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DOMESTIC PRESERVATION

OF

FRUIT AND VEGETABLES

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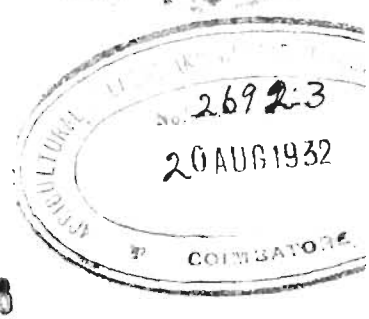

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FOREWORD.

While it is true that fruit-growing in this country might be improved and extended with profit, it is nevertheless the case that our normal fruit crop is a very valuable one, as indeed is our vegetable crop. It is in the interests of the growers and the public alike that the fullest possible use should be made of home-grown fruit and home-grown vegetables, and to this end much larger quantities might be preserved in the seasons of plenty for use at other times of the year.

It has been evident for some time that a demand exists for information as to the best methods by which fruit and vegetables may be preserved, for use when fresh material is not available. In consequence, the workers at the University of Bristol Research Station, Campden, Gloucestershire, at the request of the Ministry, have compiled this publication on the subject of preservation generally. The methods recommended and the recipes given are those which the workers at Campden, after repeated testing, have found to give the best results. They are the most reliable methods known at present, though amendments and modifications will no doubt become necessary as more scientific knowledge on preservation is acquired.

This volume provides for simple methods—without the addition of chemicals or dyes—that can be carried out in any ordinary household.

In seasons of good crops it is desirable that growers should preserve for future use a larger proportion of the crops than is done at present, and so help to prevent glutted markets and wastage. Correctly preserved fruits and vegetables are perfectly satisfactory foods, containing all the food values of the fresh materials, and often many of the vitamins as well.

Fruit-bottling, jam-making, the preparation of jellies, fruit syrups, candied fruits, chutneys and pickles, have been practised by housewives from early times, usually according to recipes handed down from one generation to another. The writers of the present book have recognized the value of many of these, modifying them only to the demands of science so as to conform to the principles now known to be the basis of these practices. In view of the expressed demand for more exact information on these practices it is hoped that this little volume will prove of service generally to those who grow fruit and vegetables or can readily acquire cheap supplies for preservation purposes.

The Ministry is much indebted to Professor B. T. P. Barker and the staff of the Campden Research Station—in particular Mr. F. Hirst, Mr. W. B. Adam and Miss M. L. Adams—for their cordial co-operation in the preparation of this volume. Without their able work it could not have been published.

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CHAPTER I.

THE PRINCIPLES OF PRESERVATION.

To preserve food is to keep it in sound condition, or, in other words, to cause it to remain good for human consumption, for a longer period than would ordinarily be the case.

Before carrying out the various methods of preserving fruit and vegetables given in the following pages, it may be interesting to know just why it is essential to carry out the operations recommended. Why, for example, is it necessary in canning or bottling, to heat to certain temperatures? Why will fruit or vegetables keep after drying? And so on. The phenomenon of life as we know it in the vegetable and animal kingdom is but a part of a great natural cycle—a perpetual building up and breaking down. The food of man being of organic origin is subject to the same cycle of growth and decay, and its preservation may therefore be regarded as a method of interrupting the natural cycle so that the normal agents which bring about decomposition are unable to carry out their destructive work.

Almost all our principal foods are built on a basis of four elements—carbon, hydrogen, oxygen, and nitrogen—all of which are present in the atmosphere; carbon as the gas carbon dioxide, nitrogen and oxygen as the chief constituents of air, and hydrogen, combined with oxygen, in the form of water vapour. Through the agency of plants these elements are converted into a large number of chemical compounds, the three classes most important from the dietetic standpoint being known as carbo-hydrates (sugars, starches, etc.), fats, and proteins. Other important constituents of foods are mineral salts and vitamins, and, as the present subject concerns principally fruits and vegetables, mention must also be made of the organic acids, the presence of which affects very greatly the conditions of sterilization required for the preservation of fruits or vegetables.

In addition to the forces tending to build up the elaborate forms of plant life, there are ever present in the air numerous types of micro-organisms—the agents of destruction and decomposition—so small that they are visible only under a powerful microscope. These microscopic organisms are the chief forces which bring about the gradual breakdown of the complex constituents of plant and animal life, and their working must be studied if it is desired to understand the problems connected with the preservation of foodstuffs.

Causes of Spoilage.—It is well known that fruit and vegetables stored under normal conditions will not keep indefinitely. Bruised or damaged portions of fruit are particularly susceptible, and may become covered with mould growth, particularly if there is much moisture in the atmosphere. The micro-organisms that bring about this type of spoilage can, for our purpose, be classified under three headings : Yeasts, Moulds, and Bacteria.

Yeasts.—Yeasts are minute, single-celled organisms of oval shape which multiply by a process known as " budding", the new cell splitting off from the end of the mother cell as the latter reaches maturity. Yeast cells are always present in the air, and consequently abound on the surface of fresh fruit. Fortunately, yeast cells are highly susceptible to heat, and can easily be destroyed by exposure to a temperature of 165° F. for a few minutes. Yeasts can do much damage in causing the fermentation of jams, fruit juices, sugar syrups, etc.

Moulds.—These are common agents of spoilage, but in their early stage of development they are difficult to detect. Mould growth commences as a fine, thread-like form known as a hypha. As development goes on the interlaced hyphae form what is called a mycelium, which has the appearance of fine cotton wool. At a later stage vertical threads are produced, on the end of which the spores develop, and the colour of these spores—green, brown, black, etc.—gives the mould its characteristic appearance. The green mould commonly seen on the surface of jam, has a brush-like appearance, and for this reason is called *Penicillium*. Another very common type is known as *Aspergillus*, and in this case the spores grow out and cluster round the head of the fructification. In another mould known as *Mucor*, the spores are enclosed in a round case or sporangium, which bursts, and allows the spores to escape when they are ready for distribution. This mould can often be seen growing on damp bread.

The spores are produced in enormous numbers, and they are easily detached and carried away in the air. Each spore is capable of producing a fresh mould growth if it falls on a food material where the conditions for growth are suitable. Fortunately, they are easily destroyed by means of heat, a few minutes' exposure at a temperature of 165° F. being sufficient to kill them.

Bacteria.—The smallest and simplest forms of life are known as bacteria. They consist of single cells which reproduce simply by dividing into two. This division takes place very rapidly and in a few hours one single cell may develop into many millions if the conditions are suitable. Certain types of bacteria have the capacity of producing a comparatively thick-walled cell called a spore, when the conditions for production of the normal vegetative type are unsatisfactory. These bacterial spores are much more

resistant to heat than the vegetative forms which are generally destroyed by heating for a short time at the temperature of boiling water. They are, however, highly sensitive to the presence of acids, and in consequence the acid fruits are much easier to sterilize than vegetables.

The word bacteria is commonly thought to refer exclusively to disease-carrying germs, but by no means all micro-organisms of this class are harmful to health. Many of them are definitely allied to the service of man, and are of industrial importance. Nevertheless, it is important that special care should be taken to prevent the development of bacteria in canned and bottled goods, and this can easily be done by carrying out the correct procedure recommended for the sterilization of the particular fruit or vegetable.

Chemical Effects.—*Enzymes.*—In addition to the small living organisms referred to above, there are certain chemical substances present in fruit and vegetables which cause deterioration on storage. These substances, which are known as enzymes, are present in all living material, and in animals they are the agents which bring about the important processes of digestion. The ripening of fruit, and the browning of bruised apples on exposure to air are due to the action of enzymes. It might be thought that these chemical changes would continue their action after the fruit or vegetable had been preserved, but enzymes are highly sensitive to a rise of temperature, and they are destroyed during sterilization.

In describing the action of yeasts, moulds, bacteria, and enzymes, it will be noticed that in all cases they can be destroyed by heat. Thus, in one method of preservation heat is the agency used, and sterilization by means of heat is one of the most convenient ways of preserving fruits and vegetables. The correct regulation of the temperature is of no avail, however, unless care is taken to see that the cans or bottles are securely sealed so that unsterilized air cannot enter. If there is the smallest leak, air will be drawn into the container, and this almost certainly means the introduction of many air-borne micro-organisms which on development will render the contents unfit to eat.

Dehydration.—The small organisms mentioned above can grow and multiply only in the presence of moisture. By removing water, the yeasts, moulds and bacteria are unable to grow, and decomposition is prevented. Enzyme action is completely arrested by dehydration. Removal of water from foods for purposes of preservation has been practised for hundreds of years, and in the early days the heat of the sun was utilized for the purpose. In hot climates this natural method is still used for the drying of fruits and vegetables. In England, however, artificial heat is required for this purpose, and in the home the

moisture is dried out by heating the fruits or vegetables in the oven, or more slowly by exposing them to the heat from a stove.

Chemical Preservation.—Sugar, salt, and vinegar are now so commonly used in foodstuffs that it is easy to lose sight of the fact that they act as chemical preservatives. Nevertheless, their preservative action is purely chemical in nature, as they make the foods unsuitable for use by micro-organisms without making them unfit for use as food for man. To act as a preservative, sugar must be used in large quantities. Spoilage bacteria will not develop in sugar solutions of 40 to 50 per cent., but certain yeasts and moulds are able to develop in much higher concentrations. Thus, in making jam it is necessary to have a large proportion of sugar present, or the jam will not keep. Again in crystallizing, the fruit is impregnated with sugar, and the moisture is removed by drying. Salt is used very largely to-day for preserving food, and it may be described as a true chemical preservative since it makes food unsuited for the growth of spoilage micro-organisms, without destroying its food value. Vegetables are largely preserved in brine for use later in the manufacture of pickles. Like sugar and salt, vinegar is a universally applicable food preservative. The active principle of vinegar is acetic acid, which prevents the development of the destructive micro-organisms.

CHAPTER II.

HOME AND FARM CANNING OF ENGLISH FRUITS.

Fruit canning has not yet been developed to any appreciable extent in England. A certain amount of home-grown fruit is bottled, but the canned fruit consumed in the average home is as a rule purchased from the Stores, and is more often than not of foreign origin. The canning of fruit in this country even on a commercial scale is only in its infancy, and canning in the home is practically unknown. The latter is largely due to the difficulty of soldering, which for an unskilled person is a rather difficult process and has prevented home canning from becoming popular. The old-fashioned can, which was used to a limited extent during the war, was the so-called "hole and cap" can (Fig. 1). The aperture in the can was small, making it difficult to put the fruit into the can. It was a difficult can to seal, and long practice was necessary in order to become efficient.

This disadvantage has now been overcome by the introduction of a hand can-sealing machine, which may be used to close open-ended, or so-called sanitary cans (Fig. 2) without the use of solder. Such cans are easily washed and packed with fruit. They are sealed on the commercial scale by power seamers, and in the home by means of a hand machine (Fig. 3). Hand can-closing machines have been in use for some years in the United States, and during recent years British-made models have been thoroughly tested at the Campden Research Station. Experience has emphasized the fact that, unless the variation in depth of the cans falls within extremely narrow limits, unsatisfactory seals are made. Moreover, any dents in the flange of the can need to be removed if good results are to be secured. Suitable cans and machines are now being made in England, and there is no reason why home-canning should not become popular, since householders will find the preservation of fruit easy to carry out, and allotment-holders and small growers who cannot afford power-driven can-closing machines are provided with a new outlet for their fruit when market prices are unfavourable. Tests have been carried out with all the principal English fruits, and satisfactory results have been obtained by the methods referred to.

In common with other methods of preservation the process of canning depends for its success upon efficient sterilization of the contents of the can. Fruit has yeast cells upon its surface, and very often the spores of moulds. These microscopic cells are always present in the atmosphere, and it is due to their presence that the fruit goes mouldy or ferments when it is allowed to get over-ripe. Spoilage may also be due to the activities of the enzymes in the fruit, which bring about ripening changes, finally causing the fruit to rot. Putrefactive bacteria are seldom

found in fruits, as the acidity of the fruit prevents their development. Thus, in preserving fruit in cans, we are only concerned with killing the yeast, moulds, and bacteria already present, and with preventing their access again to the container. This is attained by sterilizing the fruit by means of heat after the can has been rendered air-tight. In canning, the closing is completed before sterilization, thus making it impossible for micro-organisms to enter after the product has been sterilized.

Selection and Preparation of Fruit—*Gooseberries.*—This fruit is best picked under-ripe, but the berries must not be too immature or they will have little flavour. For preserving purposes green varieties of medium size are preferable. Gooseberries which are to be canned, must first of all be well washed and the stalks and blossom ends removed. This is generally referred to as "topping and tailing" or "snibbing." When the berries are snibbed by hand, it is advisable to remove a portion of the outer skin at each end, otherwise the fruit will shrivel when canned in a moderately heavy sugar solution.

Raspberries, Loganberries, and Blackberries.—There are many varieties of raspberries : of those tested at Campden, the following have given good results :—Lloyd George, Duke of Cornwall, Semper Fidelis, Red Cross, Devon, Hornet and Superlative.

Raspberries are very easily bruised, and careful picking is essential. The fruit should be gathered while it is firm, and it is better to put it into shallow baskets, so that the berries at the bottom will not be crushed by the weight of the fruit above them. In some cases it is more practicable to pick into the cans themselves. Both raspberries and loganberries deteriorate very quickly ; to obtain the best results, therefore, the fruit should always be preserved on the day on which it is picked.

For canning, the fruit should be picked over and only the firm, sound berries selected. The ripe fruit should be used for jam-making or for the production of fruit syrup. Raspberries should first of all be hulled very carefully and washed if necessary. Loganberries are liable to contain maggots, and for this reason it is advisable to soak them in a dilute salt solution (½ oz. salt to one quart of water) for two hours. This brings out the maggots from the fruit. The berries should then be rinsed in cold water, and packed without removing the hulls. Unless firm, slightly unripe fruit is used, a soft pulpy mash will result.

Blackberries may be utilized profitably if preserved, and the colour and flavour are well retained when canned. The fruit should be gathered while it is still firm and ripe. Late in the season blackberries are poor in flavour and give only indifferent results. The hulls should be removed and the fruit carefully washed before it is packed into cans.

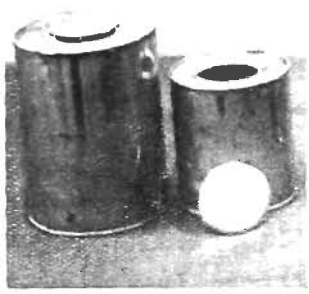
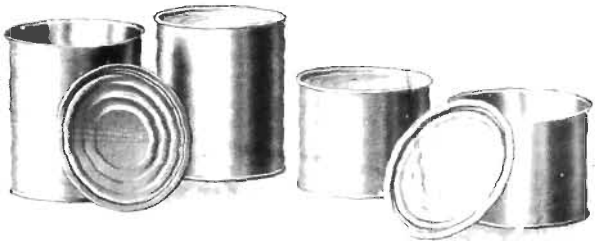


FIG. 1.—Hole and Cap Cans.



No. 2½ Cans. No. 1½ Cans.

FIG. 2.—Sanitary Cans.

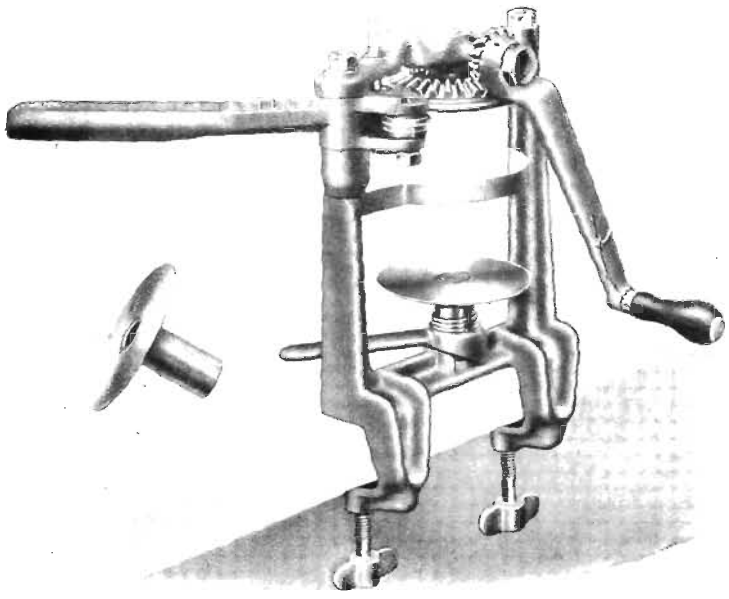


FIG. 3.—Hand Can-closing Machine.

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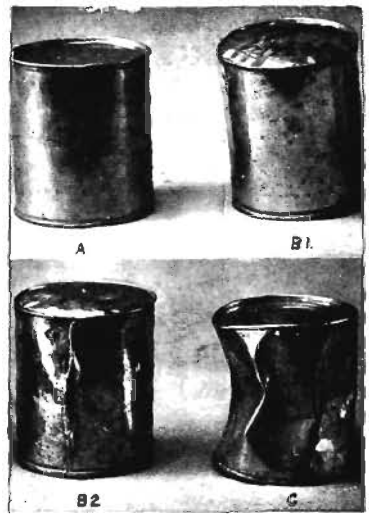


FIG. 8.—Comparison of Perfect and Imperfect Cans.

A, perfect can. B^1, bulged can, showing how the top and bottom have bulged owing to fermentation due to insufficient sterilization. If a bulged can is not opened it will eventually burst along the side seam as shown in B^2.

C, collapsed can, due to insufficient filling.

Strawberries.—Of the varieties so far tested, satisfactory results have been obtained with Sir Joseph Paxton, Tardive de Leopold and Oberschlesien. The berries should be of uniform, medium size, free from blemishes and not too ripe. The best results are obtained when a heavy syrup is used as a covering liquid. Strawberries when canned in the same way as other fruits are not attractive in appearance, as the berries lose their bright red colour.

Cherries.—Many English varieties of cherries are excellent for canning. They should be a good size, fleshy and full of flavour. For this reason, black cherries are better than white varieties Suitable black varieties are: Blackheart, Knight's Early, Waterloo and Early Rivers. White cherries when bottled or canned lack flavour, and the pink flush which is characteristic of some varieties disappears entirely when the fruit has been sterilized. They are, however, very suitable for mixing in fruit salads. If canned for this purpose, the fruit should be as free as possible from blemishes, as these become more pronounced when the fruit has been sterilized. Early Amber, Bigarreau, Napoleon and Whiteheart are good varieties for use in fruit salads. The heart-shaped Elton is not so suitable for this purpose. Among red and more acid varieties suitable for canning are Morello and May Duke. Morello cherries have proved very satisfactory for their preserving qualities, but May Duke is an even better variety, as it possesses a rich and spicy flavour and is of a bright colour. Red cherries in syrup are in demand in the confectionery trade and are often used in commercially-packed fruit salads.

Currants.—Black, red and white currants may be canned in the same way as other fruit. Fully ripe juicy fruit of a good size should be used; where inferior fruit only is available it is better to use it for jam or jelly making. If put up in well-lacquered cans, currants are excellent in flavour and retain their colour. The fruit should be prepared by removing the stalks and, if necessary, washing gently.

Blackcurrants are particularly suitable for canning.

Plums and Damsons.—There are many varieties of plums, most of which are suitable for home canning. The common yellow egg plum, or Pershore plum, is frequently superior to the less common varieties. Victoria, Early Prolific, Blaisdon, Purple Pershore, and Magnum Bogum, all give good results. The varieties Monarch and Czar are quite suitable as far as flavour is concerned, but when canned the colour of the skin tends to spoil their appearance.

When there is a heavy crop of plums it will be found advisable to commence canning whilst the fruit is still green. Plums are generally packed whole, but a good pack for home use may be made by halving the fruit and removing the stone. In this case

the fruit should be firm and ripe, and fleshy varieties, such as Victoria, Pond's Seedling, and Magnum Bonum will be found very suitable. The cut surface of the fruit becomes brown when exposed to the air, and it is customary to prevent this by placing the halves in a vessel of salt water (approximately 2 oz. salt per gal. of water). The fruit should be kept completely submerged in the brine.

When this method of packing is adopted fewer cans per unit weight of fruit will be required. At the same time, when turned out, the amount of fruit to syrup is rather large.

Pears.—Owing to the vagaries of the English climate it is doubtful if entirely satisfactory canned pears can be produced. Several of the English varieties give fair results, but the best canned pears are obtained when only well-ripened dessert fruit is used. At the same time, many of the coarse varieties, and those which do not ripen fully, may be made very palatable, although the appearance and texture are not so good as those of dessert varieties.

The following varieties have given good results:—Hessle, Williams' Bon Chrétien, Louise Bonne of Jersey, Beurré Hardy, Duchesse d'Angoulême, Marie Louise, Fertility, Conference, Catillac, Josephine de Malines, and Pitmaston Duchess.

Pears when peeled become discoloured if exposed to air for even a short time. This is due to the action of oxidizing enzymes, and may be prevented by placing the fruit in a weak brine, made by dissolving 2 oz. of salt in one gal. of water. The pears should be washed, peeled, cut into halves, and cored. The halves should be placed immediately in the brine, and a plate laid on the top of the pieces to prevent their rising to the surface, and becoming exposed to the air. After being filled into the cans, the pears should be washed in cold water to remove traces of salt.

Dessert Varieties.—Pears lose their delicate flavour when canned in water. The best results are obtained by using sugar solution as a covering liquid; this is made by dissolving 6 lb. of sugar in each gallon of water.

Cooking Varieties.—The fruit should be gently stewed until quite tender, in a syrup prepared by dissolving 2 lb. of sugar in one gallon of water. The pears should then be drained, and packed into cans. The syrup should be boiled until it is reduced to half the volume originally made up, and then poured hot over the fruit. Shrinkage takes place when the fruit is cooked, and therefore the cans should contain only two-thirds fruit in order to secure a suitable proportion of fruit to syrup when the contents are turned out.

Apples.—The best apples for canning are the cooking varieties which are fairly acid. Canned apples are chiefly used for pies,

and it is therefore advisable to pack the fruit into cans with a little water as possible.

The fruit should be peeled, cored, quartered, and cut longitudinally into slices. As apples quickly brown when exposed to air, they should be placed in brine, as for pears. The slices should then be washed in cold water and steamed for about five minutes, or until they are just soft enough to be packed tightly into cans. The cans should be filled with boiling water and sealed at once. If the pack has been satisfactorily made, the apples should retain the shape of the can when turned out.

Tomatoes.—The tomatoes should be washed, blanched, cold dipped and peeled. They should then be gently simmered for ten to fifteen minutes, but no liquid should be added. The tomatoes are then packed into the cans together with the juice which has come from the fruit. Both the fruit and juice must be boiling and the can filled to within about $\frac{1}{8}$ in. from the top. Each can should be sealed immediately it has been filled.

Canning Operations.—*Grading.*—It is necessary to emphasize that a really first-class product can only be secured by carefully grading the fruit before it is placed in the cans. Uniformity in ripeness, and evenness in size and colour should be aimed at. Inferior fruit should not be mixed with sound fruit. Low-grade fruit may be canned and used as pie fruit, made into jam, or used for the preparation of fruit syrups.

Packing Fruit into Cans.—Cans coated with acid-resisting lacquer should be used for coloured fruits, otherwise bleaching of the fruit takes place. The fruit should be packed into clean scalded cans to within one-eighth inch of the top, and a definite weight should be put into each can. Whole fruit should be packed as tightly as possible, and bruising should be avoided. Small soft fruits should be shaken down into the cans.

Syrup to Cover Fruit.—Although fruit may be preserved satisfactorily in water, it will be found that by using a sugar solution as a covering liquid, much better results will be obtained. A heavy syrup helps to retain the fresh fruit flavour, and also tends to maintain the colour of the product. From 4 lb. to 10 lb. of sugar per gallon of water should be used, the amount depending on the variety and sweetness of the fruit. The syrup should, if possible, be made with soft water, and filtered clear through muslin before use. In home-canning the syrup must always be used *boiling*, and sufficient poured into each can to cover the fruit. The steam rising from the syrup drives the air from the can, and it is essential that the contents of the can should not be allowed to cool before the can is sealed. If air is left in the can it may cause slight discoloration of the fruit at the top of the can and may also cause "pin-holing" or corrosion of the tin plate

For this reason, therefore, the temperature of the syrup should not fall appreciably before the can is sealed, and it is advisable not to fill more than six cans at a time before sealing.

Sealing the Cans.—The process of fastening the lid is termed "double seaming," and is as follows (*see* Fig. 4) :—

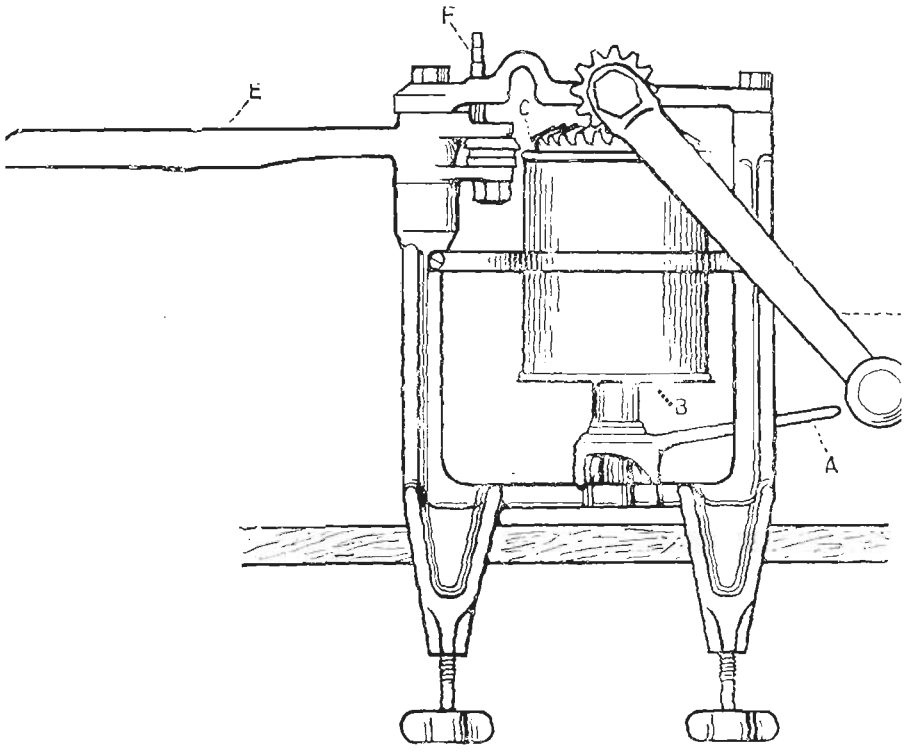


FIG. 4.—Diagram of Hand Can-closing Machine.

The cam lever (A) is adjusted so that the bottom plate (B) is in its lowest position. Alternative bottom plates are provided, that with the long stalk for No. 1½ cans and that with the short stalk for No. 2½ cans. The filled can, with loose end fitted in position, is placed on the bottom plate (B), which is then raised by turning the cam lever (A) to the fullest extent, when it will be found to lock. In this position the chuck (C) fits into the recess in the cover, and clamps it firmly into position on the can. The correct position of the can on the bottom plate is determined by the locating bracket. The can, having been locked in position, is revolved by turning the handle (D) of the machine with the right hand in a clockwise direction. This handle should be revolved as rapidly as is conveniently possible. As soon as the tin is revolving the operating lever (E) is pushed away from the

operator with the left hand until the first operation roller presses gently against the edge of the cover. Pressure should then be applied steadily and firmly, but *not too quickly,* and should be continued until the roller stop comes up against the machine stop (F), when the first operation is complete. If the operation has been performed to perfection, a steady application of pressure should bring the stops together in about twenty-four revolutions of the handle. The operating lever (E) is then pulled towards the operator, until the second operation roller is brought into contact with the edge of the can. Pressure is again applied whilst the handle (D) is turned until the second roller stop comes up against the machine stop (F), when the seaming is completed. A steady pressure is desirable in the second operation, but it is not so necessary as in the first, since the first operation forms the seam and the second merely flattens and compresses it. As it is most important that the seam should be evenly formed and tightened all round, the can should in both operations be revolved several times after the roller stop appears to have come up against the machine stop. The actual seaming is carried out by two small rollers, as shown in Figs. 5, 6 and 7 (p. 16).

In Fig. 5 the first operation roller will be seen adjacent to the can.

Fig. 6 shows the can and lid after the first operation has been completed and before the roller has been withdrawn. It will be noticed that the edge of the lid has been rolled round and under the edge of the can. In order to secure a good result the first operation roller must be brought in very slowly.

In Fig. 7 the second roller has completed its work but has not yet been withdrawn. It is of great importance that the first operation roller should complete its work before the second roller is brought into play, otherwise a faulty seal will result.

Sterilizing.—Immediately the cans are filled they should be sealed. When a batch has been completed they should be placed in a vessel of boiling water and the water, which in consequence is slightly lowered in temperature, again brought to the boil. The cans should be boiled for fifteen to thirty-five minutes according to the kind of fruit. The amount of heat conducted to the centre of the can is sufficient to destroy the enzymes and the micro-organisms, which would otherwise cause the fruit to go bad. The times found necessary to effect sterilization in boiling water are given in the table at the end of this Chapter.

Cooling.—When the cans are removed they should be placed at once in cold running water so that the fruit may not be over-cooked. To obtain a good quality product, quick cooling is essential. After cooling, the cans should be thoroughly dried and placed in a dry store to avoid rusting.

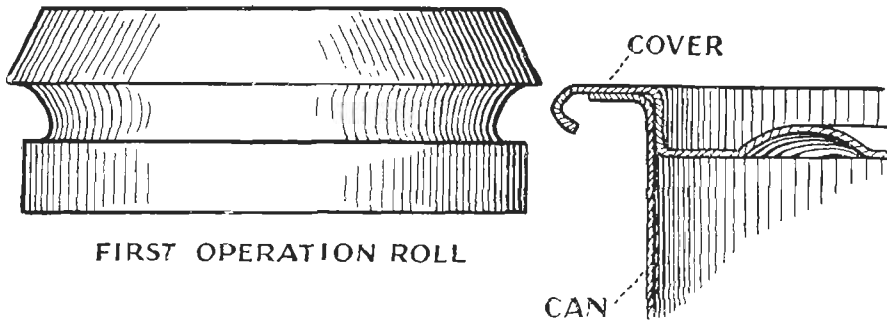


FIG. 5.—First Operation Roll *Adjacent to Can.*

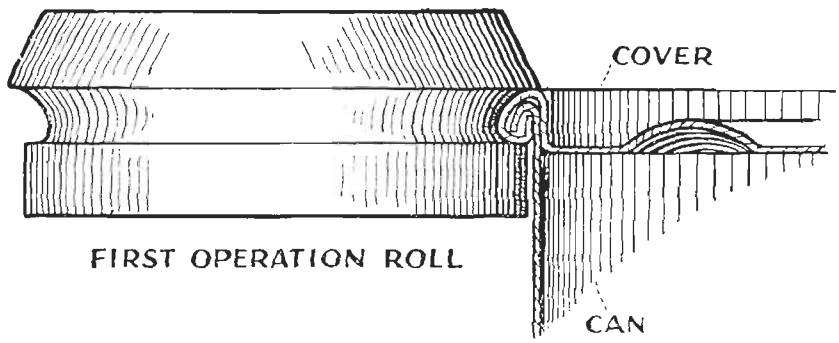


FIG. 6.—First Operation Roll Completed.

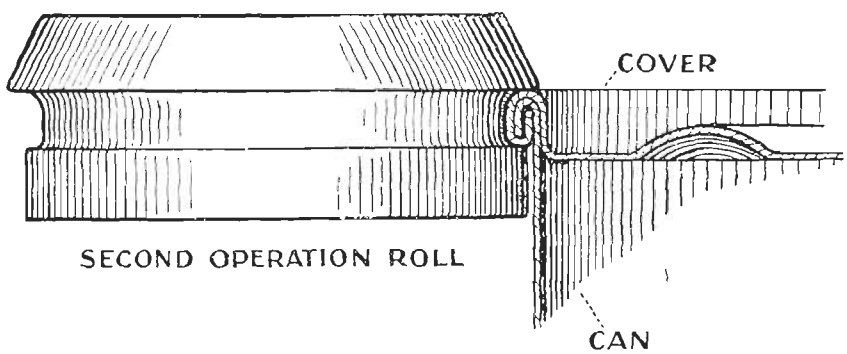


FIG. 7.—Second Operation Roll Completed.

Faulty Cans.—If the contents of a can go bad, the reason is either that the sterilization was not sufficient or, what is more likely, that there was a leak in the container through which the organisms gained access to the fruit subsequent to sterilization. Using inferior or fallen fruit may introduce organisms which are not destroyed at the usual sterilization temperatures, and for this reason the use of clean, sound fruit is essential. A leak is easily detected when the cans are placed in the hot water bath, as a small stream of bubbles will rise from it when the contents become hot. Any "leaker" thus detected should be removed and the fruit repacked in a fresh container. In this case the syrup from the leaking can must be boiled again. The proportion of faulty seals should, however, be very small if the sealer is properly adjusted and the cans are of good quality.

Spoilage of Canned Fruit.—The spoilage of canned fruit usually indicates imperfect sealing, and thus leaky containers. As the cans cool after sterilization, the contents contract, producing a vacuum. If there is a leak in the can, air—with yeast cells and mould spores—is drawn into the container. When yeast cells get in they set up fermentation, producing alcohol and carbon dioxide gas. As the gas is generated it lifts up small pieces of fruit, and these often block up the small hole. The gas is thus imprisoned in the can and it causes the latter to bulge and eventually to burst. If a bulged can is noticed in the store cupboard it should be removed and opened and the contents discarded, If this is not done the can may eventually burst, bespattering all the other contents of the cupboard with fruit juice. Normal and bulged cans are shown in Fig. 8 (facing p. 11).

TIME TABLE FOR PROCESSING FRUITS IN NOS. 1½ AND 2½ CANS, AND STRENGTH OF SYRUP TO USE.

Fruit.	*Strength of syrup in lb. of sugar per gal. of water.* *lb.*	*Process in Boiling Water* *Nos. 1½ and* *Minutes.*	*2½* *Minutes.*
Gooseberries	4–6	15	20
Raspberries, Loganberries and Blackberries ..	8–10	15	20
Cherries	4–6 (according to acidity)	30	30
Strawberries	8	20	20
Currants	6–8	15	20
Plums and Damsons ..	4–6	15	20
Plums in halves	8	35	35
Pears	4–6	25	25
Apples	None	25	25
Tomatoes	None	25	30

To Ensure Success in the Home Canning of Fruit, Attention should be Paid to the Following Details :—

(1) Sound fruit only should be used.
(2) The fruit should be carefully graded, not only for size but for uniformity of ripeness.
(3) Sugar syrup retains the fresh fruit flavour, and for canning it should always be boiling when poured over the fruit in the can.
(4) The cans must be sealed whilst steam is still rising from them.
(5) The sealing machine should be used according to the instructions given. If the cans are not properly sealed, the contents will go bad.
(6) If the cans bulge on storage, they must be opened and the contents discarded. In the majority of cases faulty sealing will be found to be the cause.

CHAPTER III.

FRUIT BOTTLING.

Preparation of the Fruit.—Fruit for bottling is prepared exactly as described for canning. All soft fruits, with the exception of gooseberries, should be firm ripe and of good colour. If the fruit is too soft it will tend to lose its shape during sterilizing, and this will spoil the appearance of the finished product. Gooseberries are generally bottled when green and under-ripe. Stone fruits should be, as a rule, firm ripe, but one or two varieties of green plums, such as Pershore and Magnum Bonum, may be bottled before they are quite ripe. To get the best results the fruit should be carefully sorted into batches, the individual fruits of which should be of the same size and in the same stage of ripeness, so that when the bottles are filled, large and small, or ripe and unripe fruits, are not mixed together.

Bottles.—There are two types of bottles in general use for the home preservation of fruit. Both types can be obtained in many different sizes and they can be purchased from ironmongers or large Stores.

(1) *Clip Bottles.*—These can be obtained with glass lids, but cheaper types with aluminium or lacquered tin lids are quite satisfactory. During sterilization the lid is kept on by a metal spring clip. As the contents of the bottles get hot the spring clip allows the lid to lift slightly so that air and steam may escape. When the bottles are cooling down, the clips hold the lids firmly in position until the vacuum is formed.

(2) *Screw Band Type.*—These bottles are supplied with screw bands made of lacquered tinplate or of aluminium. The metal band fits loosely in position while the bottles are being sterilized and air and steam can thus escape from the bottles during the heating process. When this is complete the screw bands must be screwed down as tightly as possible so that the lid is held in position until the vacuum is formed. The bands are apt to stretch somewhat after use, and unless care is taken to select a band which fits an individual bottle there is always a danger of faulty seals. The clip type gives more consistent results. Various types of clip and screw band bottles are shown in Fig. 9.

Rubber Rings.—Thin rubber rings are always inserted between the bottle and the lid, and it is essential that great care should be exercised in examining these rings before they are used. Perished rings, when stretched, will not return to their original size and they should be discarded. The rings should not be used more than once, but unused rings can be kept from one season to another provided they are not exposed to the light. A small bag is useful for storing rubber rings ; the latter should always be washed in warm water before use.

Examination of Bottles.—Before each bottle is used it must be carefully examined. The rim round the neck of the bottle, on which the rubber ring fits, should be smooth. If it is chipped in any way, the bottle must be discarded. The rim of the glass lid should also be examined. Lids are often chipped slightly when being removed from a full bottle, and if these chipped lids are again used it will not be possible to obtain a seal. As a further test, the lids should be placed on the empty bottles without the rubber washer to ensure that they fit well on the rims.

Filling the Bottles with Fruit.—The bottles should be washed in warm water, rinsed with cold water, and allowed to drain. The fruit should be packed as tightly as possible without crushing it, and the bottles must be well filled. When packing soft fruits the bottles should be tapped gently on the table to shake the fruit into position. Plums and other stone fruits should be arranged in the bottles to allow as large a quantity as possible to be put in. A long thin packing stick with a smooth flat end is often used for placing the fruit in position.

Covering Liquid.—Water may be used as the covering liquid, and almost all the bottled fruits sold in the Stores are preserved in water. A much better flavoured product will be obtained if a sugar syrup is used as the covering liquid. When such a syrup is used the sugar impregnates the fruit during sterilization and the subsequent storage, and it helps considerably in retaining the fresh fruit flavour. Fruit which has been preserved in water has to have the sugar added before it is served, but the flavour of such fruit is not to be compared with that of fruit preserved in a sugar syrup. There is one drawback to the use of sugar syrup in that it causes the fruit to rise in the bottles, and this is somewhat detrimental to its appearance. This, however, is more than compensated by the greatly improved flavour. The best proportion of sugar is 4 lb. to 6 lb. per gallon of water. The sugar is dissolved in half the water and brought to the boil. The remainder of the water should then be added, and this saves time in waiting for the syrup to cool down. It must be cool before being used to fill the bottles, for if used hot it may crack the glass. It should also be filtered through two or three thicknesses of muslin or through flannel immediately before use. The bottles should then be stood in a basin and filled to overflowing with the cold filtered syrup.

Fittings.—The next operation consists in putting on the rubber ring, lid and clip or screw band. The latter should not be screwed down tightly before sterilizing as the lid should be loose to allow air and steam to escape.

Sterilizing.—When small numbers of bottles are to be sterilized, a large saucepan, fish kettle, or similar vessel for heating water will suffice, provided it is deep enough. For larger quantities,

To face page 20.]

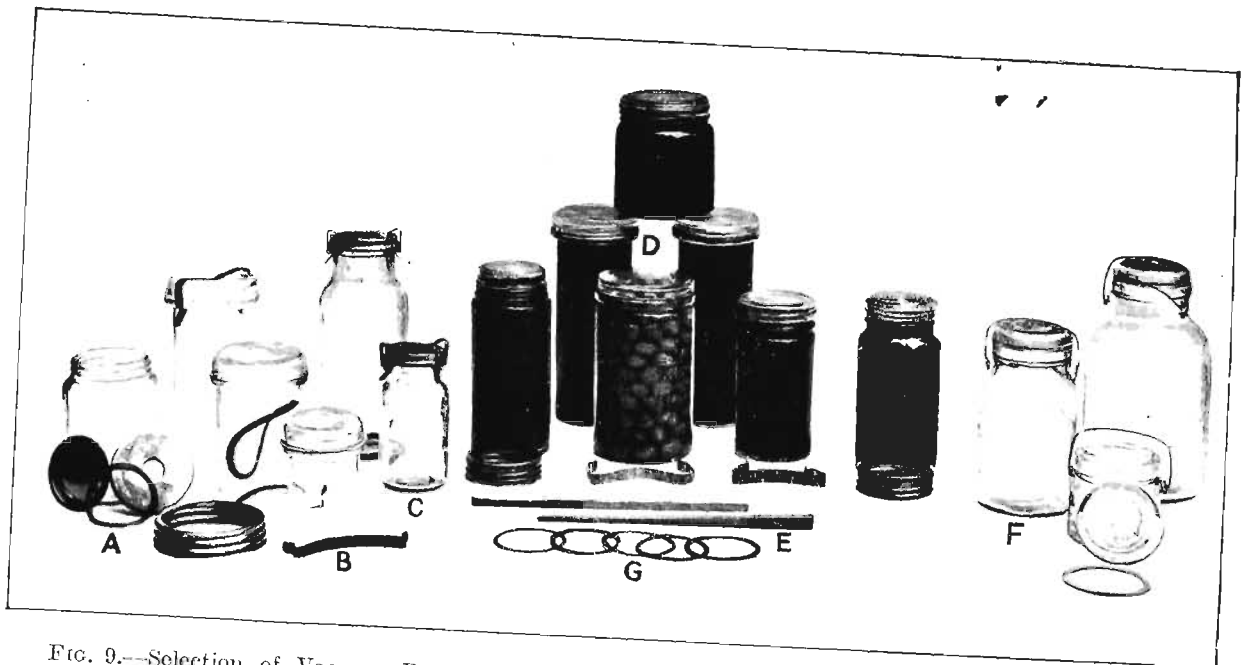


FIG. 9.—Selection of Vacuum Bottles and Jars, showing Constituent Parts and Packing Sticks.

A. Screw-top bottle with lacquered metal top and rubber ring.
B. Three jars with glass covers and spring clips.
C. Two bottles with aluminium or lacquered metal lids and spring clips.
D. Full bottles and jars with clips and screws removed.
E. Packing sticks for use in arranging fruit in jars.
F. Wire-clip bottles with glass covers.
G. Rubber rings.

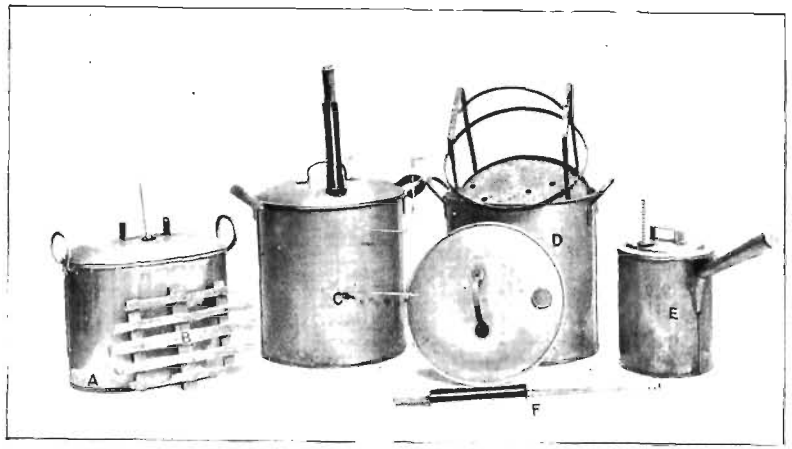


FIG. 10. Various Types of Sterilizing Pans.

A. Boiling pan with hole pierced for thermometer, showing latter held in place by a rubber washer.
B. Wooden slats nailed together to form a false bottom to the sterilizer.
C. Type of ordinary sterilizer with thermometer in position.
D. Same sterilizer showing inside tray for holding the bottles.
E. Ordinary boiling pan adapted for use as sterilizer, showing dairy thermometer in position.
F. Metal-covered sterilizing thermometer as shown in C.

FIG. 11. Testing Bottle for Efficient Seal.

Bottles which are perfectly sealed can be lifted by means of the lid in the manner indicated.

special sterilizing outfits may be used, or the washing copper may be adapted. Whatever type of vessel is used it is essential that a false bottom be fitted, as the bottles must not touch the hot bottom of the pan or boiler. A wire frame with short legs, or strips of wood nailed together trellis fashion, will answer the purpose. It is advisable to have the bottles entirely covered with water as the temperature surrounding them will then be uniform. If the bottles are not entirely submerged the sterilizer should have a very tight-fitting lid to prevent the escape of steam; a cloth placed under the lid helps to make it fit well.

Suitable types of small sterilizers are shown in Fig. 10.

For consistent results a thermometer is essential, and one of the floating dairy type, which registers not less than 212° F., is very convenient. During sterilization, the bulb of the thermometer should be well immersed in the water surrounding the bottles, and in small sterilizers it is convenient to have a hole in the lid through which the thermometer is passed so that the reading may be taken without removing the lid of the vessel. The times and temperatures at which the different fruits should be sterilized are shown in the accompanying table (p. 22).

When the bottles have been sterilized for the stated times, they should be removed from the pan or boiler—bottle tongs can be obtained for this purpose. If these are not available the water should be removed until the necks of the bottles are above the surface. They can then be removed by means of a dry cloth. If screw-band bottles have been used the screws should be tightened immediately each bottle is removed from the sterilizer. It is advisable to place the hot bottles on a wooden table, as they may crack if placed in a cold sink.

Testing the Bottles.—When the bottles are properly cold, or before they are put into the store, the clips and screw bands should be removed. They should be carefully dried and smeared with a little oil or vaseline. Each bottle should then be carefully tested by the lid, as shown in Fig. 11. If the lid remains firm, there is a good vacuum and the fruit will keep. If the lid comes off, there is a flaw in the rim of the bottle or the lid where it fits on the rubber ring may be at fault. This flaw should be found and remedied, and the bottles be then sterilized as before. If this is not convenient, the fruit should be used as soon as possible.

Strawberries.—When bottled in the ordinary way, as described above, strawberries are most unsatisfactory. The berries shrink, and rise badly in the bottles, and after sterilization the colour is also very unattractive. To get a better colour it is advisable to use the syrup from bottled raspberries or loganberries, adding ½ lb. sugar for each pint of syrup. The strawberries should be plugged, covered with the syrup, and brought just to the boil. They should be removed from the fire and left in the syrup over-

TIME TABLE FOR STERILIZING BOTTLED FRUITS AND STRENGTH OF SYRUP TO USE.

Fruit.	*Strength of syrup in lb. sugar per gall. water.*	*Time and Temperature.*
Gooseberries	4	Bring the temperature up slowly, rising to 130° F. in first hour, and 165° F. in next half hour. Maintain this temperature for ten minutes.
Raspberries	6	Do. Do. Do.
Loganberries	6	Do. Do. Do.
Damsons ..	5	Do. Do. Do.
Plums (ripe)	4	Do. Do. Do.
Plums (Green and Hard)	6	Bring the temperature up to 165° F. in 1½ hours, and maintain this temperature for 20 minutes.
Plums (in halves)	8	Bring the temperature to 190° F. in 1½ hours, and allow the bottles to remain at this temperature for 20 minutes.
Cherries ..	4 6	For sweet varieties. For acid varieties. Bring the temperature to 190° F. in 1½ hours, and allow to remain at this temperature for 10 minutes.
Currants ..	6	Bring the temperature to 180° F. in 1½ hours, and maintain this temperature for 15 minutes.
Pears ..	4	Bring the temperature to 190° F. in 1½ hours, and maintain this temperature for 10 minutes.
Apples ..	4	Bring the temperature up, slowing rising to 130° F. in first hour, and 165° F. in next half hour. Maintain this temperature for 10 minutes.
Apricots ..	4	Do. Do. Do.
Rhubarb ..	4	Do. Do. Do.
Blackberries	4	Bring to 165° F. in 1½ hours, and maintain for 15 minutes.
Mixed Fruit Salads	4	Bring temperature of bottles in sterilizer to 180° F. in 1½ hours, and maintain for 20 minutes.
Tomatoes	0	Raise to 190° F. in 1 hour and allow to remain at this temperature for half an hour.

night. On the following day the syrup should be poured off and the berries packed into vacuum bottles. The syrup should be filtered through muslin or flannel and poured over the fruit, filling the bottles completely. The rubber rings, lids, and clips or screw bands should be put on to the bottles and the fruit sterilized for the same time as that shown for raspberries and loganberries in the table above.

Tomatoes.—As tomatoes are bottled in their own juice the method is rather different from that described for other fruits.

The stalks should be removed and the tomatoes washed and either placed in a blanching basket or tied in a piece of cheese cloth or muslin. They should be blanched by dipping into a saucepan of boiling water from half a minute to one minute, according to the ripeness of the fruit. This loosens the skins and facilitates peeling. Next the tomatoes should be placed in cold water to make the fruit firm and easily handled. The skins should be peeled off and if necessary the hard core of the fruit removed. Small tomatoes may be packed whole; medium size and large fruits are generally cut into halves or quarters so that the fruit may be tightly packed without intervening air spaces. The flavour is improved if a ¼ oz. of salt to 2 lb. of tomatoes is interspersed with the fruit when packing it into the jars. The fruit should be well pressed down in the jars, and no liquid should be added. The rubber rings, lids and clips or screw bands should be placed on the bottles, which should then be stood on a false bottom in a deep vessel. The vessel should be filled up to the shoulders of the bottles with cold water, and the temperature raised to 190° F. in one hour. The bottles should be allowed to remain at this temperature for half an hour, then removed, and if screw bands are used, these should be tightened immediately. If unripe fruit is used, it will be found that the fruit will shrink in the bottles at the end of the first hour in the sterilizer; in order to have the bottles well filled they must then be filled up one from another and the bottles re-sterilized for half an hour at 190° F.

Mixed Fruit Salad.—A good pack of mixed fruits can be obtained by using raspberries, loganberries, red-currants, and black cherries. These fruits can all be obtained at about the same time. When packing the bottles, the different fruits should be arranged in layers, and the bottles should be tapped gently on the table to shake the fruit down. It is essential to pack the bottles as tightly as possible, or the fruit will rise badly during sterilization. It should be covered with a syrup containing 4 lb. sugar per gallon of water, and sterilized for the time and at the temperature given in the table.

Sterilizing without a Thermometer.—To get consistent results a thermometer should be used. Sometimes, however, the thermometer gets broken in the middle of the bottling operations, and

another cannot always be procured immediately. If a thermometer is not available, the pan containing the bottles should be placed on the stove, and heated very slowly so that the simmering point is reached in about one hour. It should be allowed to simmer for five minutes, then removed from the fire. Care should be taken that the bottles are not over-heated, particularly when soft fruits are being sterilized, or the fruit will become mushy.

Sterilizing Bottled Fruit in an Oven.—Sometimes it is more convenient to sterilize bottled fruit in an oven rather than in water. After the fruit has been packed into the bottles, but before the syrup is poured on, the bottles are placed in a moderate oven, with the lids on, but without rubber rings, clips, or screw bands. They must be heated until the fruit has shrunk and changed colour somewhat, and presents a cooked appearance. This takes from three-quarters of an hour to one hour. The bottles should be removed one at a time from the oven and each one filled to overflowing with boiling syrup of the strength given in the table. The rubber rings, lids and clip or screw band should be put on quickly, and the bottles left to cool. On the following day the bottles should be tested as shown in Fig. 11 (facing p. 21) to make sure that they are sealed. If the lids are put on quickly when the bottles are taken from the oven, this method is generally successful. It is not, however, so reliable as sterilizing in water.

Fruit Bottling without Vacuum Bottles.—Vacuum bottles of the clip or screw-band type give by far the best results, and whenever possible they should be used. If, however, such bottles are not available, ordinary wide-necked bottles or jam jars may be used.

The chief difficulty lies in getting a seal which will keep out air-carried moulds and yeasts. Several types of seals can be made to serve, but they must be carefully applied. After the bottles have been stored, they must be examined periodically in case fermentation or mould-growth has occurred. It is advisable to use only fruits which are very acid, as such fruits are easily sterilized and generally keep well. Suitable fruits for preserving in this way are gooseberries, plums, and damsons. The fruit should be packed tightly into the jars or bottles, and these should be well filled with fruit when an oven is to be used for sterilization. When the jars or bottles are to be sterilized in water, they should be filled only up to the shoulder.

(1) *Sterilizing in an Oven.*—In this method the fruit is not covered with syrup until after it has been heated. The jars or bottles should be covered with a small saucer to prevent the fruit at the top of the bottle getting scorched, and the same procedure adopted as described in the paragraph : " Sterilizing Bottled Fruit in an Oven " (*see* above).

(2) *Sterilizing in Water.*—Only jars or bottles of the same height can be sterilized together. The fruit should be covered with cold syrup, room being left for the sealing material. The bottles are placed on a false bottom in a pan or boiler, and the pan or boiler filled with cold water up to the shoulder of the jars. The pan should be covered to keep in the steam, placed on the stove, and the temperature of the water brought slowly up to simmering point, which should be reached in about one hour. The fruit should be allowed to simmer for two or three minutes, the jars then removed one at a time, and sealed as quickly as possible by one of the methods given below. Success in this form of sterilization depends on the rapidity and efficiency of the sealing after the fruit has been sterilized.

Methods of Sealing.—After the bottles or jars are removed from the oven or hot water, one at a time, they should be sealed by one of the methods given below.

(*a*) *Bladder.*—The method of tying a piece of bladder over the mouth of the jar or bottle is fairly satisfactory. Bullock or pig bladders can be obtained from a butcher. Pieces of fat should be removed, and the bladders should be cut into pieces of a size decidedly larger than the top of the bottle or jar, and be soaked in hot water to soften them before they are used. As soon as a jar of fruit is removed from the oven, a piece of bladder should be stretched over it and tied down firmly. The heat of the bottle tends to shrink the bladder, and if the pieces are not sufficiently large they are rather difficult to put on. If the seal is put on quickly, a slight vacuum will form at the top of the jar, and the bladder will be found to form a hollow cup.

(*b*) *Wax or Fat.*—Paraffin wax, or clarified mutton or beef fat, may be used. The sealing requires to be carefully done, and the inside of the neck of the bottle should be well wiped with a cloth, or the fat will not adhere to the glass. The fat or wax should be melted, but should not be heated long enough to allow it to smoke. A layer of the melted fat or wax to a depth of about $\frac{3}{4}$ in. to 1 in. should be poured very gently on the top of the syrup, which should be well up the neck of the bottle. The bottles should be placed on one side, and not moved until examined the next day. If there are any cracks showing, or if the syrup is coming through, it is necessary to put another thin layer over the top. The bottles or jars should then be tied down with paper before they are placed in the store.

(*c*) *Corks.*—If tight fitting corks are available, they can be used. They should first be thoroughly heated in hot water, otherwise they will cause the fruit to become mouldy. After the hot corks have been driven in, melted wax should be poured on the top to make them air-tight.

(*d*) *Cloth and Wax.*—Pieces of white calico or other white washing material should be cut into squares large enough to tie

over the jars. Half-oz. beeswax, ½ oz. vaseline, and 4 oz. powdered resin should be melted in a clean can standing in a saucepan containing boiling water. The mixture should be stirred well, and whilst still hot, circles should be painted on the cloth sufficiently large to cover the top of the jar or bottle. The tops should then be covered with a piece of greaseproof or other stiff paper previously cut to the exact size of the mouth of the jar or bottle. The square of calico should be placed over the hot jar immediately it is removed from the oven, and tied down firmly. Care must be taken that the paper is placed exactly over the mouth of the jar, otherwise the mixture which is melted by the heat of the jar will run down into the jar and mix with the fruit. The seal after it is secure may be painted over the top and round the sides with the mixture.

(*e*) *Paper.*—Three or four layers of writing or other stiff paper cut to the right size and pasted or gummed together one over the other may also be used. The outside of the neck of the jar or bottle should be coated with the paste or gum, and the covers should be applied so that they stick firmly round the neck of the jar or bottle, giving an air-tight seal.

To Ensure Successful Bottling, Attention Should be Paid to the Following Points:—

(1) The bottles must be scrupulously clean.
(2) The rubber rings should be examined carefully, to see if there are any flaws. Good soft rubber rings should always be used.
(3) It should be made sure that there are no chips in the rim of the bottle, or on the bottle lid.
(4) The false bottom should always be put in the pan before the bottles are put in, otherwise some may crack.
(5) When using screw-band bottles, the screw band must not be screwed down tightly when the bottles are placed in the sterilizer. The bottles should be removed one at a time from the sterilizer, and screwed down tightly.
(6) Care should be taken that the sterilizing times and temperatures given in the table are adhered to. If the water is too hot the contents of the bottles will go mushy and be unsightly; the appearance will also be spoiled by the fruit rising in the bottles.
(7) The screws or clips should be left on the bottles until the latter are quite cold.
(8) Bottles should never be put into store with bands screwed on tightly, as they may be difficult to remove later on. It is a good plan to take them off when the bottles are cold, dry them well, and smear them inside with a little vaseline. Each band can then be put back loosely on the same bottle.

CHAPTER IV.

PRINCIPLES AND PRACTICE OF JAM-MAKING FROM FRESH FRUIT.

A considerable quantity of jam is made in country districts during the summer months. The jam sections of several Produce Shows run in connexion with Women's Institutes have been judged by members of the Campden staff, and while many of the samples were really excellent, others did not reach such a high standard. From inquiries received at the Research Station it is apparent that in the majority of cases failure to obtain perfect results is not in any way due to lack of care in carrying out the operations, but rather to the use of rule-of-thumb methods and to insufficient knowledge of the main basis of the art of jam-making.

The preservation of fruit in concentrated sugar solutions appears to have been practised in the Orient in ancient times, and undoubtedly was in use there for many centuries before it was first carried out in Europe. When finally the art of jam-making developed in this country, the processes employed were handed down by means of recipes which had been found by experience to yield fairly satisfactory results. While a reasonable measure of success may be obtained by the use of these well-established methods, it occasionally happens that a most trusted recipe fails, and part of the season's making of jam is wasted. This is chiefly due to lack of knowledge of the general principles governing the process in question, and the adherence to rough and ready methods.

Science of Jam-Making.—Jam consists essentially of two parts (*a*) the fruit itself, and (*b*) a form of jelly in which the fruit, either whole or in a more or less disintegrated condition, is embedded. The jelly arises from the added sugar used in the recipe and the juice derived from the fruit during the course of cooking. The important constituents of this juice are *acid* and *pectin*. The added sugar dissolves in the juice and the result while still hot is a concentrated viscous liquid composed mainly of sugar, acid and pectin. Provided that the proportions of these three ingredients are suitable, this hot liquid in cooling sets to a jelly, or as it is technically termed a "gel," which holds the fruit residues in suspension.

Pectin.—This substance is found in fruits generally and is mainly connected with the cell walls. Some fruits are much richer than others in pectin—gooseberries, currants, plums, damsons, cranberries and blackberries all contain a considerable amount. Raspberries and loganberries are also moderately well supplied with this substance, while ripe cherries, rhubarb, and ripe strawberries are poor in pectin, and marrows have practically none. In wet seasons, when the fruit is holding more moisture than usual, the amount of pectin is proportionately rather less than in dry seasons.

The actual chemical and physical changes which take place in pectin and related substances during the course of the ripening of fruit are still the subject of some controversy, but these theoretical details are of little importance from the point of view of jam-making in the home. In unripe fruit, pectin is present more or less abundantly, but during the course of ripening, chemical changes occur which ultimately may lead, when the fruit is overripe, to complete conversion of pectin into derivatives which have no setting value.

The ideal stage for gathering the fruit for jam-making would therefore appear to be when it is just ripe, but there is another factor to be taken into consideration, namely, the acidity. It is well known that fully ripe fruit is much less acid than full-grown, unripe fruit. It is customary, therefore, to use a mixture of ripe and unripe fruit when jam-making. Certain jams, such as green plum and green gooseberry, can be made entirely of unripe fruit, as in these cases there is enough pectin present, and the natural acidity is sufficient to extract it from the cell-walls.

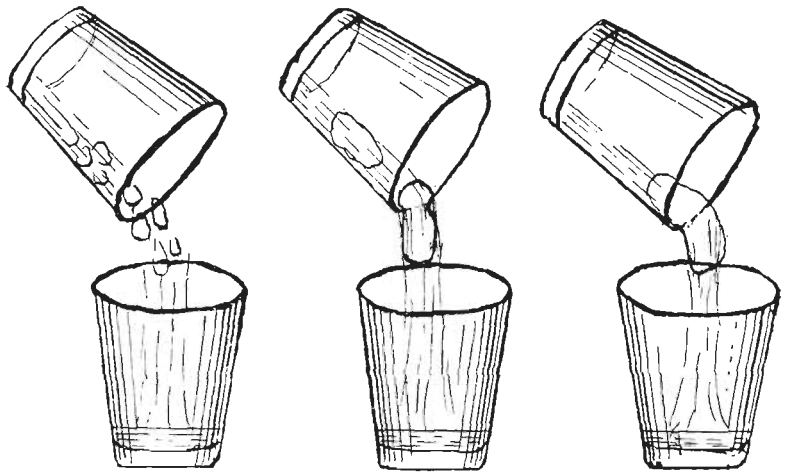
As the pectin is contained mainly in the cellular material of the fruit it has to be extracted and dissolved in the juice during the process of jam-making. In the case of ripe fruit this extraction is brought about simply by heating the fruit in the juice which flows from it when warmed. With many fruits, however, it is necessary to cook them in water to get the pectin into solution. During the process of heating the fruit to bring the pectin into the juice, some of the water is boiled off and sugar should not be added until most of the water that it is required to evaporate has been driven off. Too long boiling with the sugar destroys the brightness of the jam, and also causes slow destruction of the pectin. In actual practice, this loss of jelly-forming power is noticeable after the fruit and sugar have been boiled together briskly for about forty minutes. On the other hand, too much water must not be boiled off before the sugar is added, or the pectin may become sufficiently concentrated to cause the jam to set before removal from the preserving pan. Stirring will break up this jelly, and it will not form again satisfactorily. Air-bubbles will also become imprisoned in the jam, and spoil its appearance.

Pectin can be extracted from apples and citrus fruits. A solution of apple pectin can now be obtained in this country in small bottles for use in the household. Citrus pectin is prepared as a white powder. One or other of these pectins is sometimes added in small quantities in making jams from fruits naturally poor in pectin, or when jam containing whole fruit is desired.

Test for Pectin.—When using recipes which are known to give satisfactory results it is not always necessary to test for pectin, but when there is any doubt, the following simple procedure should be carried out. It is found to give excellent results.

After cooking the fruit in the preserving pan for about 30·

40 minutes (with or without the addition of acid according to the recipe) a tablespoonful of the pulp is removed and squeezed through muslin. One teaspoonful of the juice thus pressed out is placed in a cup, *allowed to cool*, and three teaspoonfuls of methylated spirits are added. Any pectin in the juice is thrown out of solution by the spirit, and if much is present it will form a jelly-like clot in the bottom of the cup. The cup is shaken slightly to mix the spirit and the juice, and the spirit carefully poured off. The clot is then gently poured two or three times from one cup to another. If it is firm enough to hold together in one lump, the fruit may be considered sufficiently rich in pectin, and a good set may be expected. If the clot separates into two or three small pieces, and cannot hold together, the setting value is only moderate and the pulp requires longer boiling or the finished jam will have a weak set (Fig. 12). If no clot forms there is insufficient pectin present for jam-making purposes, and it will be necessary to add apple pectin or some fruit juice known to be rich in pectin, or the jam will not set.



Poor. Fair. Good.

FIG. 12.—Pectin Clots.

Acid.—Acid has two functions in the preparation of jam : it assists the solution of the pectin in the juice, and it combines with that substance and sugar to form a " gel." There is a certain range of acidities in which such " gels " are capable of being formed. Below this range the jelly-forming capacity falls off rapidly. It is very important, therefore, to have sufficient acid in the jam.

Gooseberries, currants, loganberries, plums, damsons, cranberries, most varieties of raspberries, sour apples and not too ripe blackberries contain sufficient natural acidity, but acid should be added to cherries (except Morellos) strawberries, certain varieties of apples and late blackberries.

To increase the acidity of one of the latter group, a little red-currant, gooseberry or lemon juice may be used, or if preferred a small quantity of tartaric or citric acid may be added. Too much acid causes the jelly to " weep."

Sugar.—Sugar plays an important part in " gel " formation. In addition its final percentage must be such that neither mould growth nor crystallization of sugar will occur easily ; moreover, the sweetness has to be considered. The best flavoured jams are obtained when 60 per cent. of the final weight of the jam is due to the sugar added. The jam will then contain rather more than this percentage of sugar on account of the presence of the natural sugars which were contained in the fruits. When the sugar content is less than 60 per cent. the jam may ferment if the set is weak, whereas if it is allowed to rise above 65 per cent. there is a possibility of some of the sugar crystallizing out, and the jam will also be too sweet. Even with the higher percentage of sugar the jam will go mouldy if kept in a damp store. It is essential, therefore, to keep the jam in a cool, dry cupboard.

" *Set.*"—When jam is made in the home it is not easy for the inexperienced to know when it is boiled to the correct stage so that it will set when cool. On a small scale this difficulty can be overcome by using a balance and weighing the jam at intervals during the process, as shown in Fig. 13. A more convenient way of doing this is to fix a spring balance over the stove or burner, as shown in Fig. 14. When the weights given in the following directions are adhered to, the jam will be bright in colour and fresh in flavour, and no anxiety need be felt as to whether it will set or keep on storage.

As stated above, the jam should contain 60 per cent. added sugar. The sugar in any recipe may be made the basis of calculation in finding the " boiling-out " or final weight of the jam. If the weight of sugar in the recipe is multiplied by $\frac{100}{60}$ it will give the boiling-out weight. Simplified, this is, weight of sugar $\times \frac{5}{3}$ = boiling-out weight.

For example, if a recipe gives 10 lb. of fruit and 9 lb. of sugar the weight to which the jam should be boiled is $9 \times \frac{5}{3} = 15$ lb. When jam is weighed, the stirring spoon must be removed and it must be remembered that the weight registered on the scale includes the weight of the preserving pan.

Another way of knowing when the jam is sufficiently boiled is by means of a thermometer. This method is generally used on a commercial scale, and a steam jacketed jam pan with thermometer is shown in Fig. 15. If the jam is boiled to 220°F. the sugar percentage will be right, and if the fruit has been boiled sufficiently before the sugar was added, the jam will set. In small scale jam-making, however, it is difficult to get an accurate temperature with an ordinary thermometer, as steam is rising from the jam and the reading of the thermometer cannot be seen easily.

FIG. 13.—Weighing Jam Pan on Kitchen Balance.

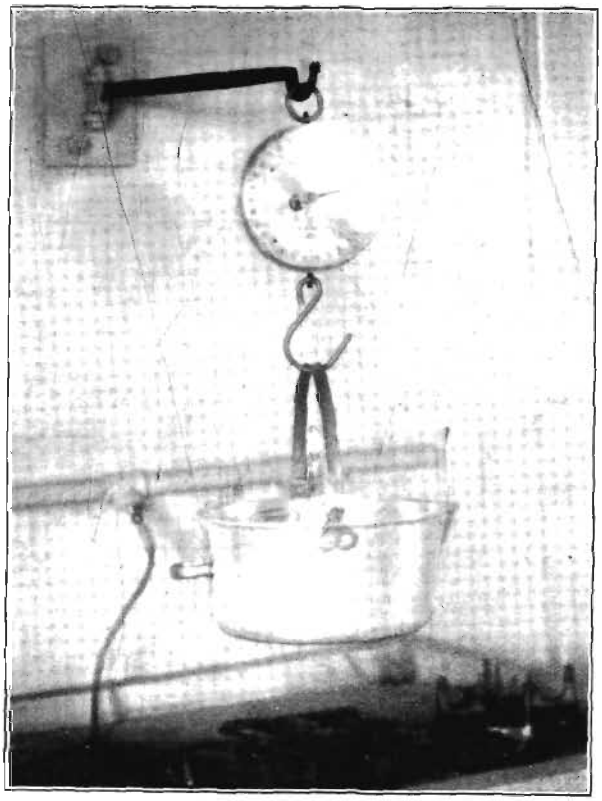


FIG. 14.—Weighing Jam Pan on Spring Balance fixed over Gas Ring.

To face page 30.]

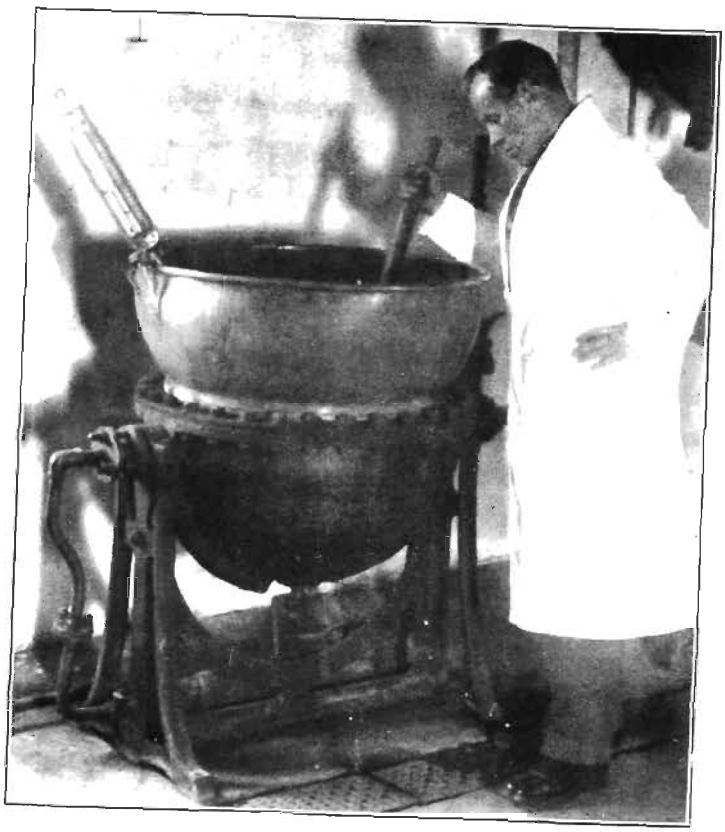


Fig. 13.—Steam Jacketed Jam Pan with Thermometer.

If neither a balance nor a thermometer is available, it is more difficult to decide just when boiling should cease. Two methods are used, but both depend largely on experience. One is to dip a clean wooden spoon, or better still a clean flat piece of wood, into the jam. It is withdrawn and turned horizontally in the hand until the adhering jam is cooled somewhat. The jam is then allowed to drop from the edge, and if it is boiled sufficiently, the drops run together forming flakes which break off in a clean sharp manner (Fig. 16). The other way is to put a spoonful of the boiling jam on a cold plate, and leave it to cool quickly. When cold, the jam is pushed with the finger, and if it has set sufficiently to wrinkle as it is moved, the jam is ready. These methods are fairly reliable in experienced hands, but the beginner will get more satisfactory results by using a balance as mentioned above.

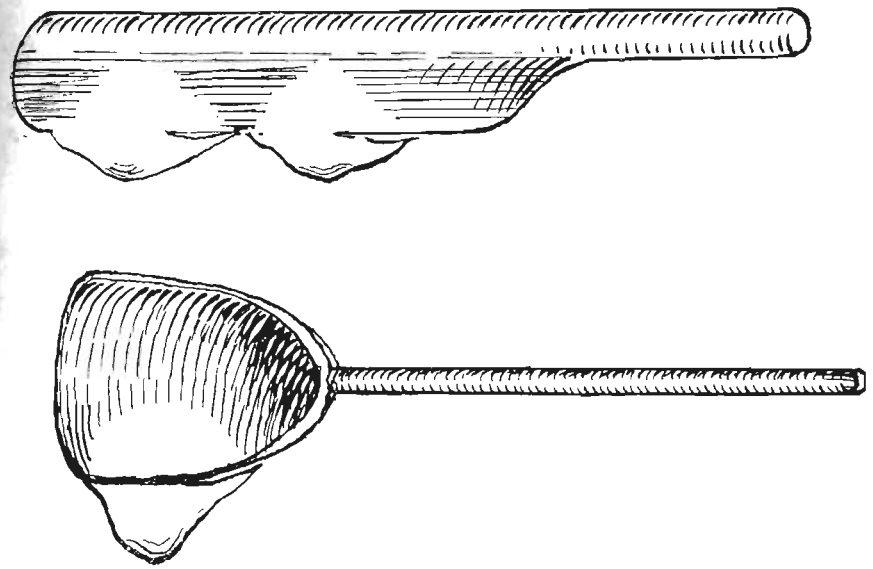


FIG. 16.—Flake Test showing how Jam or Jelly flakes when ready for pouring.

It is hoped that, by the application of the methods outlined above, a greater measure of success will attend the efforts of those who desire to see their home-made jams well set and of good appearance and flavour. In addition to the pleasure one derives from the sight of a well-set jam there is the distinctly practical advantage that a good " set " goes a long way towards preventing that common malady in home-made jams—fermentation.

General Methods for Home-Made Jams.—The spring balance should be at hand and the weight of the preserving pan taken. The prepared fruit should be placed in the weighed pan with or without water according to the recipe, and simmered gently for 40-80 minutes, the time depending on the kind and weight of fruit being

used. The fruit should be stirred occasionally at first, and then more frequently as the pulp becomes thicker. It should be boiled to the weight given in the recipe being followed, or if a balance is not available, until it has been reduced by about one-third. The sugar should then be added, the whole boiled again and stirred if necessary until the jam is reduced to the final weight given in the recipe, or if a balance is not available, until the setting stage is reached as shown by the flake or plate test.

If jam is being made on a larger scale, and by means of a steam-heated jam-pan, the same procedure is adopted with the exception of the weighing. The fruit is simmered until it is well broken down and the skins are soft. The sugar is then added, and the pulp is stirred until the sugar is dissolved. It is then allowed to boil until the temperature is 220°F., when the jam will be ready.

If whole fruit strawberry jam is required, the procedure is somewhat different, as the berries must not be broken. As explained above, it is not possible using strawberries alone to get the jam to set unless the fruit is broken down and the pectin is extracted from the cell-walls. To get the set without breaking down the berries, it is necessary to add some other kind of fruit-juice rich in pectin, or to add a small quantity of manufactured pectin.

Some jams, particularly strawberry, form a scum on the surface which in the ordinary way is skimmed off after the jam is ready. Much of this scum can be avoided by adding a small piece of butter, about as large as a hazel nut, when the jam comes to the boil after the sugar has been added. Many jams should be allowed to cool slightly before being filled into jars. This allows the consistency to thicken, and if the jam is stirred just before pouring it into the jars the fruit remains suspended throughout instead of rising to the surface. This applies particularly to whole fruit strawberry jam. Unless the jam is filled into warm jars, a little of the jam should first be poured into each of the jars to heat them slightly as this prevents cracking.

A wax paper circle should be gently placed on the surface of the jam in each jar immediately after a batch has been filled. Such circles may be purchased or they may be cut out to the size required from a sheet of wax paper.

The jars should not be tied down until they are cool, but it is advisable to cover them with a sheet of stiff paper or cardboard to keep out dust. After the jam is cold, the jars may be covered with parchment. Jars with metal covers, where available, are very satisfactory, and the metal covers, after cleaning in hot water, can be placed on the jars as soon as the jam has been poured.

Recipes.

Gooseberries.—Gooseberry jam is easy to make, since this fruit is rich in both pectin and acid. The degree of greenness of the jam will depend on the variety and maturity of the fruit and

of the length of time of boiling with the sugar. If red gooseberry jam is preferred, a good variety of berry to use is that known as 'Warrington Red.'

Recipe.— 6 lb. gooseberries.
2 pints water.
8 lb. sugar.

The gooseberries should be washed, topped and tailed, placed with the 2 pints of water in a weighed preserving pan and simmered slowly until the fruit is well broken down. The pulp should then be weighed and boiled again, with frequent stirring until the weight of the pulp is 6¼ lb. The sugar should then be added, the jam stirred until the sugar has all dissolved and the whole boiled again until the weight is 13½ lb.

Cherries.—Of the varieties tested at Campden, May Duke was found to be decidedly the best cherry for jam-making. Morello cherries, and other acid varieties are also good. Black cherries make a very sweet preserve, and are much more suitable for bottling or canning. Compared with other stone fruits, cherries contain very little pectin and relatively little acid, and consequently cherry jam is considered very difficult to make successfully. Sufficient pectin to give a set, however, can be obtained by using a relatively large proportion of fruit to sugar. In this case it must be noted that multiplying the sugar by ⅝ to give the boiling out weight does not hold, as with this recipe 60 per cent. added sugar gives a jam which is far too sweet. Tartaric acid or lemon juice should be used to supply the deficiency of acid in the fruit. When Morello cherries are used, half the quantity of acid given in the recipe is sufficient.

Recipe.—10 lb. May Duke or other variety of cherry weighed after stoning (weight before stoning approximately 11 lb.).
7 lb. sugar.
½ oz. tartaric acid or the juice of 4 large or 6 small lemons.

The preserving pan should be weighed, the fruit and acid put in the pan and simmered slowly until the fruit is quite tender, with frequent stirring as the pulp becomes thick. The cooking should be continued until the pulp weighs approximately 5¾ lb. The sugar should then be added and stirred until it has all dissolved. The jam should be boiled rapidly until its weight is 12¾ lb. and then allowed to cool before pouring into jars. The jam thickens on cooling, and when stirred the cherries remain suspended and do not rise to the surface.

Strawberries.—It has been pointed out above that pectin occurs in the cell-walls of the fruit, and that the fruit has to be broken down to a certain extent before the pectin can be brought into

solution. The most popular strawberry jam, however, is that in which the berries remain whole. In this case, therefore, it is necessary to add pectin in sufficient quantity to give the desired set. Strawberries are also low in acid, and it is necessary to increase the acidity. This deficiency in pectin and acid can be remedied by adding gooseberry juice or redcurrant juice as both these juices are rich in pectin and acid. If neither of these juices is available, a small quantity of fruit pectin and lemon juice or tartaric acid may be used.

Recipe 1.— 4 lb. plugged strawberries.
½ pint gooseberry juice.
4 lb. sugar.

A sample of the gooseberry juice should be taken and tested for pectin by the method given previously. The strawberries and sugar should be put into the weighed jam pan and allowed to simmer until all the sugar is dissolved. The gooseberry juice should then be added and the whole allowed to boil, until the weight of the jam is 6½ lb., and stirred gently to prevent burning.

Recipe 2.— 6¼ lb. plugged strawberries.
6½ lb. sugar.
8 oz. apple pectin, *or* ½ oz. citrus pectin.
The juice of 1 medium-sized lemon.

When citrus pectin is used, it should be thoroughly mixed with the sugar, otherwise it is difficult to get into solution.

The strawberries, sugar and lemon juice should be put into the weighed jam pan and allowed to simmer gently until all the sugar is dissolved. The jam should then be brought to the boil and the pectin added. Boiling is continued until the weight of the jam is 10¾ lb.

Recipe 3.—A jam with a light set and in which the berries are fairly whole can be made as follows :—

6 lb. strawberries.
4½ lb. sugar.
The juice of 2 large lemons.

The fruit should be prepared, covered with the sugar and allowed to stand over-night. On the following day the fruit and the sugar with the lemon juice should be placed in the weighed preserving pan, simmered gently until all the sugar is dissolved and then allowed to boil until the weight of the jam is 7½ lb.

Strawberry jam should be allowed to cool slightly before being filled into jars ; this causes it to thicken somewhat, and if the jam is stirred just before pouring it into the jars the berries will remain suspended throughout instead of rising to the surface.

Raspberries and Loganberries.—Raspberry is one of the most popular jams and is largely used in confectionery. Loganberries,

because of the number and size of the seeds are usually considered more suitable for jelly than for jam. If desired, however, the recipe given for raspberry jam may be followed, or a good jam may be made by mixing the two fruits.

Recipe.— 8 lb. raspberries.
9 lb. sugar.

After the preserving pan has been weighed, the fruit should be put in and simmered gently until the weight of the fruit has been reduced to 6½ lb. It will be found necessary to stir the pulp frequently as it becomes thicker. The sugar should be added, and the jam boiled until its weight is 15 lb.

Blackcurrants.—Blackcurrants contain a relatively large amount of pectin and acid, and the jam on that account is easy to make. Home-made blackcurrant jam is, however, frequently very badly made, the berries often being very hard and tough, and the consistency of the jam far too stiff. Currants have very tough skins, and the addition of sugar tends to harden them. If, however, the currants have been cooked previously in water until the skins are quite tender, it will be found that when sugar is added the currants in the jam will remain soft and plump. The addition of water to blackcurrants in jam-making dilutes the pectin and prevents the consistency from being too solid.

Recipe.— 4 lb. blackcurrants.
3¼ pints water.
6½ lb. sugar.

The prepared fruit with the water should be put into the weighed preserving pan and simmered gently until the fruit is quite tender, with frequent stirring as the pulp becomes thick. The cooking should be continued until the weight of the pulp is approximately 5 lb. The sugar should then be added and stirred until it has all dissolved. The jam should be boiled until its weight is 11 lb.

Plums and Damsons.—All varieties of plums and damsons contain sufficient pectin and acid to enable a good jam to be prepared. Victoria, Magnum Bonum, Purple Prolific, and Pershore plums all give a bright, fresh coloured jam when prepared in the following way :—

Recipe.— 6 lb. plums or damsons.
2½ pints water.
7½ lb. sugar.

The fruit should be washed and weighed, placed with the water in the weighed preserving pan, and simmered gently until it is well broken down. By stirring the pulp as it becomes thicker, burning is avoided. The cooking should be continued until the

weight of the pulp is 5½ lb. The sugar should then be added and the jam boiled until its weight is 12½ lb.

Blackberries.—The acid content of blackberries is comparatively low, and as the fruit ripens the acidity decreases. It has been found that jam made from a mixture of ripe and unripe blackberries sets well, whereas occasionally when fully ripe fruit, picked late in the season, is used, no set is obtained. This is due to too low a concentration of acid, and may be remedied by adding lemon juice to the blackberries when such late fruit is used.

Recipe.— 6 lb. blackberries.
1 pint water.
6¾ lb. sugar.

The fruit and water should be put into the weighed preserving pan and simmered gently until the weight of the pulp is 5 lb. The sugar should be added, stirred until it is dissolved, and boiled until the weight of the jam is 11¼ lb. As blackberry jam contains a large number of seeds it is sometimes considered an improvement to remove them by passing the pulp through a sieve before adding the sugar. When late-picked, fully ripe fruit is used, four tablespoonfuls of lemon juice should be used in the above recipe.

If a balance is not available, the recipes given above may be used but it will not be so easy to know just when the jam is ready. This will have to be determined by the flake test or by the cold plate method (p. 31).

Pectin Stock (Gooseberry, Redcurrant or Apple Juice).—The fruit should be washed and prepared, placed in the preserving pan together with two pints of water to each 6 lb. of fruit, and simmered until it is tender. It should then be mashed well, strained through a scalded jelly bag, and left over-night to drain. On the following day the pulp should be removed from the jelly bag, sufficient water added to make a mash and the pulp should be simmered again for about one to 1½ hours. The pulp should be strained as before and the two extracts mixed together. They should be tested for pectin by placing a sample of the liquid into three teaspoonfuls of methylated spirits and examining the clot. If a good clot is not obtained the juice should be concentrated and tested again. When a good pectin clot is obtained, the juice should be bottled and sterilized for future use. This pectin solution will be found useful when making jams from fruits poor in pectin.

CHAPTER V.

PREPARATION OF FRUIT JELLIES.

The principles outlined in connexion with jam-making apply equally to jelly making, and to get a proper jellied consistency the same three substances, viz., pectin, acid and sugar, should be present in the right proportions.

Jellies can be made easily from practically all English fruits with the exception of strawberries and cherries. These fruits when fully ripe are deficient in pectin and acid, and hence are difficult to preserve as jellies. Many wild berries, such as elderberries, blackberries, and sloes, can be used for jelly making, and excellent jelly can also be prepared from crab apples.

Preparation and Cooking of the Fruit.—The fruit should be carefully washed. It is unnecessary to plug berries, strig currants, or to peel apples. Large fruits, such as plums and apples, should be cut into small pieces before they are cooked. To get the best results the fruit should be cooked in water, the quantity of water depending on the kind of fruit. Juicy fruits, such as loganberries, raspberries and blackberries, require only a very small quantity of water. Blackcurrants want rather more as the skins take longer to soften. As a general rule, the fruit should be just covered with water in the preserving pan. Cooking should be done slowly, and the fruit should be simmered until it is quite tender. To get a jelly it is necessary to break down the fruit so that the acid and pectin are dissolved in the water.

Test for Pectin.—As the proportion of sugar to add to the extract depends on the quantity of pectin present, it is necessary to make a test for pectin. This is done as explained previously under Jam (p. 28), by taking a teaspoonful of the juice squeezed from the pulp and adding to it three teaspoonfuls of methylated spirits. If the pectin clot is poor, the pulp should be allowed to boil for a short time longer, after which the test for pectin should again be carried out. Unless sufficient pectin is present, a well-set jelly will not be obtained. Fig. 12 shows how the pectin clot may vary.

Straining the Pulp.—When the fruit has been cooked sufficiently it should be strained. Bags made of felt or flannel can be purchased for the purpose, or a bag may be made in the home by sewing small tapes across each corner of a square of flannel or felt. The tapes can then be hooked over chair legs, and the bag will hang down in the middle. The jelly bag should be scalded with boiling water before the pulp is poured into it. The cooked pulp should be tipped gently into the bag and allowed to drain until the residue is fairly dry and until there is no more liquid dropping from it. Fruits rich in pectin can be extracted a second time ;

when this is done, the pulp should be placed back in the pan, mixed with a little water, and simmered again for an hour. It should then be tipped back into the jelly bag and allowed to drain as before. The two extracts should then be mixed together.

Addition of Sugar.—If a good pectin clot is obtained from the pulp, 1 lb. sugar may be added for each pint of extract. If the pectin clot is only fair, ¾ lb. of sugar only should be added for each pint of extract. The juice should be brought to the boil, and skimmed before the sugar is added. The sugar should be added gradually to the boiling juice, and stirred until it has all dissolved. Boiling should then be continued as rapidly as possible without stirring.

Finishing Point.—The juice and sugar must be boiled so that when cold it will form a jelly. This will occur when the sugar content is between 60 and 65 per cent. For a beginner it is always difficult to know just when the jelly has boiled sufficiently. If a thermometer is available, it may be used with advantage. Provided there was a good pectin clot when the juice was tested, and that the correct quantity of sugar was added a good jelly will result after boiling to 220° F. A hydrometer may also be used to determine when the jelly is ready. While the jelly is still boiling, some of it should be poured into a tall glass or other narrow vessel, and the hydrometer inserted. If the density reads 32° on a Baumé hydrometer, or 59° on a Balling hydrometer, a good jelly will result provided the pectin clot was good. To anyone who is familiar with the use of a hydrometer, this method gives very good results. Care must be taken in pouring the hot jelly into the tube, as a bad burn will result if any of it touches the skin.

If neither a thermometer nor a hydrometer is available, the flake test gives the most reliable results. When the boiling jelly forms large bubbles and tends to bump a little, a clean wooden spoon or a flat piece of wood should be dipped in, taken out and turned horizontally in the hand for a few seconds to allow the jelly to cool slightly ; the jelly should then be allowed to drop from the edge. When it is boiled sufficiently the drops will run together, forming flakes which break off in a clean, sharp manner (Fig. 16, p. 31). Care must be taken not to break the scum when testing for the jelly stage. When a good jelly test has been obtained, the pan should be taken from the fire and the scum removed. The jelly should be filled, whilst hot, into clean glass jars, which have been heated in an oven. If it is poured through a piece of cheese cloth or a silver-plated tea strainer into the glasses, any particles of scum not previously removed can be separated.

Wax circles should be placed on the surface whilst the jelly is hot. When it is cold, it can be tied down in the ordinary way. Jellies should always be kept in a dry store. If the store is at all

damp, it is advisable to pour a thin layer of melted paraffin wax on the surface of the jelly when it is cold. The inside of the glass above the jelly should be wiped with a clean cloth. If this is not done the paraffin will not adhere to the glass. The glasses should then be tied down with parchment or with gummed papers in the ordinary way. When the jelly is used, the wax should be saved as it can be melted and used again.

RECIPES.

Gooseberry Jelly.—The fruit should be washed, weighed and placed, without snibbing, in a preserving pan, the fruit being barely covered with cold water, simmered until tender, then mashed well, strained through a scalded jelly bag, and left over-night to drain. The pulp should be removed from the jelly bag, sufficient water added to make a thin mash, simmered again for about ¾ of an hour, strained as before, and the first and second extracts mixed together. The juce should be measured, and 1 lb. of sugar allowed to each pint of juice. The sugar should be dissolved in the juice, and boiled rapidly until it will set when tested by any of the methods given above. The jelly should then be skimmed, poured through muslin to remove any particles of scum, and filled into warmed glasses.

Apple Jelly.—An acid apple with a decided flavour should be chosen, because some varieties when made into jelly have very little flavour, though flavouring such as ginger, peppermint, etc., can be added. Windfall apples can be used for jelly making. The apples should be washed and cut up, all bad portions being removed, then just covered with water and allowed to simmer for about an hour. The juice should be drained and tested for pectin. When a good clot is obtained, the juice should be weighed and 1 lb. of sugar to each pint of juice allowed. The juice should be heated until it is just warm, and stirred until the sugar is thoroughly dissolved, then brought to boiling point quickly and boiled as rapidly as possible until the jellying point is reached. The jelly should then be skimmed and poured into warm glasses.

Blackcurrant Jelly.—

4 lb. ripe fruit.
1½ pints water.
Sugar.

The fruit should be washed, and without the stalks being removed, weighed and placed in a preserving pan, the water added to the fruit, and the whole simmered until tender ; then mashed well, strained through a scalded jelly bag, and left over-night to drain. The pulp should be removed from the jelly bag, sufficient water added to make a thin mash, simmered again for about 1½ hours and strained as before. The first and second extracts should be mixed together, tested for pectin, and if necessary, concentrated

until a good clot is obtained. The extracts should be weighed and 1 lb. of sugar allowed to each pint of extract. The sugar should be dissolved in the juice, and boiled rapidly until the jelly will flake when tested. The jelly should then be skimmed, poured through muslin to remove any particles of scum, and filled into warmed glasses.

Redcurrant Jelly.—Redcurrant jelly is popular for serving with meat, and on this account it should be piquant, and of a firm consistency.

Two methods are given for the preparation of redcurrant jelly. Method A makes a very delicious jelly, but the output is small, and unless large ripe juicy fruit is used, only slightly over 3 lb. of jelly will be obtained. Method B gives a more economical jelly, as by adding water to the fruit and heating it twice, more pectin is brought into solution; more sugar may then be added, and the output of jelly is thereby increased. The flavour of this jelly, however, is inferior to that prepared by Method A.

Method A.—6 lb. fruit (if desired a mixture of red and white currants may be used).
Sugar.

The clean fruit from which the stalks have not been removed should be placed in a preserving pan and gently heated until the currants are soft and tender. This will take about 45 minutes. The fruit may be cooked by placing it in a large basin, covering it with a plate, and warming it in an oven.

Next, the fruit should be mashed, strained through a scalded jelly bag, and left over-night. The extracted juice should be weighed, and 1½ lb. of sugar allowed to each pint of juice. The sugar should be added to the juice, stirred constantly while they are brought to boiling point, and boiled for one minute. The jelly should then be skimmed very quickly, and poured at once into warmed glasses. Quick handling is essential, as the concentration of pectin and acid is so great that the jelly tends to set in the preserving pan.

Method B.—
6 lb. fruit.
2 pints water.
Sugar.

Method as for blackcurrant jelly, but allowing 1 lb. sugar to every pint of juice.

Blackberry Jelly.—

8 lb. blackberries.
¼ oz. tartaric acid
(or the juice of three large or four small lemons).
1½ pints water.

The fruit should be washed, placed in a preserving pan with the acid and water, and simmered until tender; then mashed well, strained through a scalded jelly bag and left over-night. A test should be made for pectin, and if this is satisfactory, the extract should be weighed, and 1 lb. of sugar added to each pint of extract. The sugar should be dissolved in the juice, the jelly brought to boiling point, and boiled until ready. The jelly should be skimmed and poured at once into warmed glasses.

Loganberry or Raspberry Jelly.—

8 lb. loganberries.	8 lb. raspberries.
2 pints water.	1 lb. sugar per pint juice.
1 lb. sugar per pint juice.	

The fruit should be placed in the preserving pan, and if loganberries are being used the water should be added. The mixture should be heated gently until it is quite tender, then mashed well, turned into a scalded jelly bag and left over-night to drain. The extracted juice should then be weighed, and 1 lb. of sugar allowed to each pint of juice. The sugar should be dissolved in the juice, stirred constantly, while being brought to boiling point, and then boiled without being stirred until the jelly is ready. This should be skimmed, strained through muslin, and poured at once into warmed glasses.

Damson Jelly.—Damson jelly may be made in the following way. After being washed, six pounds of the fruit should be weighed out and placed in the preserving pan. Three pints of water should be added to the fruit and the whole simmered slowly until tender. The fruit should be mashed and strained through a scalded jelly bag, left 12 hours to drain, and then the pulp removed, and sufficient water added to make it into a thin mash. This should be simmered again for about an hour, strained as before, and the first and second extracts mixed together. A test should be made for pectin, and when a good clot has been obtained, the extract should be weighed, 1 lb. of sugar per pint of extract added, the sugar dissolved in the juice, and boiled rapidly until the jelly is ready. It should then be skimmed, poured through muslin to remove scum, and filled into warmed glasses.

Plum Jelly can be made in exactly the same manner as Damson jelly.

DETAILS OF IMPORTANCE IN THE MAKING OF JAMS AND JELLIES.

(1) The fruit should be allowed to simmer quietly before the sugar is added.
(2) To get a well-set jam or jelly, it is necessary to have pectin, acid, and sugar present in the correct proportion.

(3) The sugar should not be added until the fruit is well cooked and broken down. After the sugar has been added, the jam or jelly should be *boiled rapidly* until the setting point is reached.

(4) Jam should be allowed to cool slightly, and it should be stirred before it is filled into the jars. If this is not done, the fruit will rise to the top of the jars. Jelly should not be allowed to cool, but should be skimmed and poured into the jars as quickly as possible.

(5) Wax circles should be placed on top of the jam or jelly immediately the jars are filled, and while the contents are still hot.

(6) The jars must not be tied down until they are cool. While cooling they should be covered with a sheet of stiff paper or cardboard.

(7) If jams or jellies are stored in a damp store, they are likely to develop mould growth on the surface. They should be stored, if possible, in a cool dry cupboard.

CHAPTER VI.

PREPARATION OF FRUIT SYRUPS.

The manufacture of syrups from fruit juices and sugar has not been developed to any extent in this country. Excellent products, however, can be made, and as they can be utilized in many ways in the home, they are well worth the trouble of preparation.

Fruits to Use.—The best English fruits for this purpose are raspberries, loganberries, blackberries, and black and red currants. The fruit should be ripe and sound, any berries showing signs of mould being discarded. Unripe fruit is too acid, whilst over-ripe or spoilt fruit imparts a disagreeable flavour. If dirty, the fruit should be washed by placing it in a colander and allowing cold water to run gently over it.

Pressing the Fruit.—(1) *Raspberries and Redcurrants.*—The fruit should be heated before it is pressed, and to get the best results care should be taken. If the fruit is heated in a pan directly over the fire or gas burner, the flavour and colour of the juice will be affected. The fruit should be placed in a large basin, and this should be placed over a vessel of water on the stove. It should be heated until the juice begins to flow from the fruit. The basin should then be removed, and the fruit should be crushed by means of a wooden spoon—a potato masher is excellent for the purpose. It should then be tipped into a jelly bag (Fig. 17) and left until the juice has drained off. The pulp should then be pressed thoroughly to remove the remainder of the juice. For this purpose a small press is very convenient. The fruit should be placed in a clean cloth, and the ends and sides folded over in such a way that the fruit will not be squeezed out of the cloth when pressure is applied. A small press, similar to the one shown in Fig. 18, gives very good results. The cloth with the fruit folded in it is placed in the bottom of the press, and thick pieces of wood which just fit the circular cage are placed on the top of it. The wheel is then turned, pressure is exerted on the fruit, and the juice runs into a basin placed to catch it.

If a press is not available, the fruit pulp can be pressed by placing it in a cloth, and, by twisting the two ends, squeezing out the juice (Fig. 19). Only small quantities at a time can be dealt with in this way. It is essential to sort, wash, and crush the fruit in wooden or earthenware vessels, as contact with metal darkens the colour, and also adversely affects the flavour of the fruit juice.

(2) *Loganberries, Blackcurrants, and Blackberries.*—If these fruits are pressed without heating, the juice often goes into the form of a jelly in the press. By heating the fruit before pressing this can be prevented, but the jelly will form when sugar is added

to the juice. This can be overcome by first crushing the fruit with a potato masher, and allowing it to ferment slightly before the sugar is added. The fruit should be placed in a large porcelain vessel and it should be allowed to stand in a warm place and left for three days, being stirred occasionally. The fermentation must not be allowed to go too far, or the flavour of the juice will be affected.

Filtration.—As it flows from the press, the juice contains suspended particles of pulp which render it cloudy. These suspended particles are so small that filtration of the juice is somewhat difficult. Cone-shaped flannel filter bags are fairly satisfactory, but they do not take out the very fine particles. These separate out when the syrup has been bottled for some time, and if the syrup is poured out carefully without disturbing the sediment a clear, sparkling product can be obtained.

Natural Juices.—Raw juice is not very palatable, and if it is bottled, sterilized, and stored, the flavour and colour deteriorate still more.

Fruit Syrups.—A much better product can be obtained by adding sugar to the juice. Sugar retains the fresh fruit flavour even after sterilization and storage. The juice should be measured, and approximately $\frac{3}{4}$ lb. of white granulated sugar should be added to each pint of juice, care being taken to ensure that all the sugar is dissolved.

Bottling the Syrup.—The syrup should be bottled at once, and any suitable bottle that will withstand moderate pressure may be used. Clean sauce bottles of the type in which a metal top screws over the cork, or screw stoppered bottles, are convenient for the purpose. If ordinary bottles are used it is necessary to wire the corks in or they will blow out during sterilization. The syrup should be filled to within about 2 in. of the cork or stopper. The bottles should then be tightly sealed and the corks or screw stoppers should be sterilized by being heated in hot water. If the corks are not sterilized the syrup often goes mouldy on storage. If screw tops are not available, stout cloth may be tied securely over the corks to prevent them from being blown out during sterilization. The bottles can be sterilized in any pan which is large enough to take them. They should be placed on their sides on a false bottom, and covered completely with cold water. If a sterilizer with a tight-fitting lid is used, the bottles can be placed upright, with the water well up their necks. The temperature should be raised very slowly, and should reach 170°F. in about one hour. This temperature should be maintained for twenty to thirty minutes. When the bottles are removed from the sterilizer, the corks should be dipped in melted paraffin wax to make them air-tight.

[To face page 44.

Fig. 17.—Jelly Bag and Stand.

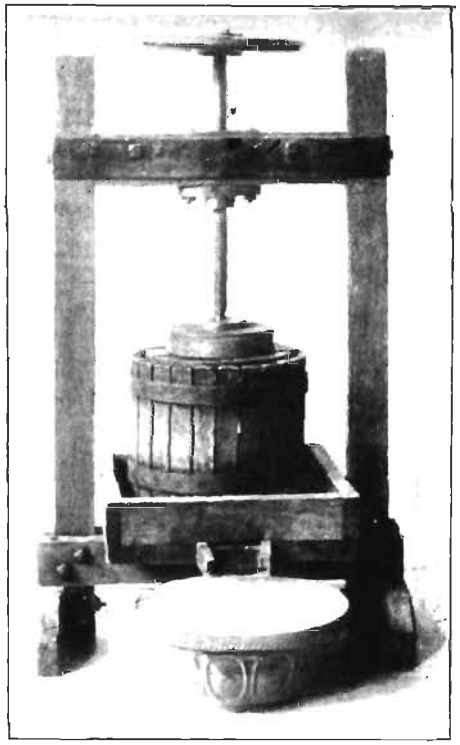


Fig. 18.—Fruit Press.

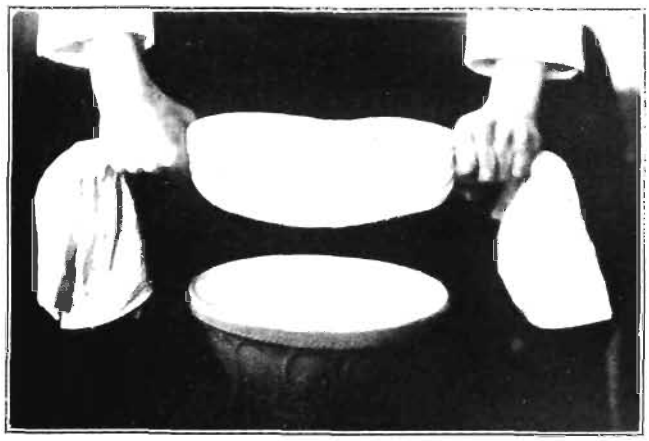


FIG. 19.- Use of a Cloth for Pressing out Fruit Juice.

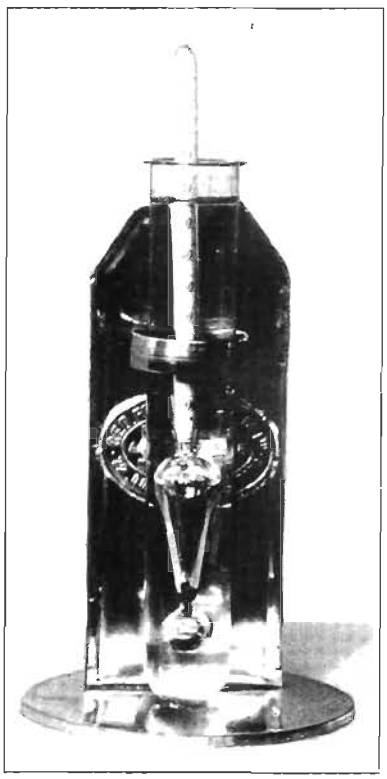


FIG. 20.- Hydrometer, Tube and Stand.

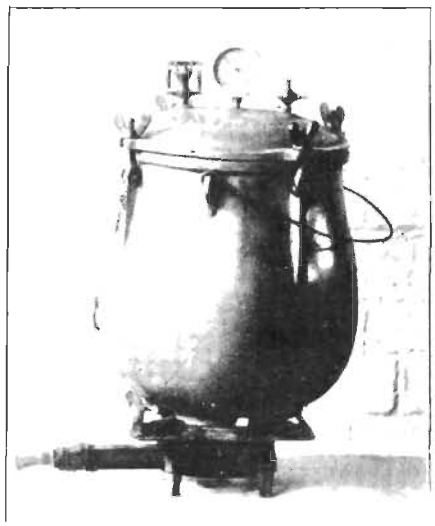


FIG. 21.- Small Pressure Cooker for use in the Home.

Uses for Fruit Syrups.—These home-made fruit syrups make excellent drinks when diluted with soda water. They can also be used for sweet sauces, ices, trifles, and for fruit jellies when stiffened with gelatine.

Points to Remember.

(1) The fruit should be fully ripe, but should not be fermenting or mouldy.
(2) The fruit should be heated, but not to too high a temperature.
(3) Neither the fruit nor the juice should be allowed to come into contact with metal during any stage of the operations, or the flavour and appearance will be spoiled.
(4) Care should be taken that all the sugar is dissolved before the syrup is bottled.
(5) Clean bottles should be used.
(6) The corks should always be sterilized before use, or the syrup may go mouldy on storage.
(7) During sterilization, the corks should be wired on, or tied down, or they will be blown out and the syrup will be lost. Screw top bottles, or bottles with a metal screw cap over a cork, are convenient.
(8) When pouring out the syrup before use, care should be taken not to disturb the sediment at the bottom, or the syrup will appear cloudy.

CHAPTER VII.

THE PREPARATION OF CANDIED, CRYSTALLIZED AND GLACE FRUITS.

Candied, crystallized and glacé fruits are very expensive to buy, because they are largely imported from France and their preparation entails the use of a very large quantity of sugar. However, the preparation can be carried out in the home quite easily and without a great deal of expense, although the process is rather a long one. It consists in covering the fruit with a dilute hot syrup, which from day to day is gradually increased in sugar content until it becomes a heavy syrup, and thus the fruit is gradually impregnated with sugar. The slow increase in the strength of the syrup is necessary in order to allow the water which is found in all fruits to diffuse out slowly, and the sugar to diffuse in slowly. Unless the process is a gradual one the fruit becomes shrivelled in appearance and tough.

Candied Fruit.—The most suitable fruits are those which have a pronounced flavour, as delicate flavours are frequently masked by the large quantity of sugar absorbed. Pineapples, apricots and peaches, which are among the most successful, are for reasons of cost in this country generally prepared from canned fruits. Among the fresh fruits suitable are fleshy plums, greengages, apricots and cherries. Angelica, orange and lemon peel may also be used.

(*a*) *From Canned Fruits.*—Only canned fruit which is of a good Empire brand should be employed, and the fruit should be of good firm quality and of large size. Pineapple chunks, or the very small rings canned by some firms, plums, sliced and halved peaches and halved apricots make attractive candied fruits. Different fruit should not be candied in the same syrup. The process is as follows :—

(1) The can of fruit (about 1 lb.) should be opened and the syrup drained off into a bowl large enough to hold the fruit when completely covered with syrup.

(2) The syrup should be measured and made up to 1 pint by the addition of water, placed in a saucepan and 1 lb. sugar added. It should then be put on to heat, and the sugar stirred until it is thoroughly dissolved, then brought to boiling point and removed from the heat.

(3) The syrup should be poured over the fruit in the bowl. Sufficient syrup must be prepared to immerse the fruit completely ; the proportions given have been found satisfactory, i.e., to 1 lb. of fruit a syrup composed of 1 pint of water or liquid from can and 1 lb. sugar should be used. If the fruit floats in the syrup, a saucer should be placed over the fruit in the bowl to keep it completely submerged. This should be allowed to stand for 24 hours.

(4) At the end of this time the syrup should be poured off, placed in a saucepan and 2 oz. of sugar added to it. It should be brought to boiling point, and after it is clear that the sugar is dissolved it should be poured over the fruit again and allowed to stand for 24 hours.

(5) This process should be repeated twice more at 24 hour intervals, with the addition of 2 oz. of sugar each time.

(6) On the fifth day the syrup should be placed in a saucepan, 3 oz. of sugar added and stirred until it is dissolved. The fruit should then be added, brought to boiling point and boiled for three or four minutes. The fruit and syrup should be returned to the bowl and left for 48 hours or longer.

(7) This process should be repeated by again boiling the fruit in the syrup; if on cooling the syrup is of the consistency of thick honey, the fruit should be left soaking in it for 3 or 4 days, but if at this stage the syrup seems of rather a thin consistency, it should be boiled once more with the fruit with another 3 oz. of sugar added, and the fruit left in the syrup for three or four days. The object of boiling the fruit in the syrup in the final stages, is to make the fruit more plump.

(8) When the fruit has been soaking in the syrup for three days or longer (the fruit will keep in a heavy syrup for a fortnight or three weeks) the syrup should be drained off and the pieces of fruit placed on a wire tray (a cooling tray is very suitable) over a plate to catch the syrup as it gradually drains from the fruit.

(9) The fruit should be placed in a very cool oven at a temperature of not more than 120° F. An oven supplied with oil stoves is very suitable for this purpose. If such is not available the fruit can be placed in a coal oven at the end of the day when the heat is dying down, or it may be placed on the rack above the kitchen stove provided it is well protected from dust. When the heat is continuous, as in an oil oven, the fruit is dry in a few hours, but when not continuons, as in a coal oven, the drying process may take three days. The fruit is sufficiently dry when the surface is no longer sticky and when it can be easily handled. It is advisable to turn the fruit over occasionally during the drying process. In summer the fruit may be dried by placing in the sun for several hours.

(10) The fruit should be packed in cardboard or wooden boxes, waxed paper being used to line the boxes and to separate the layers of fruit. It is quite a good plan to save for this purpose cardboard chocolate boxes and small wooden boxes in which commercial crystallized fruit is packed, If desired, the fruit may be stored in jam jars or fruit bottles by tying a paper or cloth over the top. The container must not be sealed or airtight, as the fruit may mould under these conditions.

(*b*) *From Fresh Fruits.*—Fresh fruit should be firm and sufficiently ripe so that the flavour is good, but fruit that is soft should not be used. Small crab apples, pears, apricots and fleshy plums

should be punctured in numerous places with a silver fork. Cherries should be stoned, peaches and pears peeled and cut in halves, or if large in quarters. Peeled, stoned and cut fruits do not require puncturing.

(1) After preparing the fruit it should be placed in boiling water sufficient to cover it, and cooked gently until just tender. Tough fruits such as apricots may require 10 to 15 minutes, while tender fruits require only 3 or 4 minutes or less. Too much cooking will spoil the shape and texture, too little will result in slow penetration of the sugar, dark colour and toughness.

(2) For 1 lb. of fruit a syrup should be made from 1 pint of the water in which the fruit was cooked and ¾ lb. sugar. It will be noticed that, in proportion, less sugar is used to candy fresh fruit than canned fruit. The reason for this difference is that canned fruit has already absorbed a certain quantity of sugar from the syrup in the can, and therefore is able to absorb more sugar without shrivelling than is possible with fresh fruits. The syrup should be poured over the fruit and left for 24 hours.

(3) The syrup should be drained off, 2 oz. of sugar added to it, brought to boiling point, poured over the fruit again, and left for 24 hours.

(4) This process should be repeated three times and the procedure is then exactly as for canned fruit. The following table gives the method in the two cases :—

Day.	*Sugar to Add.*	*Method.*	*Time for soaking in Syrup.*
1st	Canned 1 lb. to 1 pint Fresh Fruit ¾lb. to 1 pint	Sugar should be dissolved, syrup brought to boiling point and poured over the fruit.	24 hours
2nd	2 oz.	Do. Do.	Do.
3rd	Do.	Do. Do.	Do.
4th	Do.	Do. Do.	Do.
		For fresh fruit the above process should be repeated once again. The procedure is then as below.	
5th	3 oz.	Sugar should be dissolved, fruit added, boiled for 3 or 4 minutes and then returned to bowl.	48 hours
7th	Do.	As above till consistency of honey when cold.	4 days
11th		Fruit should be dried in oven.	

Glacé and Crystallized Fruits.—Glacé and crystallized fruits are prepared by the same method as candied fruit, but the process goes one stage further. When candied fruit has been dried in the oven, it may, if a better finish is desired, be dipped in a fresh syrup, to give in the one case a glacé or transparent finish, and in the other, a crystallized finish. The reason why a fresh syrup is necessary for the crystallizing and glacéing process is that the acid in fruit has a certain chemical action on the sugar of the syrup in which the fruit is soaking, and this action prevents the formation of crystals and of a clear glacé finish. The fruit so finished certainly looks nice, but its flavour is in no way improved and the process entails the use of more sugar and such necessary apparatus as a hydrometer and a boiling tube. There are two kinds of hydrometers available, the Beaumé and the Balling. On the Beaumé scale the density of water is zero; by the addition of solids to the water, sugar for example, the spindle is caused to rise. Beaumé hydrometers are designed for testing salt solutions, but they are often used for sugar solutions and register between zero and 50 degrees. The Balling hydrometer gives the exact percentage by volume of sugar present in the solution, and registers from zero to 100 degrees. A boiling tube costs from 1*s.* 6*d.* to 1*s.* 9*d.*, and is very convenient as the glass is made to withstand high temperatures, and the tube being very narrow, only a small quantity of syrup is required to float the hydrometer (Fig. 20, facing p. 45).

(*a*) *Glacé Finish.*—1. A syrup should be made from 1 lb. sugar and about ¼ pint of water, stirred very carefully until the sugar is dissolved and brought to boiling point.

2. Sufficient of this boiling syrup should be poured into the boiling tube to float the hydrometer, which should be placed in the boiling tube, the latter held so that the surface of the liquid is on a level with the eye, and the reading of the hydrometer taken at the line where it emerges from the liquid. If 35 deg. Beaumé or 65 deg. Balling is indicated, the syrup is of the right strength; should it be less than 65 deg. Balling more sugar should be added to the syrup to increase its strength, or it should be boiled for a little longer. If the syrup is stronger than necessary, a tablespoonful of water should be added for each degree over 65 deg., and this addition should make it of the required strength. If sugar or water is added to give the correct reading, the syrup must be brought to boiling point and then the strength tested.

3. Assuming that the syrup is of the correct strength, a small quantity should be poured into a cup, the pieces of candied fruit dipped into it with a fork or skewer, and then placed on a wire tray. As soon as the syrup appears cloudy, it should be discarded and a fresh portion taken. The bulk of the syrup should be kept warm, and should be closely covered with a damp cloth or a tight fitting lid to prevent evaporation.

4. When all the fruits have been dipped, the wire tray containing them should be placed in an oven or a warm place. The temperature should not be more than 120 deg. F. During drying the fruit should be carefully turned over, so that it may become dry on all sides.

5. The packing should be as for candied fruit.

(*b*) *Crystallized Finish.*—1. The syrup should be prepared as for the glacé finish, using 1 lb. sugar and rather less than ½ pint of water. The density should be 60 deg. Balling. It is most important in order to get good even crystals (a very difficult achievement) that the syrup should be exactly 60 deg. Balling or 32 deg. Beaumé.

2. The candied fruit should be placed on a wire tray, and this placed in a deep enamel tin and covered completely with the syrup. Another wire tray should be placed on the top of the fruit to keep it under the syrup.

3. The fruit should be left in this syrup from 12 to 18 hours, or until a thin crust of crystallized sugar forms on the surface of the syrup.

4. The fruit should be removed by carefully raising the wire trays out of the syrup. As much syrup as possible should be drained from the fruit, and the top wire tray removed.

5. The wire tray containing the fruit should be placed in an oven, the heat of which is not greater than 120 deg. F., and dried until crystals are formed evenly on the surface of the fruit.

Note.—If a hydrometer has been purchased, the whole process of candying may be carried out by the use of the instrument. As explained above, the hydrometer indicates the strength of the syrup in which the fruit is being candied, from day to day. By its use, increasing the strength too rapidly is guarded against, although with care this can be avoided without using a hydrometer, as already described. However, if a hydrometer is available it should be used for the process of candying and the table on page 51 will be helpful in its use and in indicating the strengths from day to day.

As canned fruit has absorbed some sugar from the syrup in the can, the process should begin at 25 deg. Beaumé or 46 deg. Balling (1 lb. sugar to 1 pint = 25 deg. Beaumé), and from that point should be carried on exactly as shown in the table for fresh fruit.

Candied Angelica.—The stalks should be picked in April when they are young and tender and the colour is at its brightest. The root ends and the leaves should be cut off and the stalks placed in a basin. A boiling brine made from ½oz. salt and 2 quarts of

Day.	*Sugar to add to 1 pint water.*	*Method.*	*Degrees Beaum.*	*Degrees Balling.*	*Time for Soaking.*
1st	½lb. sugar	Sugar should be dissolved, syrup brought to boiling point and poured over fruit.	20	37	24 hours
2nd	2 oz.	Do. Do.	25	46	Do.
3rd	Do.	Do. Do.	26	48	Do.
4th	Do.	Do. Do.	27	50	Do.
5th	Do.	Do. Do.	29	53	Do.
6th	3 oz.	Sugar should be dissolved, fruit added and boiled for 3 or 4 minutes.	33	61	48 hours
8th	3 oz.	As above	35	65	3 or 4 days
12th	Fruit should be dried in an oven or in a warm place.				

water should be poured over them. They should be soaked for ten minutes, then removed; rinsed in cold water, placed in a saucepan of fresh boiling water and boiled 5 to 7 minutes according to the age of the stalks. They should then be drained and scraped to remove the outer skin.

Next, 1 lb. of sugar to 1 pint of water should be dissolved, brought to the boil, the density made 25 deg. Beaumé, the syrup poured over the angelica and allowed to soak for 24 hours.

The density should be increased to 27 deg. Beaumé, 50 deg. Balling, and the stalks allowed to stand for 24 hours.

The density should again be increased to 28 deg. Beaumé 51 deg. Balling, and the stalks allowed to stand for 24 hours.

The density should again be increased to 30 deg. Beaumé, 55 deg. Balling, and the stalks allowed to stand for 24 hours.

The density should again be increased to 32 deg. Beaumé, 60 deg. Balling, and the stalks allowed to stand for 24 hours.

The density should again be increased to 35 deg. Beaumé, 65 deg. Balling, and the stalks allowed to stand for 3 days.

The stalks should then be taken out, placed on wire trays and dried in a cool oven, 100 deg. to 120 deg. F. The angelica should be stored in bottles and kept away from the light. Angelica may be candied without the use of a hydrometer by following the directions given in the first table (p. 48).

Candied Orange Peel.—

8 oranges or lemons.
½ oz. bi-carbonate of soda.
2 qts. boiling water.

After being washed, the oranges and lemons should be cut into halves and the cores carefully removed. The bi-carbonate of soda should be dissolved in the boiling water, and the orange or lemon skins soaked in this solution for 20 minutes. The skins should then be removed, rinsed well in cold water, and simmered gently in fresh water until they are quite tender. The orange and lemon peel should then be removed, and immersed in a syrup made as follows :—1 lb. sugar should be dissolved in 1 pint water and the solution brought to boiling point. The skins should be placed into this hot syrup, a small plate placed over them and left to soak for two days. After this time the syrup should be drained off and ½ lb. sugar added to it. It should be brought to the boil as before, and the skins simmered in this syrup until they are clear ; they should then be removed, and placed on a cake tray to dry. This is best accomplished by placing the tray in a cool oven at a temperature from 100 deg. to 120 deg. F., or on the rack above the kitchen stove provided it is well protected from dust.

The syrup in which the peel has been cooked should then be boiled for 3 or 4 minutes, stirred, and when it is cloudy and thick the pieces of peel dipped into it and replaced on the cake tray. They should be dried as before in a cool oven or in a warm place. Candied peel may be dried in the sun, if the process of candying is carried out during the summer.

Use of Syrups.—A question may naturally be raised as to what can be done with the syrup after the fruit has been removed from it. The syrup, which is of the consistency of honey, has a delightfully fruity flavour and can be utilized in fruit salads, sauces, or for sweetening puddings or stewed fruit ; or it may take the place of sugar in fruit chutneys of various kinds. It can also be used for toffee making, with the addition of a little butter. Of course, if a fairly large quantity of fruit is to be candied, the syrup could be diluted until it is quite thin in consistency and used for candying another batch of the same kind of fruit, or the syrup may be bottled and sterilized for future use (sterilize at 190 deg. F. for 15 minutes bringing the temperature up from cold). The syrups used for purposes of giving crystallized or glacé finishes can be utilized in the same way.

CHAPTER VIII.

THE PRESERVATION OF VEGETABLES.

BOTTLING.

There is not the same interest in vegetable bottling as there is in fruit bottling because it is possible to procure many kinds of fresh vegetables all the year round. Nevertheless, it is often very convenient to have a supply of bottled vegetables which have been preserved whilst young and fresh and can be removed from the bottle ready for use, only requiring to be heated.

Vegetables are more difficult to preserve than fruits, and require more elaborate treatment. On no account should they be treated in the same manner as fruits. The latter can be sterilized by raising the temperature to 165° F. in 1½ hours and keeping it at that level for ten minutes, but vegetables will not keep even when the temperature has been raised to boiling point and kept at that from one to two hours.

The difference in the chemical composition largely accounts for the difficulty encountered in sterilizing vegetables. Fruits invariably contain organic acids, which assist sterilization. Thus plums, gooseberries and rhubarb are very easily preserved. In vegetables, however, there is little or no acid present; moreover, many grow in contact with the soil, and others are exposed to soil contamination. Thus soil bacteria are always present upon them. Many of these soil bacteria enter into a resting stage, and form spores when conditions are unsuitable for the ordinary vegetative form of reproduction. The spores are very resistant to heat, and often can survive boiling temperature for two hours or longer. When vegetables are bottled at the same temperature as fruit, or even after being heated to boiling point for one to two hours, the spores may not be killed, and when the product is stored for a period, they may develop and cause the decomposition of the vegetables. It will therefore be seen that strict cleanliness in removing all traces of soil from the vegetables, with careful carrying out of the following instructions, is necessary to ensure successful preservation.

Preparation of the Vegetables.—Before describing the methods of preservation, a few words about the preparation of the vegetables are necessary, as the preparation is the same whatever method of sterilization is used. The vegetables should be young and absolutely fresh. The latter point is most important and the housewife should always aim at preserving her vegetables immediately she brings them in from the garden. They should be thoroughly washed to remove all traces of soil, and should be peeled, scraped, etc., according to their kind. They should then be tied in muslin and dipped in boiling water, or *blanched* as it is often termed, from

two to five minutes according to age and kind. Blanching shrinks the vegetables and makes them more pliable when they are being packed into the bottles. and it is an additional cleansing operation. When the vegetables are removed from the boiling water they should be plunged at once into cold water for a few minutes to make them more easily handled for packing. They should be packed loosely into clean vacuum bottles. Tight packing is a common cause of the liquid in the bottles becoming cloudy, and moreover, during sterilization it is very difficult for the heat to penetrate if the packing is very tight. The vegetables should then be covered with a solution of salt, lemon juice and water. Lemon juice is not always used, but its value is explained under methods of sterilization. The rubber rings, lids and screw bands or clips are then finally placed in position.

Methods of Sterilization.—(1) *Lemon Juice Method.*—It has already been stated that the acids present in fruits enable them to be preserved fairly easily. By adding acid to the covering liquid when bottling vegetables it has been found that they can be sterilized more readily, and citric acid or lemon juice is generally used for this purpose. The vegetables in the bottle should be completely covered with a solution containing 2½ oz. of salt and 5 fluid oz. of lemon juice per gallon of water. The solution should be prepared by boiling the water, and adding the lemon juice and salt, and it should be allowed to cool before it is poured into the bottles. The bottles should be placed on a false bottom in a deep vessel, covered completely with warm water, brought to boiling point and boiled for 1½ hours. Care must be taken to see that the temperature is kept at boiling point for the full length of time. If on removing the bottles from the sterilizer, it is noticed that the liquid is not covering the vegetables, the bottles should be opened quickly, one at a time and filled up with boiling acidified brine. The lids should then be replaced and the bottles returned to the sterilizer and allowed to boil for another twenty minutes. The bottles should be removed from the sterilizer, and if screw bands are used, these should be tightened and on the following day tested to see whether or not the bottles are sealed.

(2) *Intermittent Sterilization.*—The vegetables in the bottles should be covered with a solution of salt and water (2½ oz. of salt to 1 gallon of water). Lemon juice is not used. The bottles should be placed in a sterilizer, covered with water, brought to boiling point and boiled for one hour. The bottles should then be removed, and, if the liquid has sunk in the bottles, opened and filled up with boiling brine. They should then be closed immediately and left until the following day. The bottles should then be replaced in the sterilizer, covered with water and boiled for one hour and filled up if necessary. This process should be repeated on the third day, the bottles removed from the sterilizer,

screw bands tightened (if they are used), and the bottles allowed to cool until the following day. Then they should be tested. This method of sterilization is effective in destroying germs which would cause the vegetables to go bad. The first boiling destroys most of the vegetative bacteria and during the 24 hours which elapse spores which have not been killed may start to germinate. The second sterilization destroys these cells and kills or weakens the bacteria which were not destroyed originally. Any harmful organisms that may have survived the first and second sterilizations are destroyed during the third operation.

(3) *Sterilization under Pressure.*—Although bacteria spores can withstand boiling temperatures, unless acid in the form of lemon juice is added, they can be killed by heating to a temperature of 240° F. for about 30 or 40 minutes. To get this temperature, pressure cookers or autoclaves are used. These cookers are generally made of strong cast iron or aluminium and have tight fitting lids which can be clamped on so firmly that the vessel is made steam tight. On the top of the vessel is a pressure gauge and a safety valve. As the pressure inside the vessel rises, the temperature of the steam also rises, so that when the pressure gauge registers 10 lb. pressure, the temperature is 240° F. For preserving vegetables on a large scale these pressure cookers are always used. Small pressure cookers (Fig. 21, facing p. 45) for use in the home can be obtained, and they are useful for preserving meats, fish, etc., as well as vegetables. Exact instructions as to its use are supplied with the cooker. Where, however, a pressure cooker is not available, the lemon juice method or the intermittent method must always be used, as vegetables preserved in the ordinary way at boiling temperature or at the temperature used for fruit are not safe to eat.

N.B.—When Kilner or other screw top jars are used, great care is necessary in the adjustment of the screw bands. Before placing the bottles in the sterilizer the screw bands should be turned half a turn back, and when they are removed from the sterilizer screwed down as tightly as possible. When the intermittent method of sterilization is followed, the screw bands must be loosened each day before the bottles are placed in the sterilizer, and they must be tightened when the bottles are removed from the hot water. The general rule for screw tops is to have the bands slightly loose before sterilization, and as tight as possible immediately after.

In giving details of bottling the different vegetables, the lemon juice method is described as it is the simplest, but the intermittent method can be used equally well, and those who like the flavour of mint in bottled peas should use the intermittent method for this vegetable.

Peas.—(1) As the pods are often very dirty from the soil, it is most important to wash them very thoroughly before shelling the peas, otherwise infection is transferred from the pods to the peas during the shelling operation. The pods should be washed in water, or better still in a dilute solution of potassium permanganate. To prepare this solution sufficient crystals should be dissolved to make the water a deep magenta colour. In this way many of the soil bacteria are removed and preserving is rendered easier.

(2) The peas should be shelled and tied loosely in muslin.

(3) The bag of peas should be dipped in boiling water from ½ to 2 minutes, according to the size of the peas.

(4) They should be removed from the boiling water and placed in a basin of cold water for a few minutes.

(5) The peas should be packed into clean vacuum bottles to within ¼ inch of the top. They should not be packed too tightly.

(6) The peas should then be covered completely with brine made from 2 oz. of salt, 5 fluid oz. of lemon juice, 4 oz. of sugar and one gallon of water.

(7) The bottles should be placed in a sterilizer, covered with warm water, the water brought to boiling point and boiled for 1½ hours. If necessary, the bottle should be filled up with boiling brine and re-sterilized for 20 minutes.

N.B.—If peas are preserved by the intermittent method the covering liquid should be as follows:—4 oz. of sugar, 2½ oz. of salt, 2 oz. of mint leaves and 1 gallon of water. The water should be boiled, half of it poured over the mint leaves and strained when cold. The salt and sugar should be added to the remainder of the water and this solution poured over the peas in the bottles, which should then be sterilized by the intermittent method. Mint improves the flavour of the peas, but it is not possible to use mint with lemon juice, and for that reason the intermittent method is preferable to the lemon juice method.

To Use Bottled Peas.—The bottle should be opened, care being taken not to chip the glass. The peas should be placed in a colander over a saucepan of boiling water and heated for 20 to 30 minutes; in this way they may be heated without becoming broken.

French Beans.—The method is the same as that for peas.

(1) The beans should be washed in water, or in a very dilute solution of potassium permanganate (the solution should not be darker than a very pale pink).

(2) The beans should be strung and cut up as for cooking, dipped in boiling water and then in cold as for peas.

(3) The bottles should be packed to within ¼ inch from the top

and the beans covered with a solution made from 2½ oz. of salt, 5 fluid oz. of lemon juice and 1 gallon of water.

(4) The beans should be sterilized in exactly the same way as for peas, and if necessary the bottles filled up with boiling brine and re-sterilized for 20 minutes.

Broad Beans.—(1) The pods should be washed very thoroughly, as for peas.

(2) The beans should be shelled, blanched for three minutes and then plunged into cold water for a few minutes.

(3) They should be packed loosely into the bottles to within ¼ inch of the tops, and covered completely with acidified brine as for French Beans.

(4) The bottles of beans should be sterilized at boiling point for one hour, the bottles removed one at a time, the lids taken off, and, the beans being held back with a spoon, the covering liquid poured off, as this will be dark in colour. The bottles should be filled with boiling water and the water poured off again, this operation being repeated three or four times so that the beans are well rinsed. Then the bottles should be refilled with boiling acidified brine and the fittings replaced with the screw bands slightly loose. The bottles should be replaced in the hot water in the sterilizer and, when all the bottles have been rinsed and filled up afresh, the water in the sterilizer brought again to boiling point and the bottles boiled for 30 minutes.

(5) Green Windsor is a good variety for bottling, as the beans retain their colour, whereas most varieties turn brown on processing.

Asparagus.—Only young and fresh stalks with closed buds should be preserved, and the operations in connexion with its preservation should be carried out as quickly as possible after cutting. Tips of uniform size and maturity should be selected and the " sprue " or inferior stalks discarded.

(1) The stalks should be washed and cut to the same height as the bottle.

(2) The rough outer skin should be scraped off and the asparagus tied in bundles, each bundle containing rather more stalks than will fit into the bottle.

(3) The bundles should be stood with the tips up in a wire basket or tied in muslin and lowered into a pan of boiling water, so that the heads are just above the surface. The lid should be put on and left for two to three minutes. By this method there is no danger of the heads becoming over-cooked.

(4) The asparagus should be removed carefully from the boiling water and dipped into cold water for a few minutes.

(5) The heads should be packed at once into clean vacuum bottles to within ¼ inch of the tops, the tips being placed either

at the top or bottom of the bottle. When packed with the tips downwards, the asparagus is more easily turned out.

(6) The bottles should be filled up with acidified brine and sterilized as for peas.

To serve Asparagus.—The bottle should be opened, the covering liquid drained off and the contents heated in the bottle, as in this way the handling of the delicate stalks is prevented. They should be served in a vegetable dish, placed on a piece of toast to complete the draining, with melted butter.

Young Carrots.—These are excellent when bottled. They should be preserved in late June and early July when the carrots are only about three inches in length.

(1) The tops should be removed and the carrots thoroughly washed to remove all traces of soil.

(2) They should be placed in a saucepan of boiling water and boiled from 10 to 15 minutes. For very young carrots 10 minutes' boiling is quite long enough.

(3) The carrots should be removed from the boiling water and placed at once in cold water.

(4) The skins should be removed with a coarse cloth, care being taken not to break the pointed end of the carrot. Any black parts should be cut away and the carrots trimmed where necessary.

(5) As soon as they have been skinned they should be laid in cold water to preserve the bright colour and to keep them fresh.

(6) The carrots should be graded for size and packed into the bottles to within ¼ inch of the top.

(7) They should be covered with acidified brine and sterilized for 1½ hours at boiling temperature.

Broccoli and Cauliflower.—(1) The flower only should be used and washed to remove soil.

(2) It should be soaked in salted water for about one hour to remove insects.

(3) The flower should be separated into large sprigs and dipped into boiling water for three or four minutes, and then into cold water for a few minutes.

(4) It should be packed into the bottles and covered with the acidified brine.

(5) It should then be sterilized at boiling point for 1½ hours, and if necessary the bottles refilled as previously explained.

Celery.—Only small quantities of celery are preserved, and most of that is used for the purpose of mixing with other vegetables in soups.

(1) The celery should be washed and the outer stalks removed.

(2) The heads should be cut lengthwise in four or eight sections.

(3) They should be examined for insects and the outer stalks scraped if necessary.

(4) The celery should be dipped into boiling water, and then into cold water for a few minutes.

(5) It should be packed into the bottles and covered with acidified brine.

(6) Finally, it should be sterilized at boiling point for 1½ hours.

Beetroots.—Beets for preserving should be of a deep red variety and uniformly coloured.

(1) The tops should be removed and the beets soaked in a bucket of water until all the soil has been softened.

(2) They should be washed thoroughly and the process repeated until there is no trace of soil left on them.

(3) They should be placed in boiling water and boiled for 10 to 20 minutes according to the size.

(4) The skins should be removed and if the beets are small they should be packed whole, but if large, cut into slices about ¼ inch thick.

(5) They should then be covered with acidified brine and sterilized at boiling point for 1½ hours.

Vegetable Macedoine.—Vegetable macedoine is composed of three or four different vegetables such as peas, carrots, turnips and runner beans. Such mixtures of vegetables are very useful in winter time for soups, stews and various vegetable garnishes, and they require no preparation.

(1) The vegetables should be prepared according to their kind, carrots scraped, peas shelled, etc.

(2) Carrots and turnips should be cut into small squares and the runner beans sliced.

(3) The different vegetables should be blanched separately and packed into the bottles in layers to give a bright contrast in colour.

(4) The bottles should be filled with acidified brine and sterilized at boiling point for 1½ hours.

Care Necessary in Using all Home-Bottled Vegetables.—On account of the chance of faulty sterilization, if, when a bottle of vegetables is opened, the contents do not smell good, they should be thrown out and should on no account be tasted or fed to poultry or animals.

CANNING.

For canning, vegetables are prepared in exactly the same way as for bottling. In canning, however, the covering liquid

must always be used boiling, and the cans should be sealed in the hand sealing machine whilst steam is still rising from them, exactly as described under the Canning of Fruit (p. 13).

The same methods of sterilization as described under bottling vegetables must be used. It will be noticed that bottles should always be placed in cold water, as they would crack if placed into boiling water. Canned vegetables, on the other hand, should be placed at once into boiling water. When the lemon juice method is used, the cans should be placed in boiling water, and allowed to boil for 1½ hours. Care must be taken to see that the temperature is kept at boiling point for the full length of time. The cans should then be removed from the hot water, and placed in cold water to cool.

If the intermittent method of sterilization is used, the cans should be placed in boiling water and allowed to boil for one hour. They should then be taken out and placed in cold water to cool. On the following day they should again be boiled for an hour, and cooled in cold water, and this must be repeated on the third day.

When sterilized in a pressure cooker, the procedure is exactly the same as described under bottling, with the exception that when the cans are taken from the cooker they are placed in cold water to cool. When the cans are cold, they must be removed from the water, and dried carefully. They should then be labelled and placed in the store.

If canned fruits or vegetables are put into a damp store, the labels are apt to come off. It is, therefore, advisable to scratch the name of the fruit or vegetable, with the date on which they were prepared, on the top of the can. This can easily be done with an iron nail, and often prevents confusion in the store cupboard.

IMPORTANT POINTS WHICH REQUIRE PARTICULAR ATTENTION.

(1) Vegetables are more difficult to preserve than fruits and require a more elaborate treatment. On no account should they be treated in the same manner as fruits.
(2) Only *clean* bottles or cans should be used.
(3) The vegetables must be young and fresh, and they should be preserved as soon as possible after picking.
(4) The vegetables should be washed carefully to remove all traces of soil.
(5) The vegetables should always be blanched in boiling water.
(6) The bottles or cans must not be packed too tightly.
(7) Whichever method of sterilization is used it must be done thoroughly.
(8) If, when a bottle or can of vegetables is opened, the contents do not smell good they must not be eaten or fed to poultry.

CHAPTER IX.

THE DRYING OF FRUIT AND VEGETABLES.

Drying as a method of preservation has been used from the earliest times. In the early days fish, meat, fruit and vegetables were dried by making use of the sun and wind, and in countries such as Australia, California, and certain parts of France, sun-drying is still carried out. In other countries where the atmosphere contains more moisture, it has been found satisfactory to carry out the process in machines which are so constructed that the temperature, humidity, and air distribution can be easily controlled.

The drying of fruit and vegetables in the home can be carried out quite simply and involves no expensive apparatus. Trays are required on which to lay the fruit and vegetables ; these may be purchased, or may be constructed by nailing together, in a square, four wooden lathes, and stretching wire gauze or cheese-cloth across the frame-work. If wire trays are used they should be protected by loose pieces of cheese-cloth or muslin in order to prevent the fruit taking the imprint of the wire mesh. If new cheese-cloth is used as the foundation of the tray or simply to cover the wire gauze, it should be washed to remove the dressing which scorches easily.

Drying must be done only in a moderately warm oven ; the spare heat of the oven or stove may be utilized after the cooking for the day is over. This probably means that the process cannot be a continuous one, and that it will have to be carried out on several evenings, but the fruit and vegetables do not suffer to any appreciable extent. If an oil-heated oven is available, the heat can be regulated more easily, and the process can be carried out continuously or intermittently according to the general use of the oven. The rack over a coal range can also be used, provided the fruit and vegetables are protected from dust.

Dried Fruit.—As in other methods of preservation, it is very important to use absolutely fresh fruit, also to use the fruit when it is ripe. Ripe fruits dry more quickly than unripe ones, retain a better colour and have a very much better flavour. The fruit should be prepared according to its kind, peeled, cored, etc., laid on the trays and dried at a temperature between 120 deg. and 150 deg. F. The fruit should be heated slowly at first to prevent the outside hardening. Such hardening prolongs the process by preventing evaporation of the moisture from the centre of the fruit ; also, in the case of plums, if the heat is too great at the outset the skins burst and much of the goodness of the plum is lost. When the fruit is removed from the oven it should be exposed to ordinary room temperature for twelve hours, during

which time it cools. It should then be packed in wooden or cardboard boxes lined with greaseproof paper, and stored in a very dry place.

(1) *Apples.*—Apples on the whole stand drying well, but it is not a method which should be used except for windfalls and those varieties which do not keep well by the usual method of storing. Windfalls can be preserved quite satisfactorily by drying. The fruit must be carefully peeled and cored, with all blemishes removed, and cut into rings from $\frac{1}{4}$ in. to $\frac{1}{8}$ in. in thickness. The rings should be arranged in single layers on the trays or threaded on sticks, which can be laid across the trays, and placed near the kitchen fire or in a cool oven at a temperature of not more than 140 deg. F. If the process can be a continuous one the rings should be dry in from four to six hours. If the rings are dried at the end of the day when the stove heat is dying down, drying may continue intermittently over a period of two or three days. When the fruit is sufficiently dry the texture should resemble that of chamois leather, and if a handful of rings are pressed firmly together the slices should be springy enough to separate at once on being released from the hand. When they have reached this stage they should be removed from the oven and left for twelve hours, then packed and stored in a dry place.

Note:—*Sulphuring.*—When apples are peeled and exposed to the air they turn brown. This can be prevented by exposing the apple rings to fumes of burning sulphur. On a home scale sulphuring is not very practical, because it is difficult to regulate the quantity of sulphur being used, and if too much is used the flavour of the fruit is injured. The method is as follows: 1 teaspoonful of flowers of sulphur should be placed on an old tin lid, ignited, and, one at a time, three or four wide-mouthed jars inverted over it. As each jar becomes filled with fumes it should be turned the right way up and immediately covered with a plate or lid. As the apples are cut into rings they should be dropped into the jars, the jars covered again and the rings left in the sulphur fumes from ten to fifteen minutes. The jars should be shaken so that all the surfaces of the rings are exposed to the fumes. The rings should then be removed and dried in the oven as above.

(2) *Pears.*—The two following methods can be used for drying pears. Pears, like apples, discolour quickly when peeled, but sulphuring is not advised as it is so apt to spoil the delicate flavour of the fruit.

(*a*) The fruit should be peeled and cut into quarters or eighths, cored, and the pieces placed immediately in a solution of salt and water (1 oz. salt to 1 gallon water) for about one minute. This helps to prevent discoloration. The fruit should be removed from the water, superfluous moisture shaken off, the fruit placed on trays and dried in the oven at a temperature of 110 deg. F., gradually

increasing to 150 deg. F. The time required for drying is from four to six hours.

(*b*) The fruit should be peeled and cut into quarters, cored, and placed immediately in a syrup made from two pounds of sugar and one gallon of water. The fruit should be stewed until it is tender, then the syrup drained off, the fruit placed on trays and dried in a cool oven at a temperature of not more than 110 deg. F., gradually rising to 150 deg. F.

(3) *Plums.*—Fleshy varieties such as Victoria, Belle de Louvain, and Pond's Seedling are suitable for drying. The fruit should be washed, if necessary, laid on muslin-covered trays and dried in an oven at a temperature of 120 deg. F. If the heat is too strong at first the skins burst and much of the goodness of the plum is lost. The temperature should be kept low until the skin begins to shrivel, and then it can be raised gradually to 150 deg. F., which temperature should be maintained until the drying process is finished. To test if a plum is sufficiently dry, it should be squeezed between the fingers very gently; if the skin does not break or exude juice, the drying process need not be continued and the fruit should be removed from the oven, left for twelve hours and then packed.

(4) *Small Fruits and Berries.*—These become unattractive in colour, do not gain their original size when soaked before cooking, and are generally unsuitable for drying.

Preparation of Dried Fruits for Use.—Failure to make dried fruits appetising is usually due to not soaking them long enough before cooking and to adding sugar too early in their preparation. Dried fruits require long soaking in plenty of water (24 to 48 hours). They should then be allowed to come to boiling point slowly in the water in which they were soaked, and boiled gently until the fruit is plump and tender. The sugar should be added a few minutes before the cooking process is completed.

Dried Vegetables.—Most vegetables can be preserved by drying, and large numbers were preserved in this way during the War. For such vegetables as carrots, turnips and other roots, drying in the home is not recommended as these vegetables can be stored in sand or clamps.

(1) *Runner Beans and Other Green Vegetables.*—All varieties of string beans can be dried. They should be young and absolutely fresh. The beans should be washed and strung carefully. The very young and tender beans can be dried whole, but those that are older should be cut diagonally into strips, a sharp knife being used or one of the numerous machines sold for the purpose. The prepared beans should be tied in a piece of muslin or cheese-cloth, or placed in a wire basket, and then the bag or basket put in a pan of boiling water from two to five minutes, according to the

age of the beans. If liked, ½ oz. bi-carbonate of soda can be added to each gallon of boiling water. This helps to improve the colour of green vegetables. The beans should be removed from the boiling water and spread on trays, placed in the oven at a temperature of 120 deg. F., increasing gradually to between 150 deg. and 160 deg. F. The beans should be dried until they are crisp, cooled for twelve hours and packed in tightly-corked bottles which should be protected from the light. For use, the beans should be soaked in cold water for twelve hours, then boiled in salted water until tender.

(2) *Peas.*—Generally speaking, with the exception of a few varieties, peas do not dry well. One variety which is quite satisfactory is Harrison's Glory. The method is the same as that for runner beans.

Dried Herbs.—The herbs used as seasoning are parsley, mint, sage, thyme, marjoram and winter savory. These, of course, can be used in the fresh condition, but it is useful in winter time to have a store of dried herbs.

The herbs should be gathered just when the young plants are about to flower, and, if possible, when they are dry and not exposed to strong sunshine. Small-leaved herbs such as thyme and winter savory should be washed, tied in bundles, protected from dust with a piece of muslin and hung up to dry near the kitchen fire. With the large-leaved herbs the leaves should be picked from the stalks, any shrivelled ones being discarded. The leaves should be tied in muslin and dipped into boiling water for one minute, removed, superfluous water shaken off, and placed in a cool oven at a temperature between 110 deg. and 130 deg. F. The leaves should be dried until they are quite crisp. If the drying process can be carried out continuously, it takes one hour, but if the leaves are placed on the rack above the stove, it takes from three to four hours. When dry the herbs should be crushed with a rolling-pin and sieved to a fine powder, which should be stored in bottles and protected from the light. Small-leaved herbs should also be crushed and sieved, and stored as above.

Parsley.—If parsley is placed in a very hot oven for one minute, it will be found that the colour is very much better than if it is dried by the slower method. Care to avoid scorching must be taken.

CHAPTER X.

THE PREPARATION OF CHUTNEYS AND PICKLES.

CHUTNEYS.

In chutney making there is scope for individual taste and ingenuity in combining different ingredients to give a distinctive flavour. Acid fruits, such as apples, gooseberries, plums, ripe tomatoes and green tomatoes are bases for chutney, and onions, garlic, raisins, dates, sugar, spices, are added according to taste, and the whole mixed with vinegar. The vinegar and the spices are the preserving agents. A good chutney, whatever the ingredients, should be smooth to the palate, and should have a mellow flavour. To obtain this result, it is necessary to cut up all the ingredients finely, and to cook them very slowly for two hours or longer. Long and slow cooking is essential. The addition of raw materials, such as chopped onion or garlic immediately before the chutney is bottled is not advisable, as they destroy the smooth texture and do not give such a good flavour as when cooked with the other ingredients. It is sometimes necessary to put certain ingredients through a sieve, and in that case a hair one should always be used, as metal sieves usually give an unpleasant metallic taste to the chutney. For this reason also, the use of brass, copper or iron pans during the preparation should be avoided; enamel-lined, monel metal or aluminium pans should be used.

In bottling chutney, the bottles should be clean, dry and hot. The chutney should be bottled hot, and the bottles immediately sealed. If they are to be sealed by means of bladder or parchment paper, however, the chutney should be allowed to cool down before sealing. If corks are used, they should be heated in hot water at about 170 deg. F., and then covered with a circle of greaseproof paper and placed in the bottle or jar. The seal may then be dipped in melted paraffin wax to make the cork airproof. If metal-capped jars are used, wax circles, such as are used for jam, should be inserted between the metal and the chutney.

Gooseberry Chutney Recipes.—

(1) 1½ lb. gooseberries
3 oz. stoned raisins
5 oz. sugar
4 oz. onions
½ oz. salt.
¼ oz. mixed spice
¼ oz. crushed mustard seed
⅛ pint vinegar

The onions should be chopped and cooked in a little water till tender, and the water drained off. The gooseberries should be topped, tailed and washed, placed in a pan and the cooked onions, raisins, crushed mustard seed, spice, salt and vinegar added. The chutney should be simmered for an hour or until it is of thick consistency.

(2) 3 lb. green gooseberries
¾ lb. stoned raisins
2 lb. brown sugar
2 tablesp. mustard seed
2 tablesp. ground ginger
2 tablesp. salt
½ teasp. cayenne
½ teasp. turmeric powder
3 onions
2 pints vinegar

The onions and raisins should be chopped, the gooseberries topped and tailed and the mustard seed crushed. All the ingredients should be put into a pan, brought to boiling point and simmered slowly for 1½ hours or until the ingredients are quite tender.

Apple Chutney Recipes.—

(1) 6 lb. apples
2 lb. onions
3 lb. brown sugar
½ lb. preserving ginger
¼ teasp. cayenne
2 heads garlic
Salt to taste
4 pints vinegar

The apples should be peeled, cored, and cut up into very small pieces and the onions sliced very finely. All the ingredients should be mixed with the vinegar in a preserving pan and boiled gently for 2½ hours or until the chutney becomes very thick.

(2) 7 lb. green apples
2 lb. sultanas
4 lb. brown sugar
1 lb. preserving ginger
1 teasp. cayenne
1 oz. garlic
1 teasp. spice
1 teasp. salt
1 quart vinegar

The apples should be peeled and sliced and boiled with the brown sugar until fairly thick. The chopped ginger, sultanas, garlic and spices should be added and boiled for twenty minutes. The vinegar should then be mixed in and simmered until the mixture has the requisite consistency.

(3) 4 lb. green apples
1 lb. raisins
½ lb. sugar
½ lb. preserved ginger
1 pint vinegar

The apples raisins and ginger should be chopped very finely ; the sugar and vinegar added, brought to boiling point and simmered till of thick consistency.

Plum Chutney.—

½ lb. stoned plums
4 oz. shallots or onions
4 oz. raisins
1½ oz. brown sugar
1 large apple
½ pint vinegar
¼ teasp. ginger
3 chopped chillies
¼ teasp. allspice
¼ oz. salt
Pinch of cayenne, ground clove mustard and nutmeg

The onions and apples should be chopped very finely and all ingredients placed in a saucepan, brought to the boil and simmered till tender.

Marrow and Apple Chutney.—

2 lb. marrow
½ lb. shallots
1 lb. green apples
½ lb. sugar
½ oz. bruised whole ginger, chillies and peppercorns
1½ pints vinegar

The marrow should be cut into small pieces and placed in a basin with salt between each layer, left for twelve hours, and then drained well. The marrow, apples, and onions should be chopped finely; the spices tied in muslin; and the ingredients, except vinegar, put in a saucepan and cooked until tender; the vinegar should then be added, and the chutney cooked until it reaches the consistency of jam.

Green Tomato Chutney Recipes.—

(1) 4 lb. green tomatoes
1 lb. apples
½ lb. stoned raisins
1 lb. *brown sugar*
½ oz. bruised ginger
12 red chillies
2 oz. garlic
1 lb. shallots
1 *pint vinegar*

The tomatoes should be sliced, the apples, shallots and raisins chopped, and all the ingredients placed in a pan, brought to the boil, and cooked until the chutney has the consistency desired.

(2) 5 lb. green tomatoes
3 lb. green apples
1 lb. moist sugar
1½ lb. chopped onions
1 saltsp. cayenne
½ teasp. cloves and peppercorns
¼ saltsp. cinnamon
1 quart vinegar

The tomatoes should be peeled and sliced, placed in a basin with salt between each layer, left for twelve hours and then drained. They should then be placed in a saucepan with the other ingredients, brought to the boil and simmered until quite tender.

(3) 1 lb. green tomatoes or apples
½ lb. onions
2 bananas
½ lb. raisins
¼ lb. preserved ginger
¼ oz. cayenne
1 oz. salt
¾ lb. brown sugar
1¼ pints vinegar

The tomatoes and bananas should be sliced, the onions, raisins and ginger chopped, and all ingredients placed in a pan, brought to the boil and simmered slowly until of a thick consistency.

Ripe Tomato Chutney.—

Spiced vinegar:
1 pint vinegar
¼ oz. cinnamon bark
¼ oz. whole allspice
¼ oz. Penang cloves (stalks only)
¼ oz. blades of mace
12 lb. tomatoes
1½ lb. sugar
1½ oz. salt
Pinch cayenne
¼ oz. paprika
2 fluid oz. Tarragon or Chili vinegar

The spices (tied in muslin) should be added to the vinegar, brought to the boil and allowed to infuse for two hours. The tomatoes should be blanched for one minute in boiling water, the skins and hard cores removed, cut up and simmered until a thick pulp is obtained. The other ingredients should be added and the strained spiced vinegar. The chutney should be cooked until it is of a very thick consistency.

Date Chutney.—

1 lb. stoned dates	½ oz. garlic
¼ lb. stoned raisins	¼ oz. salt
¼ lb. shallots or onions	6 red chillies
¼ lb. sugar	1 pint vinegar

The dates, raisins and onions should be chopped finely, put in a pan with the other ingredients, and boiled until tender.

PICKLES.

On a commercial scale cauliflowers, cucumbers and onions are held for long periods in brine, and a large proportion of the pickles purchased in the Stores are prepared from such brined vegetables. They are put down in large barrels or tanks and covered with a brine containing approximately 1 lb. of salt per gallon of water. The salt draws water and carbohydrates from the tissues of the vegetables and also toughens them somewhat. It also prevents the growth of many kinds of bacteria, but certain types which produce lactic acid can tolerate salt, and these organisms slowly ferment the carbohydrates. This is known as the curing process, and cured vegetables have a darker colour than the fresh ones. Cucumbers change from a bright green to a deep olive green colour, and the flesh becomes more transparent. Cured vegetables are seldom used until they have been brined from six to twelve months. In making pickles in the home this long brining is unnecessary. The vegetables are generally covered with salt or placed in a brine for only one or two days. The salt or brine withdraws some of the water from the vegetables and makes them more crisp.

General Method for Home Pickling.—In pickling, as in any other methods of preservation, it is important that the vegetables should be in a thoroughly fresh condition. After the preliminary preparations, such as removing outer leaves of cabbage or cauliflower and cutting the larger vegetables into suitable pieces, the vegetables should be either placed in a brine made from 1 lb. salt and 1 gallon water or sprinkled liberally with salt and left from 12 to 48 hours. If the vegetables are placed in brine they should be kept under the liquid as much as possible by weighing them down. If dry salt is used the vegetables should be placed in a large porcelain

basin in layers, with a good sprinkling of salt between each layer. The time necessary for soaking in brine is given in the recipes at the end of the Chapter. The vegetables should be removed from the brine and rinsed thoroughly in cold water to remove traces of salt. They should then be allowed to drain to remove as much water as possible and packed into clean jars to within one inch of the top. If any water has settled at the bottom of the jar during packing it should be drained off before the jars are filled with vinegar. Sufficient cold, spiced vinegar should be poured over the vegetables to cover them completely ; in fact there should be a layer of vinegar on top of the vegetables of at least ½-inch. During storage there is a certain amount of evaporation of the vinegar, and if the vegetables are not well covered with vinegar at the outset the vegetables at the top of the jar are left uncovered after some weeks and become very badly discoloured. When the vinegar has been poured over, the jars should be sealed as tightly as possible. If metal caps are used, care should be taken to see that the vinegar does not come into contact with the metal.

Vinegar.—The best vinegar should be used for pickling, and it should have an acetic acid content of about 5 per cent. White vinegar gives a better appearance to the pickles, but malt vinegar is preferable because it gives the pickles a better flavour. Spices are generally added to the vinegar before it is poured over the vegetables. To make spiced vinegar, the following ingredients should be added to each quart of vinegar :—

¼ oz. cinnamon bark.
¼ oz. cloves
¼ oz. mace
¼ oz. whole allspice
A few peppercorns or a pinch of cayenne pepper.

The spices tied in a muslin bag should be added to the vinegar and brought just to boiling point. It is important to have the lid on the saucepan during this process, otherwise much of the flavour is lost. The vinegar should then be removed from the stove and allowed to stand for two hours. The spice bag should be removed, and the vinegar is ready for use. There is a certain amount of controversy as to whether the vinegar should be used hot or cold, but experience has shown that cold vinegar gives the better result when pickling vegetables such as cabbage, onion, etc., which should be crisp when ready to eat, while hot vinegar proves better for the softer type of pickles such as walnuts, plums, etc.

RECIPES.

(1) **Pickled Cauliflower.**—Sound cauliflower should be selected and the outer leaves removed. The flowers should be broken into small pieces, washed thoroughly in salt and water, placed in a large

basin, and covered with brine made from 1 lb. salt to 1 gallon of water, and allowed to stand for 24 hours. They should then be rinsed in cold water, drained thoroughly, and placed in bottles or jars. The spiced vinegar should be poured over, and the bottles sealed with corks or tied down with a piece of bladder.

(2) **Pickled Onions.**—Small, even-sized onions should be selected and placed with their skins on in a brine made from 1 lb. salt to 1 gallon water. They should be left for twelve hours, and then peeled, laid in a fresh brine, and left for 24 or 36 hours. They should then be removed from the brine, washed thoroughly in cold water, and allowed to drain thoroughly. The onions should then be filled into jars or bottles, covered with cold spiced vinegar, and kept for three or four months before being used.

(3) **Pickled Red Cabbage.**—The cabbages should be firm and of a good colour. They should be washed and any discoloured outer leaves removed, and the cabbage cut into shreds. The shreds should be placed in a large basin, each layer being sprinkled with salt, left for 24 hours, the shreds allowed to drain thoroughly, and then packed into jars or bottles and covered with cold spiced vinegar.

(4) **Pickled Beetroot.**—The beets should be washed, care being taken not to break the skin. They should be placed in boiling salted water, and simmered gently for 1½ hours. When cold, they should be peeled and sliced into rounds ¼ inch thick, packed into bottles, and covered with cold spiced vinegar. They should not be used for at least a week.

(5) **Pickled Gherkins.**—The gherkins should be placed in a brine made from 1 lb. salt to one gallon of water, left for three days, drained well, and packed into jars. Hot spiced vinegar should then be poured over them, and they should be covered tightly and left for 24 hours in a warm place. The vinegar should be drained off, boiled up, and poured over the gherkins, which should be covered tightly, and left for another 24 hours, this process being repeated until the gherkins are a good green. After the final process, a little more vinegar should be added if necessary, and the jars corked and stored.

(6) **Pickled Vegetable Marrow.**—

2 lb. marrow (after peeling)
4 oz. sugar
¼ oz. ground ginger
¾ oz. mustard
¼ oz. curry powder
6 peppercorns
3 gills vinegar

The marrow should be cut up, sprinkled with salt, and allowed to stand overnight. The other ingredients should be added to the vinegar, boiled for five minutes, and then the marrow added and cooked until tender. The pickle should be packed into jars and sealed.

(7) **Pickled Green Tomatoes.**—

5 lb. green tomatoes
1 lb. small onions
1 lb. Demerara sugar
1 quart spiced vinegar

The tomatoes and onions should be sliced, sprinkled with salt, left overnight, and drained thoroughly. The sugar and vinegar should be boiled, the tomatoes and onions added and cooked until tender. They should then be put into jars and sealed.

(8) **Mixed Pickle.**—Cauliflowers, onions, cucumbers, and French beans may be put up as a mixed pickle. If small cucumbers can be obtained they are preferable. The vegetables should be cut into suitable sized pieces, salt sprinkled over them, and allowed to stand for 48 hours. They should then be washed, drained thoroughly, packed into bottles, the vegetables being arranged neatly, covered with spiced vinegar, and sealed.

(9) **Pickled Damsons or Pears.**—

7 lb. fruit
4 lb. sugar
3 pints vinegar
½ oz. whole cloves
½ oz. allspice
1 piece ginger root
1 stick cinnamon
The rind of half a lemon

Damsons should be washed and stalked; pears should be peeled, cored and cut into eighths or quarters according to the size of the pears. The sugar should be dissolved in the vinegar, the spices crushed, tied loosely in a muslin bag and added to the vinegar. The fruit should be simmered in the spiced, sweetened vinegar until quite tender. Then the liquid should be drained from the fruit, which should be packed neatly into jars. The vinegar should be boiled gently until slightly thick, and each jar filled with enough hot vinegar syrup to cover the fruit. The pickle should be tied down with bladder, or corked securely. It is better if it is kept some months before being used.

(10) **Pickled Walnuts.**—The walnuts should be used before the shells have begun to form. They should be tested by pricking them with a needle, and if any shell can be felt they should

be discarded. The nuts should be covered with a brine made of 1 lb. salt to 1 gallon water, and allowed to soak for six days ; then the brine should be changed and the nuts soaked for another 14 days. They should then be spread on dishes, and exposed to the air till they become black ; they will do so in about one day. For every quart of vinegar, 2 oz. of peppercorns, 3 blades mace, 2 oz. bruised ginger, and one scraped horse-radish, 3 oz. mustard seed and two cloves of garlic should be added, and all boiled up together for five minutes and strained through muslin. The walnuts should be put into jars, the vinegar poured over them and when cold covered closely, and put away for a month or longer, the jars being laid on their sides.

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