much finely divided pulp.

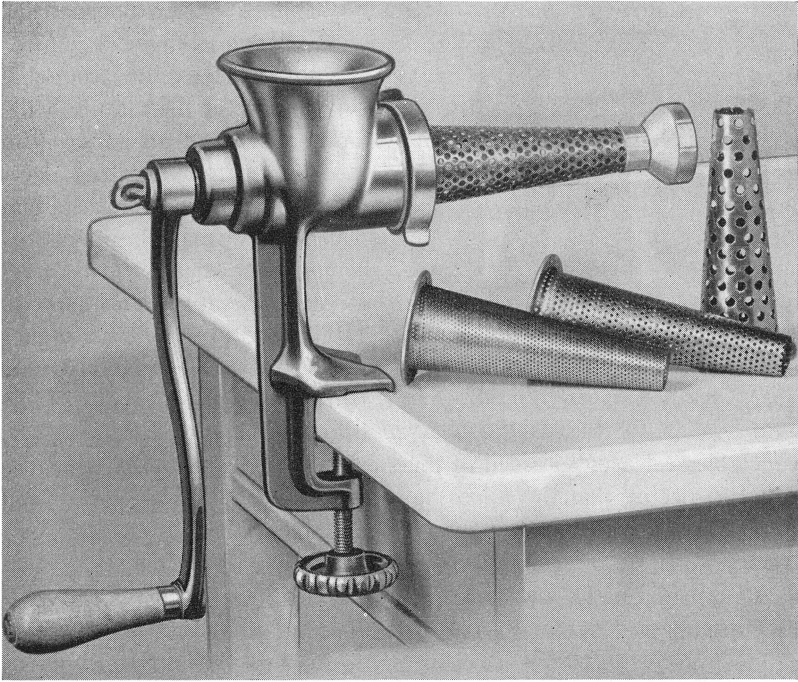


FIG. 7.—A COMMON TYPE OF TAPERED SCREW PRESS OR EXTRACTOR.

### GENERAL PRINCIPLES OF PREPARATION AND PRESERVATION

As indicated previously, all fruits, with the exception of citrus fruits, should be crushed or ground before being pressed thru cloth. However, when pulpy juices are made in a continuous tapered screw juice extractor, it is not necessary to crush the fruit, altho the fruit should be cut into pieces, and if it contains large seeds, they must be removed before the fruit is put into the extractor. The grinding and separation of juice is carried out in one operation with the centrifugal extractor.

Ordinarily, juices are extracted cold from the crushed fruit or vegetable, but certain fruits, particularly grapes, are heated to 140° to 150°F before pressing in order to extract color and to obtain a larger yield. Small fruits, such as raspberries, strawberries, and cranberries, are best extracted after freezing and subsequent thawing. Freezing and thawing causes the solution of the natural fruit colors



FIG. 8.—A CENTRIFUGAL EXTRACTOR  
FOR VEGETABLE JUICES.

in the juice and breaks the cells of the fruit to release the juices contained therein. Heating dissolves some of the tannin of the fruit and if the fruit is heated to too high a temperature or for too long a time, so much tannin is dissolved that the juice becomes somewhat bitter. Therefore, temperatures of 140° to 150°F are preferred to higher temperatures and obviously the fruit should not be boiled. The heating of certain fruits and

vegetables releases so much of the solids, and in other cases dissolves so much pectin, that the juices have the texture of sauces rather than juices. Juices from such fruits or vegetables can only be cold extracted.

All crushed fruits and fruit juices are easily oxidized by the air if they are allowed to stand around at any stage of the process of preparation and preservation. Oxidation causes loss of true fruit flavor and vitamins and the development of undesirable flavors. Therefore, fruit juices should be rapidly and promptly handled during all procedures involved in their preparation and preservation. Most fruit juices do not require the addition of sugar. Sugar does not aid in the preservation of pasteurized fruit juices.

Juice is easily extracted from citrus fruits either by reaming or by pressing in a small press in which only one-half of a fruit at one time is pressed. If only a small amount of juice is needed, a stationary glass or metal reamer is satisfactory. In this type, the half orange or other citrus fruit is simultaneously pressed and turned against the stationary burr. Juice can be made faster with reamers having motor-driven revolving burrs.

All kinds of juices may be preserved either by freezing or by heat sterilization. Juices may be frozen and stored in an ordinary locker plant or in a farm freezing cabinet, or, if larger quantities are to be preserved, in a commercial cold storage warehouse. The storage temperature should be kept not higher than + 5°F. In freezing juices it is important to cool the juice down to about 55°F but preferably

lower before filling it into containers. Further, the containers must not be filled more than nine-tenths full; otherwise the expansion of the juice which occurs during freezing will burst them. Strong glass bottles, such as those used for soda or ginger ale, glass jugs, fruit enamel-lined tin cans, or liquid-tight paperboard containers of the type used for frozen foods may be employed.

Unlike the nonacid vegetable juices, it is not necessary to boil fruit juices to effect sufficient sterilization to preserve them. Pasteurization of fruit and acid vegetable (rhubarb and tomato) juices in the home kitchen is easily carried out by heating the freshly pressed juice in the upper compartment of a double boiler of large enough size so that it need not be filled over two-thirds full.<sup>1</sup> Care should be taken to have the water in the lower section of the double boiler boiling rapidly before the juice is placed in the upper compartment. Further, a brisk fire should be used so that the juice will be rapidly heated. When the juice attains the pasteurization temperature (175°F for fruit juices and rhubarb juice and 190° for tomato juice), it should be immediately filled into fruit enamel-lined tin cans, hot, sterile (recently boiled) glass fruit jars, or hot, sterile bottles of the crown closure type. Care should be taken to fill the bottle completely full. Any foam on the surface should be removed and replaced with hot juice. If the containers are not completely filled while the juice is still at the pasteurization temperature, it may mold or ferment. The cans, glass jars, or bottles containing the hot juice are then *immediately* closed. New clean rubber jar rings should be used on the jars. New clean crowns, preferably those with a composition "spot", should be used on the bottles. The covers of the cans should be crimped on with a properly adjusted can closing machine (Fig. 9).

After closing, the cans, bottles, or jars should be inverted or laid on their sides or may be placed in a boiler or large bucket filled with hot (165°F) water. After 5 minutes the jars or bottles should be placed in lukewarm water for 5 minutes. Finally, the containers should be cooled in the coldest water available. Cold water may be run into the hot water until cold. This system of gradual cooling will prevent breakage because of sudden temperature changes. Cans may be rapidly cooled by immersion in running cold water.

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<sup>1</sup>If a double boiler is not available, heating may be accomplished by floating a large pan or kettle partially filled with fruit juice in a larger container partly filled with rapidly boiling water.

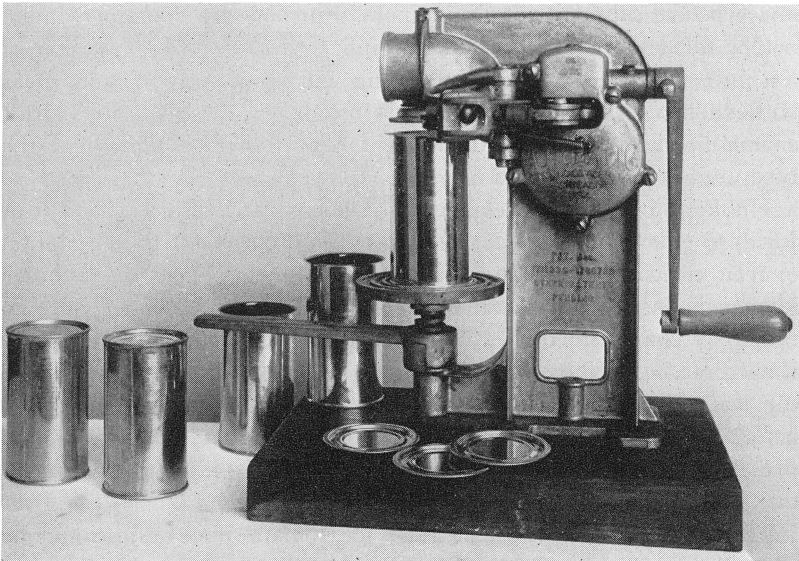


FIG. 9.—A HAND-OPERATED CAN-CLOSING MACHINE.

Screw-top half-gallon and gallon glass jugs may be used as containers for juice provided rubber rings are employed in the screw caps to provide a tight seal. The procedure followed in filling, closing, and cooling jugs is the same as that described above for bottles.

The nonacid vegetable juices may be made acid enough by addition of sauerkraut juice, vinegar, or lemon juice so they may be pasteurized like tomato juice, that is, by heating to 190° to 195°F in a double boiler. After the acidified blend is made, the juice is heated to 190° to 195°F, filled into sterilized containers which are sealed and then inverted or turned on their sides for 5 minutes and cooled.

*If vegetable juices are not made acid, they must be "processed" or heated in a pressure cooker.* This is essential because spore-forming bacteria which can grow in nonacid vegetables or juices but cannot develop in the acid products are not killed at 190° to 195°F. By no means should one attempt to process a juice not made strongly acid without using a pressure cooker. After extraction, the juice is heated to 170° F, filled into sterilized bottles, jars, or cans, closed, and then processed in the pressure cooker at 10 pounds pressure for 20 to 30 minutes.

## STORAGE OF FRUIT AND VEGETABLE JUICES

Regardless of the care taken in the preparation and preservation of fruit and vegetable by-products, they will slowly deteriorate in quality over a period of time, particularly if kept in a fairly warm place. This loss of quality may be reduced to a minimum by storage at low temperature, for example in a cold dry cellar.

## DETAILED DIRECTIONS FOR MAKING AND PRESERVING FRUIT JUICES

### APPLE JUICE

Select sound firm-ripe autumn or winter apples.

Wash carefully.

Crush apples in grinder.

Press in barrel press or hydraulic press.

Strain juice thru muslin or cheesecloth.

Heat juice promptly and rapidly to 170°–175°F in upper part of double boiler.

*Without cooling*, fill immediately into fruit enamel-lined cans, or into hot sterile glass jars, hot crown-closure bottles, or hot screw-top glass jugs, taking care to remove foam and to fill each container completely.

Close each container immediately.

Invert cans or place bottles or jars on their sides for 3 to 5 minutes.

Place in hot (160°–165°F) water and cool immediately by running a stream of cold water into the container. If running water is not available, allow the containers to remain for 5 minutes in the hot water, then remove and air cool.

### GRAPE JUICE

Select preferably fully ripe Concord, or Concord-type grapes. Catawba and Ives also give excellent products.

Wash carefully.

Remove grapes from stems.

Crush grapes in grape crusher.

Heat crushed grapes to 140°–145°F in upper part of double boiler.

Press hot grapes in barrel press or hydraulic press.

Strain juice thru muslin or cheesecloth.

Heat juice rapidly to 170°–175°F in upper part of double boiler.

*Without cooling*, fill immediately into large hot fruit jars or hot screw-top glass jugs, taking care to remove foam and to fill each container completely.

Close each container immediately. Invert container or lay on side for 3 to 5 minutes. Place in water at 160°–165°F and cool bottles in running water, or as directed above.

The juice may be used as it is or it may be repasteurized after the crude argols have settled.

Allow to stand in cool cellar 3 months or more to allow crystallization of crude argols.

Carefully siphon supernatant juice from sediment and pass juice from bottom (containing sediment) thru heavy muslin cloth.

Heat juice rapidly to 170°F in upper part of double boiler.

*Without cooling*, fill immediately into hot, sterile fruit jars, hot crown-closure bottles, or hot screw-top glass jugs, taking care to remove the foam and to fill each container completely.

Close immediately and cool in running water or as directed above.

### CHERRY JUICE

Blends of cold-pressed and hot-pressed cherry juice have many of the desirable qualities of each.

#### COLD PRESSED

Use sound, fully ripe, Montmorency or English Morello cherries, or a mixture of the two varieties.

Wash carefully.

Crush cherries in grape crusher.

Press in barrel press or hydraulic press.

Strain juice thru muslin or cheesecloth. Sweeten if considered desirable.

Heat juice promptly and rapidly to 170°F in upper part of double boiler.

*Without cooling*, fill immediately into fruit enamel-lined cans, or into hot, sterile, glass jars, hot crown-closure bottles, or hot screw-top glass jugs, taking care to remove foam and to fill each container completely.

Close each container immediately and invert or place on side for 3 to 5 minutes. Place in water at 160°–165°F.

Cool with running water or as directed above.

#### HOT PRESSED

Use sound, fully ripe, Montmorency or English Morello cherries, or a mixture of the two varieties.

Wash carefully.

Crush cherries in grape crusher.

Heat crushed cherries to 175°–180°F in upper part of double boiler.

Press hot cherries in barrel press or hydraulic press.

Strain juice thru muslin or cheesecloth. Sweeten if considered desirable.

Heat juice promptly and rapidly to 170°F in upper part of double boiler.

*Without cooling*, fill immediately into fruit enamel-lined cans, or into hot, sterile, glass jars, hot crown-closure bottles, or hot screw-top

glass jugs, taking care to remove foam and to fill each container completely.

Close each container immediately.

Cool in running water or as directed above.

#### RASPBERRY JUICE

The following procedure may be used for the making and preservation of the juices of red, black, and purple raspberries, loganberries, blackberries, youngberries, boysenberries, dewberries, currants, gooseberries, and cherries.

Select soft, ripe fruit, preferably of a highly colored and flavored variety.

Wash carefully.

Mix with granulated sugar, using 10 parts fruit to 1 part sugar by weight.

Fill into heavily paraffined paperboard cartons or fruit enamel-lined tin cans.

Close containers.

Freeze in locker plant or farm freezer and store until needed.

Without opening containers, thaw in a refrigerator or at room temperature before a fan.

Immediately after thawing, press in barrel press or hydraulic press. (See alternate method.)

Strain juice thru muslin or cheesecloth.

Heat juice promptly and rapidly to 170°–175°F in upper part of double boiler.

*Without cooling*, fill immediately into fruit enamel-lined cans, or into hot, sterile, glass jars, hot crown-closure bottles, or screw-top glass jugs, taking care to remove foam and to fill each container completely.

Close each container immediately. Invert or turn containers on side.

Air cool for 3 to 5 minutes, then place in warm water 150°F.

Cool with running water or as directed above.

#### ALTERNATE METHOD FOR PULPY BERRY JUICE

If pulpy berry juice is desired, the thawed juice may be passed thru a collander or a taper screw press to separate the seeds and more solid parts. Pulpy berry juice may also be prepared from fresh fruit.

Heat juice promptly and rapidly to 180°–185°F in the upper part of a double boiler and continue as directed for pressed juice.

Because of difficulty of removing air from the pulpy juice, it will not retain its quality as well as pressed juice but may be used satisfactorily in fruit juice blends.

#### PLUM JUICE

Select soft, ripe fruit, preferably of a highly colored and flavored variety. Fresh (undried) prunes may be used.

Wash carefully.

Pit and cut in halves.

Mix well with granulated sugar, using 10 parts of fruit to 1 part of sugar by weight.

Fill into heavily paraffined paperboard cartons or fruit enamel-lined tin cans.

Close containers.

Freeze in locker plant or farm freezer and store until needed.

Thaw, without opening containers, in a refrigerator or before a fan.

Immediately after thawing, crush in grape crusher.

Press in barrel press or hydraulic press.

Strain juice thru cheesecloth.

Heat juice promptly and rapidly to 170°–175°F in upper part of double boiler.

*Without cooling*, fill immediately into fruit enamel-lined cans, or into hot sterile glass jars, hot crown-closure bottles or screw-top glass jugs, taking care to remove foam and to fill each container completely.

Close each container immediately.

Invert or place container on side. Air cool 3 to 5 minutes.

Place in hot water at 160°–165°F, then cool in running water or as directed above.

## BLENDING FRUIT JUICES

### APPLE-BERRY

Most berry juices are too strong to be palatable unless they are either sweetened and diluted with water or blended with a bland juice, such as that of the apple. The exact proportion of any berry juice to use will depend upon its acidity and amount of flavor. In the case of highly flavored berries, such as black raspberries, 3 to 4 parts of apple juice may be used with 1 part of raspberry juice. If the berry juice is milder in flavor, 2 parts of berry juice to 1 part of apple juice may be a satisfactory proportion.

Blending of the preserved juices may be done just before use, or preserved (canned or frozen) berry juices may be blended with either freshly prepared or preserved apple juice and the product pasteurized as directed below.

Apple juice may be added to the thawing berries (see section on berry juices) and pressed with the berries. The latter method will result in the greatest yield from the berries.

Blend juices to give pleasing flavor.

Sweeten with sugar, if a sweeter juice is desired.

Heat juice rapidly to 170°–175°F in upper part of double boiler.

*Without cooling*, fill immediately into fruit enamel-lined cans, or into hot, sterile, glass jars, hot crown-closure bottles, or hot screw-top glass jugs taking care to remove foam and fill each container completely.

Close each container immediately. Invert or place container on its side. Air cool for 3 to 5 minutes. Place in water at 160°–165°F. Cool with running water or as directed above.

#### APPLE-CHERRY

The juice of sour cherries (Montmorency, English Morello, and Early Richmond) is too intense and tart for consumption without sweetening and dilution with water or blending with apple juice. Two parts of apple juice should be blended with 1 part of hot-pressed cherry juice. Cold-pressed cherry juice should be blended with an equal amount of apple juice.

The blended juice should be pasteurized in the same manner as the apple-berry blend described above.

#### APPLE-PLUM

The juice of most varieties of plums is too strong for consumption without dilution with water or blending with apple juice. As a rule, plum juices should be blended with an equal volume of apple juice. The blended juice should be pasteurized in the same manner as the apple-berry blend described above.

### DETAILED DIRECTIONS FOR MAKING AND PRESERVING VEGETABLE JUICES

#### TOMATO JUICE

Select fully red ripe tomatoes.

Wash thoroly and remove all green, yellow, black, and rotted areas.

Cut out stem end.

Quarter tomatoes and heat to boiling.

Strain thru a sieve, collander, or tapered screw press or any other type of screening device. The finer screens give a smoother juice.

Add salt, approximately 1 teaspoonful per pint.

Heat rapidly to 190°–200°F in the upper part of a double boiler or in a kettle with continued stirring.

*Without cooling*, fill immediately into hot sterile glass jars, hot crown-closure bottles, or tin cans, taking care to remove foam and to fill each container completely.

Close each container immediately and invert to heat the closure. Place in hot water at 190°F, hold for 5 minutes, and then cool by adding cold water slowly.

#### TOMATO JUICE BLENDS OR COCKTAILS

Tomato juice blends or cocktails of delightful flavor may be prepared by mixing with various vegetable juice, or by extracting tomatoes heated with onions, celery, or other vegetable. After blending they are preserved by the methods as described for tomato juice. A few satisfactory blends are as follows:

Four parts tomato juice and 1 part sauerkraut juice.

Four parts tomato juice and 1 part celery-sauerkraut juice.

Tomato juice with 5 per cent turnip juice.

Tomato juice with 2 to 3 per cent beet juice.

The beet juice may also be added to the first combinations to give a deeper red color to the cocktail.

If sauerkraut juice is not available, vinegar or lemon juice may be used, but they do not impart the same flavor.

### SAUERKRAUT JUICE

Excess sauerkraut juice is nearly always present in vats or barrels of sauerkraut. This juice contains approximately the same nutritive qualities that are present in kraut including from 1 to 2 per cent of digestible organic acid.

Kraut juice may be obtained from barrels of kraut made in the home or from vats of kraut made by commercial packers.

Heat the juice to 150°–155°F in the upper part of double boiler or in a kettle, stirring continuously.

*Without cooling*, fill immediately into hot sterile crown-closure bottles, glass jars, or tin cans, taking care to fill each container completely.

Close each container immediately and invert to air cool 3 to 5 minutes. Place in warm water, 150°F, and cool in running water or as directed above.

### RHUBARB JUICE

#### FIRST PROCEDURE

Select tender and juicy stalks of rhubarb. Red varieties give the best color. Trim off all of the white portion.

Wash thoroly and drain excess water.

Cut in pieces 4 to 6 inches long.

Add 2 quarts of water for each 10 pounds of rhubarb.

Heat until water begins to boil.

Press in a barrel type press while hot, using muslin cloth or fine pore press cloth.

Sweeten if desired. One pound of sugar per gallon of juice is usually sufficient.

Heat to 165°–170°F in an aluminum or white enamel kettle, stirring continually.

*Without cooling*, fill immediately into fruit enamel-lined tin cans, hot sterile glass jars, or hot crown-closure bottles, taking care to remove foam and to fill each container completely.

Close each container immediately, invert it or turn on its side and cool for 3 to 5 minutes.

Place in warm water, 155°F, and cool in running water or as directed above.

## ALTERNATE PROCEDURE

After washing and cutting the rhubarb as directed above, it may be mixed with sugar at the rate of 10 parts of rhubarb to 1 part of sugar and placed in fruit enamel-lined tin cans or heavily paraffined paperboard container for freezing.

Place in a sharp freezer or in a cold storage locker and freeze.

At a later date, thaw.

Extract the juice, sweeten, and preserve as described above.

## CARROT JUICE

Select large, well-formed carrots.

Wash, peel, and remove green parts.

Shred and extract the juice in a centrifugal extractor (page 10).

Three different procedures may be used for preserving the juice.

## FIRST METHOD — FREEZING

Heat the extracted juice to 180°F in a double boiler and then cool immediately to 55° F or lower.

The cooled juice may be placed in heavily paraffined paperboard containers and frozen in a sharp freezer or locker cold storage plant.

## SECOND METHOD — ACIDIFICATION

The carrot juice may be mixed in equal quantities with high acid sauerkraut juice.

After blending, heat rapidly to 190°—195°F in double boiler or kettle, stirring continuously.

*Without cooling*, fill immediately into hot sterile glass jars, hot crown-closure bottles, or tin cans, taking care to remove foam and to fill each container completely.

Close each container immediately and place in hot water at 190°F and hold for 5 minutes.

Cool by running in cold water or as directed above.

## THIRD METHOD

The carrot juice may be sterilized in a pressure cooker.

Heat juice to 160°–180°F. Fill into glass jars or tin cans, leaving a half-inch head space. Cover but do not seal tightly. Sterilize in a pressure cooker at 10 pounds pressure for 30 minutes. When pressure is released, seal glass jars tightly while still hot.

Air cool.

## CELERY, BEET, AND TURNIP JUICES

Various other vegetable juices are nutritious and flavorful and blend very well with each other as well as with tomato juice. The centrifugal extractor (page 10) or similar device is required to extract fresh juice from the hard vegetables.

Wash, trim, and extract juice.

Three different procedures may be used for preserving these juices.

#### FIRST METHOD — FREEZING

Heat the extracted juice to 180°F in a double boiler and then cool immediately to 55°F or lower.

The cooled juice may be placed in heavily paraffined paperboard containers and frozen in a sharp freezer or locker cold storage plant.

#### SECOND METHOD — ACIDIFICATION

The vegetable juice may be mixed with one-half the quantity of high acid sauerkraut juice.

After blending, heat rapidly to 190°—195°F in a double boiler or kettle, with continued stirring.

*Without cooling*, fill immediately into hot sterile glass jars, hot crown-closure bottles, or tin cans, taking care to remove foam and to fill each container completely.

Close each container immediately and place in hot water at 190°F and hold for 5 minutes.

Cool by running in cold water or as directed above.

#### THIRD METHOD

The vegetable juice may be sterilized in a pressure cooker.

Heat juice at 160°—180°F. Fill into glass jars or tin cans, leaving a half-inch head space. Cover but do not seal tightly. Sterilize in a pressure cooker at 10 pounds pressure for 30 minutes. When pressure is released, glass jars should be tightly sealed.

Air cool.

CARL S. PEDERSON AND H. G. BEATTIE