LIPPINCOTT'S HOME MANUALS

SUCCESSFUL CANNING AND PRESERVING

OLA POWELL

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O. POWELL

LIPPINCOTT'S HOME MANUALS

EDITED BY B. R. ANDREWS Ph.D.

LIPPINCOTT

Mabel Dodge Purdy
New Canaan
Connecticut

"Survey our empire and behold our home!"
—Byron.

LIPPINCOTT'S HOME MANUALS

EDITED BY

BENJAMIN R. ANDREWS, Ph.D.

ASSISTANT PROFESSOR OF HOUSEHOLD ECONOMICS, TEACHERS COLLEGE
COLUMBIA UNIVERSITY

SUCCESSFUL CANNING AND PRESERVING

PRACTICAL HAND BOOK FOR SCHOOLS, CLUBS, AND HOME USE

By OLA POWELL

U. S. DEPARTMENT OF AGRICULTURE, ASSISTANT IN HOME
DEMONSTRATION WORK IN STATES RELATIONS SERVICE

A B C D E

Preserves

A. Grape-fruit marmalade. B. Whole kumquat preserves. C. Preserved watermelon rind. D. Whole yellow tomatoes preserved. E. Strawberry preserves.

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4 COLORED PLATES, 164 ILLUSTRATIONS IN TEXT

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TO

YOU WHO ARE STRIVING TO "MAKE YOUR BEST BETTER" MY WORK IS SYMPATHETICALLY DEDICATED

PREFACE

THE canning and preserving of food products is an important factor in household management and of even greater importance in national economy, since the conservation of foodstuffs, from the time of production and natural time of consumption to a later time, makes for a more varied and adequate diet, and that secured at a lower economic cost. Practical success in canning, preserving, drying, and brining turns upon the proper application of the principles of science involved. The great necessity for scrupulous care in every step of the whole process is imperative. A worker who follows scientific principles and is watchful of sanitary conditions will have results that are uniform and satisfying. It is easy to talk of science in the abstract as applied to such problems, but unless one can show just how this science demands that the processes be conducted in order to secure success, such applied "science" is mere pretence.

Women and girls are now facing a most wonderful opportunity for service in aiding to produce and conserve foods not only for home consumption, but by increasing the commercial products for export to Europe. The responsibility of wisely utilizing the yield from greatly increased acreage rests in good part upon the women and girls. Their work can be simplified and made more effective by wisely applying scientific methods.

It is imperitive not only to produce and conserve supplies of food, but also to select the most economical means of keeping the various food products. In view of these facts, the suitability of canning in comparison with other means of keeping food must be considered. Since the public has been convinced of the convenience of handling and serving canned foods, canning has become the most widely used and popular means of preserving large quantities of fruits and vegetables. Some products could be stored and sometimes prepared more economically in the home if conserved by other means of preservation, such as drying, brining and storing.

Preserving foods by drying is a very desirable means and one which is especially important to practice when there exists a shortage of tin cans and when glass containers have advanced a great deal in price.

Vegetables, such as sweet corn, green string beans, peas, and fruits such as cherries, berries, peaches, and figs, can be dried, and in this state they will furnish variety and serve as a substitute for canned foods. If properly dried and stored many foods are attractive and wholesome. Such vegetables as cauliflower, cabbage, cucumbers, and chayotes are better saved in brine than canned. Many other vegetables may also be kept in brine. Legumes like peas and beans, root crops like carrots and beets, while attractive when canned in a succulent stage, are more nutritious and more economically stored when mature.

The use of various foods in the home should be planned in advance, so there will be no waste, at the same time having food for each meal economically combined and balanced so as to nourish each member of the family properly.

This book has been written to help rather than to shine, and if it does help, the author will be content.

Ola Powell.

July, 1917.

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Assistance is acknowledged from all of the commercial concerns which have so generously contributed illustrations and information. Thanks are also due and gratefully given to many others who have aided by advice, information, and encouragement.

To Miss Carrie Harrison, of the U. S. Department of Agriculture, is due the phrase used as the dedication, "To you who are striving to make your best better"—which expresses the sentiment to-day animating the tens of thousands of canning club girls, South and North and West, as it also expresses the perennial spirit of the American housewife.

OLA POWELL.

JULY, 1917.

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SUCCESSFUL CANNING AND PRESERVING

CHAPTER I

HISTORY OF THE DEVELOPMENT OF SCIENTIFIC CANNING

Most great industries have existed in some form for a long period of time, but the preservation of foodstuffs by canning is distinctly a modern art. Men turned their thoughts at a very early time to devising means of preventing foods from spoiling, but until the beginning of the nineteenth century the only methods employed to this end were drying, pickling, smoking, and preserving in sugar.

French Government First to Discover Method.—The wars of Napoleon were directly responsible for the discovery of the efficacy of the hermetic sealing of foods in order to keep them. Near the end of the eighteenth century a prize was offered by the French Government for the most practical method of preserving foods for sea service and military stores. M. Nicholas Appert, of Paris, was stimulated by this offer of a reward and began experimenting. He worked from 1795 until 1809, when he submitted to his government a treatise on the means of preserving foods. During this year he was awarded the prize of twelve thousand francs. In 1810 he published the results of his experiments.

Appert's Method.—His method was to enclose fruit, after heating it, in a glass bottle, which was then corked and subjected to action of boiling water. The bottle was placed in a water-bath and was heated very gradually for varying lengths of time, depending upon the character of the food. Appert did not know why foods kept when treated according to his method. He believed that air was the destructive agent and that its exclusion alone would preserve food which had been cooked. In his treatise he wrote: "Absolute privation of the contact of external air is necessary after the internal air is rendered of no effect by proper application of heat by means of a water-bath."

Past Experiences a Background for Work.—Appert's wide experience in life excellently equipped him to solve the problem to which he had applied himself so devotedly. He had for nearly fifty years been dealing with various lines of food preservation, working as a pickler, a preserver, an expert confectioner, a brewer, a distiller, and a chef. He continued his efforts, using many different products, and so perfected the art of canning in glass that it is difficult to surpass it even in these times with all our modern appliances. His simple utensils and process-room might provoke a smile to-day, for science had in his day not really determined why canned food kept; though his explanation has proved to be wrong, his methods, oddly enough, worked.

Investigations Made by Guy Lussac.—Conclusions drawn by Guy Lussac, an eminent French chemist, who was employed by his government to investigate this matter, coincided with what appeared to be the controlling factor in the practice of canning. He reported that spoiling of food was due to a series of oxidation changes, and that by excluding the air these changes could be prevented and the food saved. This theory was accepted, and the true explanation of the matter was not known until the advent of the new science of bacteriology. Since the principle of Appert's methods has been shown by time and experience to be correct, it is that on which all canning and preserving have since been done. He is regarded as the father of an art which has proved a boon to all mankind. The French Government has erected a monument to perpetuate his memory. His method was so simple that others began using it very soon, and before 1830 it was put into commercial practice. Appert used an open water-bath for heating his bottles, and this method is one in common use to-day in home canneries. This information on canning was desired primarily for military and naval stores, but the advantage of having food preserved in this manner attracted considerable attention to its use in the home.

Canning Begun in England.—In 1807 a paper was submitted by Mr. Sadding to the English Society of Arts, under the title "A Method of Preserving Fruits Without Sugar for House and Sea Stores." It is believed that this knowledge of the general principles was obtained from Appert while Sadding was travelling in France. About the same time Peter Durrand obtained a patent in England for preserving meat, fruit, and vegetables in tin cans.

DEVELOPMENT OF THE TIN CONTAINER

The canning industry from this time on depended a great deal on the can; in fact, it took its name "canning" from it. The apparatus for manufacturing tin cans was at first very crude. The bodies were cut with shears and the side seams made with a plumb joint and then soldered together. A weight was pulled up to the ceiling and allowed to drop upon a sheet of tin in order to cut tops and bottoms of the cans. The die was cast on the under side of the weight, and the opposite die was cast in a piece of metal below. The forming of these pieces depended on the weight being properly guided, therefore the process was slow and difficult. Heads or caps were made to set into the body and were soldered in place by hand in a very primitive

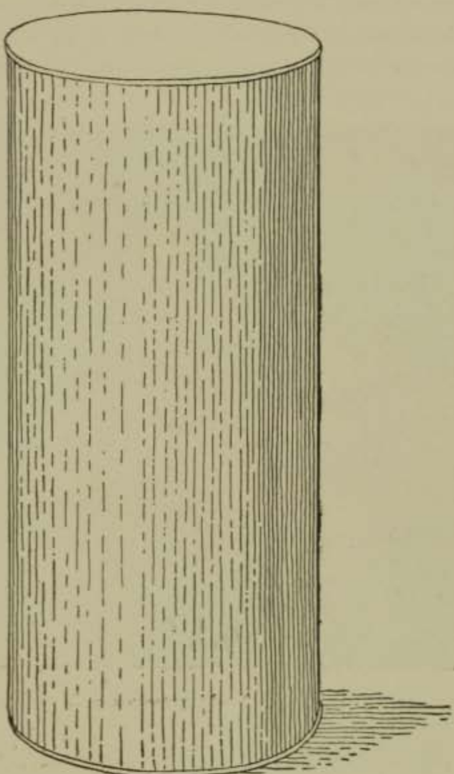

Fig. 1.—Type of can used about 1889.

way. Necessity has never more truly proved its title, "The Mother of Invention," than in the canning line (Fig. 1). These cans were about the size of a No. 2 can, except that they were taller. From the crude homemade experimental apparatus there have been developed for the purpose of the canner all sorts of machinery and appliances. Now all parts of the can are made by labor-saving machinery and put together by machinery. This method reduces their cost enormously (Fig. 2). Commercial

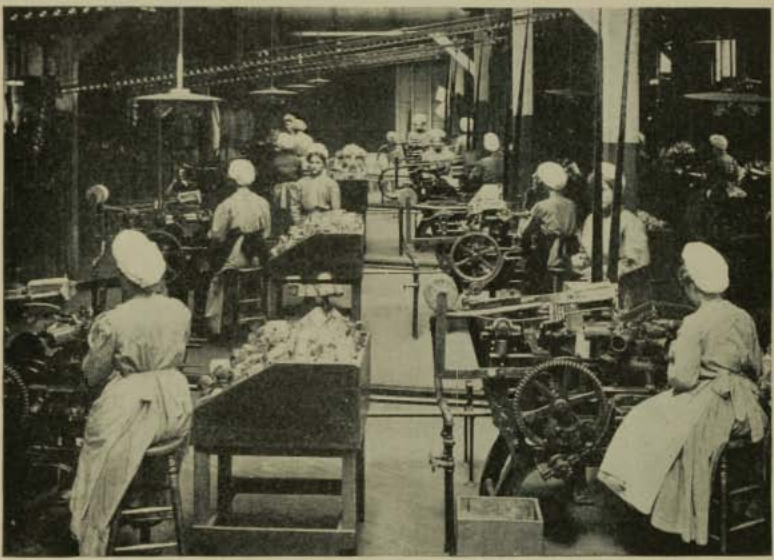

FIG. 2.—Manufacturing tin cans to-day. (Heinz Co.)

houses abandoned glass in favor of tin cans because they would withstand extremes of temperature and the initial cost was less. The transportation both ways on the tin can was less costly and the loss from breakage was eliminated. Tin is probably the container used almost universally by canners now, although glass is popular in the more exclusive canning and preserving kitchens where very choice special products are put up into fancy packs.

The Real Cause of Putrefaction.—During the time of Tyndall and Pasteur, 1822 to 1895, the real cause of putrefaction was determined to be living microörganisms which come in contact with the material which "spoils." To these men belongs the honor of discovering the fundamental principles involved. Nowadays it is understood that the mere presence or absence of air in a can is a matter of no importance in itself. Air plays no important part in putrefaction save as a carrier of living things, which are commonly and popularly spoken of as germs, microbes, microörganisms, or bacteria. All of these terms are used somewhat indiscriminately and all mean practically the same thing.

DEVELOPMENT OF COMMERCIAL CANNING IN AMERICA

The canning industry was established in the United States by Ezra Daggett, in 1819. He had learned the trade before emigrating to this country, and packed salmon, lobsters, and oysters in New York. The records show that William Underwood packed preserves and table condiments in glass as early as 1821, in Boston, and in 1835 he packed tomatoes in glass. The records also show that William Underwood shipped his goods to South America in 1821. In 1837 Isaac Winslow began experimenting with the canning of corn in Portland, Maine. There is probably no earlier record of canning in tin in this country than the work of Isaac Winslow. Corn was first canned on the cob. This proved unsatisfactory on account of the bulk, and it was thought the cob absorbed some of the sweetness from the kernels. Maine was the home of the corn canning, and is still so considered. The first cannery in Baltimore was opened about 1840. The canning of corn, tomatoes, and fruits was started in Cincinnati, Ohio, about 1860. The growth of the industry was very rapid. New canneries sprang up like mushrooms in various parts of the country, and unskilled men vied with the older packers in the quantity put out. This rapid growth resulted in the formation of Canners' Associations, the development of which led to new and better methods of work.

The question of preservation of food is one of the most interesting and important in the whole field of applied science. H. L. Russell, of the University of Wisconsin, was the first man in this country to apply the science of bacteriology to canning, in 1895, and in 1896, Prof. S. C. Prescott, of the Massachusetts Institute of Technology, and W. L. Underwood, of Boston, began investigations regarding the bacteriological technique of canning. Until this time the commercial art of canning was a mixed lot of theory hedged about by mystery.

Theory of Canning Not Understood.—Factories were jealously guarded. It was almost impossible for an outsider to gain admission. The canner really knew so little about the science that he felt compelled to guard carefully his ignorance. He tried to throw a glamour of secrecy over nearly every movement simply through caution to protect what little good information he possessed regarding the process of canning. The uncertainty and the possibilities that losses might occur were a constant source of worry and uneasiness to a great many who were engaged in the canning business. The general public had a very vague knowledge in regard to bacteria. Most people associated them only with disease. Canners were loath to have the subject of canning connected with germs, because they believed this would frighten people, who would then not wish to eat any more canned goods. If a season came in which bacteria seemed unusually prevalent, the canners considered it most mysterious and attributed it to the "strange season." Since science has brought to us the knowledge of microörganisms the lines of attack have become more clearly marked, and with the modern weapons to combat the foe we can fight the war against bacteria with safety and assurance of success. The principal weapon of defence against bacterial action is the practice of most scrupulous cleanliness; just as modern surgery depends upon absolute cleanliness. Like most other manufacturing industries carried on by enterprising men, the process of canning has undergone complete change as the scientific principles involved have come to be understood and to be given a controlling power over the practical processes involved.

Location of Industry (Figs. 3 and 4).—Large quantities of vegetables, meat, and fish are preserved along the Atlantic Coast; much of the salmon supply is canned in Oregon and Washington; meats are put up largely in Chicago and Kansas City, and fruits and vegetables of the highest grade are packed in California, Hawaii, and New York. Maryland and New Jersey rank very high in the production of canned tomatoes. Maine and Illinois lead in corn canning. The development in the canning industry in the ten-year period is shown in the accompanying charts and is largely due to improved machinery.

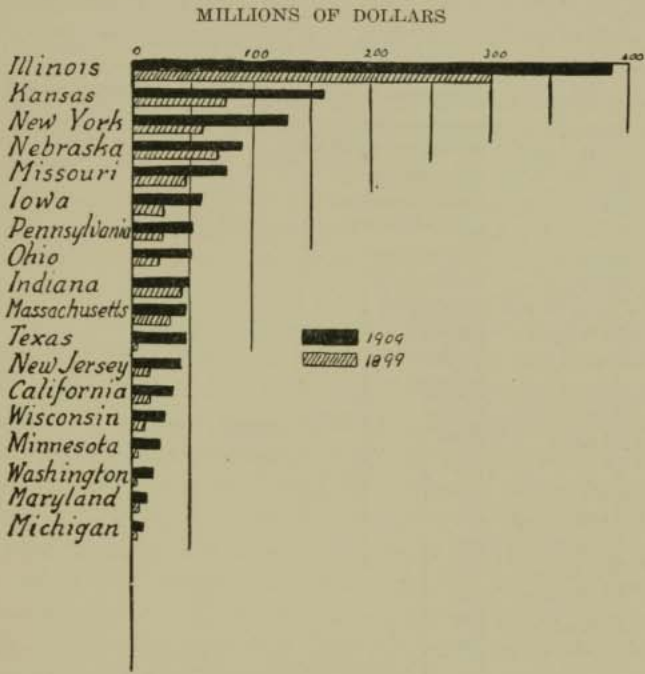

FIG. 3.—Chart showing comparison of value of meat products by states in 1899 and 1909. (Thirteenth Census of U.S., Vol. VIII, 1910.)

A striking illustration of growth in the canning industry is the rapid development of the pineapple canning in the Hawaiian Islands indicated by the following table:

1901	2,000 cases
1908	410,000 cases
1913	1,667,000 cases

This volume of business is the combined output of ten separate companies. These results show the quick appreciation of a really good product by the consuming public. In the first canning large quantities of juice were lost when the prime ripe fruit was sliced. Recently it has been discovered that the juice contains seven per cent of sugar and can be concentrated and used for syrup in canning pineapple, thus saving the purchase of large quantities of sugar.

Better Equipment Invented.—When corn canning was first begun, the corn was cut from the cob with a common case-knife;

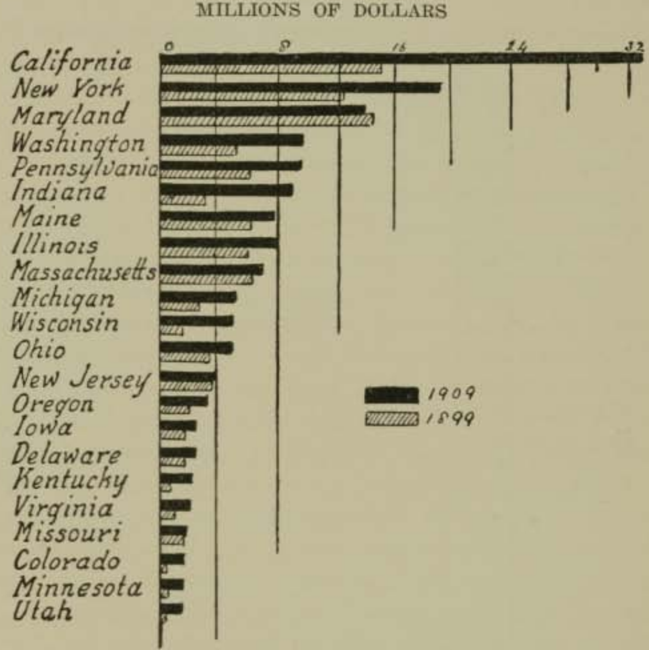

FIG. 4.—A chart showing comparison of value of canned and preserved products by states in 1899 and 1909. (Thirteenth Census of U. S., Vol. VIII, 1910.)

then came the use of a curved form shaped to the ear. At this stage of development "cutters" were the most numerous body of workmen about the factory. For instance, in 1869, 800 hands were employed in a factory: 375 were cutters and about 100 huskers. Machines run by hand came in about 1875. Power machines came into use about 1886. Much improvement has been made on all machinery since that date. In canning corn, for example, among the most important machinery are those which husk the corn, take off the silk, cut kernels from the cob, fill the cans, seal the cans, put on labels, etc. Different machines are made to fit into the work of other machines so the various processes of handling one product will be continuous. These machines are now perfected in all details and are operated automatically. The capacity is immense for carrying products through the different departments in a very short time.

Processing Methods (Fig. 5).—In the early days of this industry the open-kettle method was used. The highest obtainable temperature was 212° Fahrenheit, the temperature of boiling water. It was soon realized that a higher temperature would kill more "germs" and insure more successful results in a shorter length of time. A little later a higher degree of temperature was secured by the addition of common salt to the water-bath. Following this another method of obtaining a higher degree of heat came into favor. It was found that by adding chloride of calcium to water the specific gravity of water was increased and a temperature of 240° Fahrenheit was obtainable without ebullition. The advantage claimed for this method was that it was fuel-saving and labor-saving. Under this process, however, the cans became discolored and considerable expense was incurred in cleaning them. With the coming of the "steam-jacketed" copper kettles and the "closed-process" kettle these previously described methods of sterilizing were abandoned, except for the plain water-bath, which is still in use. The steam-jacketed kettle is one in which a kettle is surrounded by a metallic chamber like the common double-boiler kettle, except that the outer chamber is air-tight and superheated steam is piped into it from a boiler, thus raising the temperature of the cooking kettle considerably above 212°. Such steam-jacketed kettles are commonly used in large-quantity cookery, as in hotel kitchens and industries like dyeing and soap making, as well as in canning. The closed-process kettle is simply a kettle for boiling which can itself be closed tightly so as to prevent all escape of steam; the heat which ordinarily escapes from the water as the steam arises is thus kept within the water and in the superheated body of steam in the closed chamber above it, and so the temperature rises above 212° With the introduction of steam retorts in 1897 the time for sterilizing was shortened. Next came the present style of kettle and dry steam.

Latest Processor.—The agitating cooker is perhaps the latest development. Bulky starch products are poor conductors of heat, and it requires a long time for the heat to penetrate to the center of the contents. The time for processing can be greatly reduced by causing the cans to roll over and over in such a man-

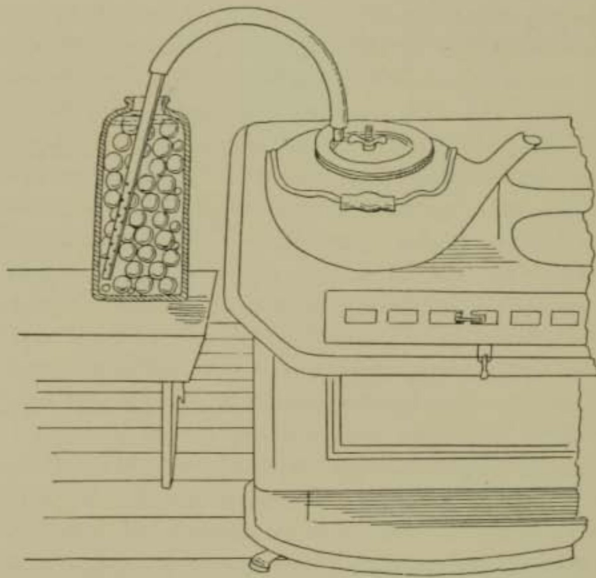

Fig. 5.—A processing device for home canning proposed in 1889.

ner that the liquid present within each can will be carried more quickly through the mass and the contents will be gently moved to the inside surface of the can, where they become heated more rapidly. It is necessary that this agitation be slow and even.

Other Labor-saving Devices.—There are machines for almost every step of the handling of different fruits and vegetables for canning; conveyors, sheet-iron tunnels where jets of water are constantly running to wash the product, sorters, peelers, slicers, fillers, and cappers; these and many other machines are available, and all are labor-saving and space-saving as well. The result of this application of machines and power is that a great quantity of products can be handled in a very short time.

Greater Demand for Canned Foods.—In 1890 there were about one thousand establishments engaged in this industry and the value of the output was a little less than $45,000,000. In 1916 the output for domestic consumption was thirteen times this amount. The consumption of canned products has increased yearly, largely because the prices have been reduced as the commercial process has been perfected, thus coming within reach of a larger number of people. It has been said that in 1857 a quart of tomatoes sold for 50 cents and a quart of peaches for $1. Nathan Winslow sold to Samuel S. Pierce, of Boston, one dozen canisters of preserved corn for $4 in February, 1848. The public has been informed through reports and investigations and through the advertising world that the conditions under which reliable concerns work are sanitary and that canned food products are as desirable in their place as are fresh foods; the more the public becomes aware of these facts the greater is the demand for this class of food. Reduced prices and a buying public educated to the real value of canned foods explain the greater demand for them.

Consumption and Estimated Value of Canned Foods in 1916.—A report which was given at the annual meeting of the National Canners' Association in Louisville, Ky., in February, 1916, will be of interest here to show, to some extent, the use of canned food in the United States. Three billion cans of food are retailed yearly at about $600,000,000. The consumption of corn is estimated to be 100,000,000 cans annually; of peas, 200,000,000, and of tomatoes, 350,000,000. New York City spends yearly at retail over $64,000,000 for milk, $45,000,000 for bread, $45,000,000 for eggs, and for canned goods over $150,000,000—almost as much as for milk, bread, and eggs combined. In 1916 the report of the Canning Club girls and Home Demonstration Clubs in the South showed 3,318,481 containers put up for home use and for the market. In the North and West 7903 Canning Club members put up 201,306 containers in 1916. This is, of course, only a very small percentage of the full amount of such products put up in the homes of the country. The economic significance of the use of canned foods has grown to such proportions that it cannot be ignored by the housewife or by the nation.

It is important to have vegetables and fruits in the diet, but it is impossible to have them fresh at all seasons, especially with the difficulty of distribution and transportation of foods in thickly populated areas. The problem of extending the supplies from season to season must necessarily be met by preservation of foods. The composition and their importance in the diet place them among staple foods rather than as accessories in the diet. A judicious amount of fruits, vegetables, meats, and whole cereals mingled with the canned products will doubtless furnish the necessary supply of "vitamins," growth-promoting substances, which recent investigations indicate are essential to good health.

United States Government Publication.—The United States Government has many persons employed to work out some of the problems that perplex the preservers of food. These people have been studying for years and experimenting along these lines. Bulletins have been printed on the subject which can be secured free, or at a very small cost. Many housekeepers are now eagerly seeking this information. Laws also have been passed to attempt to regulate the methods of preparation of canned foods. People have gradually acquainted themselves with the ways in which bacteria work for our good or ill, and it is no longer necessary to whisper when discussing their effect on canned goods. It is known that useful "germs" greatly outnumber the harmful ones. Since we could not exist without the action of bacteria, we must regard them as our friends rather than our foes, even though there are a few species which might do us injury.

QUESTIONS

1. What proof can you give that canned goods hold to-day a large place in the food supply of our large cities as well as in portions of the country remote from the centers of population?
2. Why is it impossible to collect statistics of the value of the foods canned annually in the United States?

3. Why is the study of the canning of foods a legitimate work for the United States Government?
4. What large classes in the community may be helped by the knowledge of canning disseminated by the government?
5. What forces have made possible the extensive use of canned foods?
6. What has determined the locations of the canneries?
7. State chronologically the different processing methods used, giving a brief explanation of each.
8. What is the principle to which each process conforms?
9. To what science are we indebted for the explanation of the results obtained in canning?
10. What is the meaning of putrefaction? What is its cause?
11. To whom are we indebted for the explanation of putrefaction? To whom indebted for the application of scientific explanations to canning?
12. To whom are we indebted for the discovery of canning? What historical events led to this discovery? Give approximate date.

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CHAPTER II

BACTERIOLOGY AS APPLIED TO CANNING

SCIENTISTS have established beyond a doubt that the decomposition of food is due to the presence of living organisms which cause fermentation and putrefaction. These organisms are molds, yeasts, and bacteria and belong to the lowest order of plants. The presence of all or any of these types of germs on food is the principal cause of its spoiling. Similar microörganisms exist in teeming millions and are present everywhere. They are in the water we drink, in the soil, floating about in the air we breathe, and on all objects. All of these except mold are so minute as to be invisible without the aid of a microscope. Molds, yeasts, and bacteria differ from the plants with which we are more familiar in that they are unable to manufacture their own food out of the air and the soil as the green plants do. These types contain no chlorophyll or green coloring matter, and must therefore get their food from substances already built up by higher plants or animals. These colorless plants are generally grouped by botanists under the division " fungi," though the bacteria are strictly separated from the yeasts and molds. Both the chlorophyll-bearing and the colorless plants embrace those that are parasites and others that are saprophytes. The parasites live upon live animals and plants; the saprophytes live upon dead animals and plants, and it is this class, therefore, which concerns us in canning.

Some people do canning and preserving of foods successfully with little knowledge of these germs, but to know something about these minute forms of life, which are so abundant everywhere, will make the work more interesting. When it is understood why foods keep, uniform results may be more easily obtained.

Molds.—The molds, unlike yeasts and bacteria, are visible to

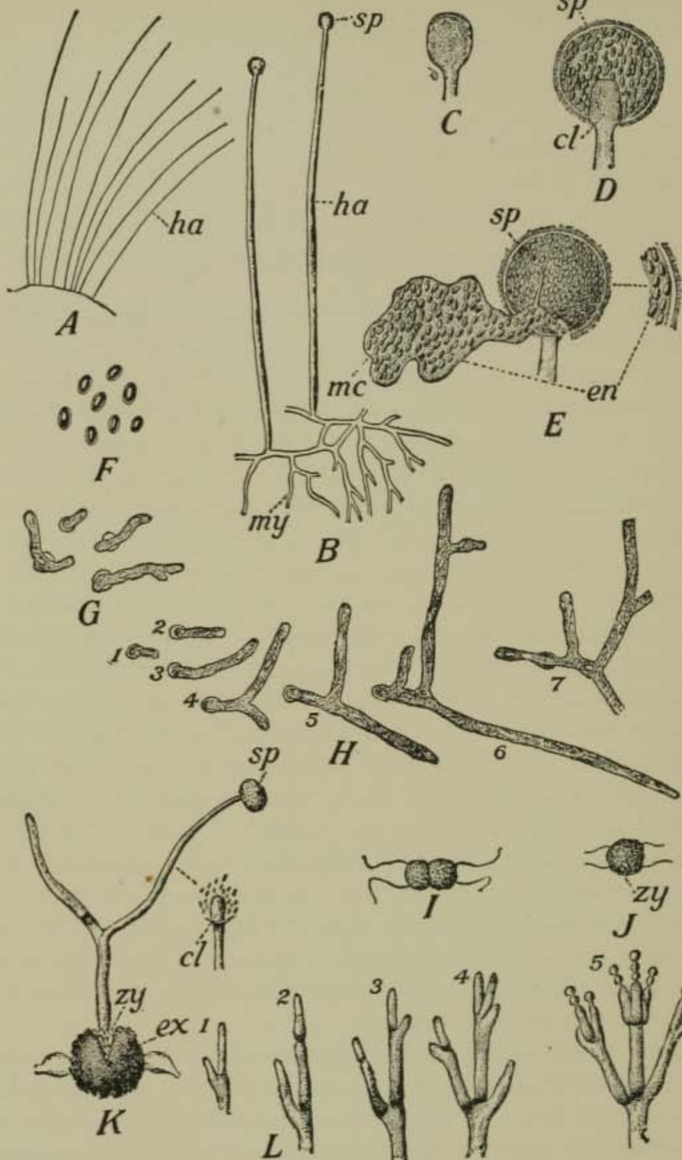

FIG. 6.—Parasitic organisms. In the following figures *ha* denotes aerial hyphæ; *sp.* sporangium; *zy*, zygospore; *ex*, exosporium; *my*, mycelium; *mc*, mucilage; *cl*, columella; *en*, endogonidia.

FIG. A. Spore-bearing hyphæ of *Mucor*, growing from horse-dung. FIG. B. The same, teased out with needles (A, 4). FIGS. C, D, E. Successive stages in the development of the sporangium. FIG. F. Isolated spores of *Mucor*. FIG. G. Germinating spores of the same mold. FIG. H. Successive stages in the germination of a single spore. FIGS. I, J, K. Successive phases in the conjugative process of Mucor. FIG. L. Successive stages observed during ten hours in the growth of a conidiophore of *Penicillium* in an object-glass culture (D,4).

the naked eye. They are considered first because most housekeepers and students in home economics are familiar with them in their growing stage. Molds require oxygen, considerable moisture and heat, and use sugar and starches as food; moreover, they can grow in the presence of acids. They thrive in damp, dark places where there is little or no circulation of air. Because they have the ability to grow in acids molds readily attack fruits and tomatoes. At first in general appearance molds are gray, soft, and fluffy; later they show colors, as blue, green, brown, black, or yellow. The color appears when the molds are reproducing. Under a microscope the minute, thread-like mass of mold found upon jelly or bread shows a mycelium or root-like structure extending into the food upon which it grows. The upward-growing branches bear special spore organs which contain thousands of seed-like spores. The spores drop from the mold plant and float unseen to other places. They grow with great rapidity. The kinds reproducing yellow and green spores are sometimes found on jellies, preserves, and dry meats. They are first green and then yellow. Brown mold is found in putrefaction of fruit. Certain types of food materials, particularly the fruits, are most apt to be attacked by molds such as Penicillium and Aspergillus (Figs. 7 and 9). These molds do not develop unless there is oxygen present. These mold spores being abundant in the air, it is impossible to leave food exposed without having a number of living spores fall upon it. If fruit is opened, partly used, and the jar is simply covered again, the fruit will soon mold, due to the mold spores which enter while it is open. If this fruit is to be kept it should be reheated and sealed to exclude the air. Usually the mold is confined to the surface, but the decomposition products of its growth frequently penetrate and flavor the whole mass. At one time it was believed by some housekeepers that a thick layer of mold on the top of crocks and jars containing jams and preserves was a good indication of its keeping, because this layer of mold excluded the air from the contents in the lower part of the container. When these jars were opened it was necessary to throw away several inches of the food which was next to the mold and sometimes nearly half of it. As the food stood with this heavy layer of mold the odors and flavor permeated the balance of the contents of the jar, and the product when served was not so palatable and wholesome as it would have been had it been sealed air-tight and processed when first put up (Fig. 8). In addition, all waste of food is thus avoided.

Molds are easily killed by moist heat. A temperature of 160° to 180° Fahrenheit will be sufficient to kill all mold. When food

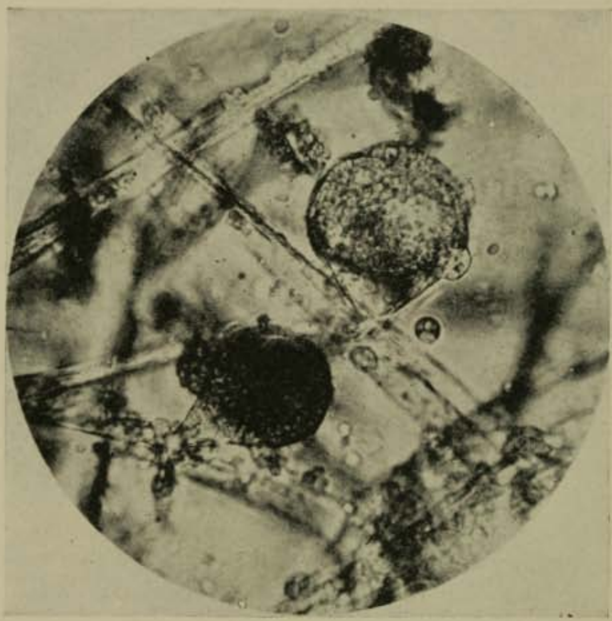

FIG. 7.—*Aspergillus fumigatus* (appears on tomato sauces and preserves).

is sterilized, packed into jars or cans, and sealed immediately to protect it, mold will not appear so long as the containers remain air-tight. If the top of jelly is wiped off with alcohol this will kill some of the spores. Sometimes a circular disc of paper which has been dipped into alcohol is placed over the jelly before the cap is placed on the glass. Often a thin layer of melted paraffin is poured over the top of the jelly. Either method will kill any mold spores which might have fallen on the jelly while it was open and cooling. Immediately after so treating the jelly it should be covered to exclude the air (Figs. 6 and 9).

Yeast.—The yeast plants are not difficult to control in canning. Yeasts are the natural agents which produce fermentation. As this word is commonly used it refers to the process by

FIG. 8.—Bacillus found on tomatoes, showing flagellæ, thread-like appendages.

which alcoholic liquors are produced from sugar solutions. Fermentation is the basis of producing stimulating beverages. Methods of raising yeast bread are also examples of fermentation. It is always the sugars present in these substances which undergo the fermentation.

Yeasts are one-celled plants. They reproduce by budding; that is, by the growth of a bud on the side of the cell. This bud becomes fully developed very quickly and separates itself from the mother-cell, and after attaining the adult stage begins to reproduce itself in a similar manner. Yeasts, under adverse conditions, sometimes reproduce by forming spores within the cells. The cell bursts and the wind carries the spores everywhere. The use of yeast in bread making is familiar. When given food (in form of sugar), warmth, moisture, and air, yeasts grow, breaking up the sugar and producing a gas, called carbon dioxide, and alcohol. Bubbles of this gas may be seen when a can of fruit fer-

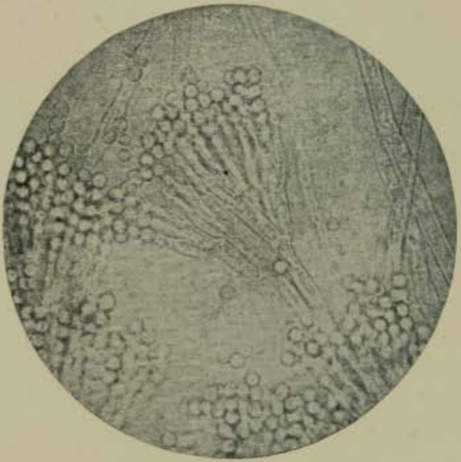

FIG. 9.—*Penicillium glaucum* (a common mold) (× 500). (Frenkel and Pfeiffer.)

ments. Since yeasts are abundant in the air and on the skins of fruits and vegetables, it is always necessary both to destroy them on the food being canned and to prevent their further entrance into the sterilized foods by sealing the containers airtight. Yeasts are easily killed by moist heat at a temperature of 160° to 190° Fahrenheit. Occasionally spores, which are more resistant than active plants, may be present. The organisms described above are not difficult to control (Fig. 10).

Bacteria.—Bacteria are the most serious foes to combat in canning because they are more difficult to kill by heat than either molds or yeasts. They are present everywhere in enormous numbers. They are also unicellular plants, but are smaller than yeasts. A young bacterium cell attains full size and acquires the capacity to reproduce itself much more rapidly than any other form of life. So rapid is their reproduction that a single bacterium may produce millions more in a few hours. The rapidly multiplying bacteria often form more or less colorless viscous masses or a thin scum floating on the liquid in which they are growing. Similar masses form the green scum sometimes seen on stagnant water, due to the growth of a microscopic plant, the Spirogyra.

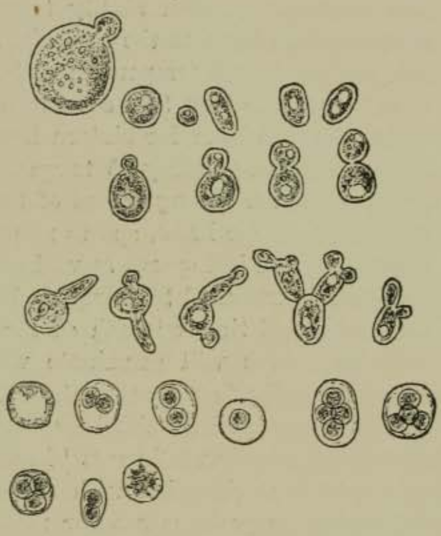

FIG. 10.—Various stages in the development of brewer's yeast, seen, with the exception of the first in the series, with an ordinary high power (Zeiss, D. 4) of the microscope. The first is greatly magnified (Gundlach's 1-16 immersion lens). The second series of four represents stages in the division of a single cell; and the third series a branching colony. Everywhere the light-areas indicate vacuoles.

Bacteria require for their growth warmth, moisture, and food. Many kinds of bacteria prefer protein food. Food for bacteria is not necessarily of a highly complicated nature. Many species will find the right conditions for nourishment and growth if a small amount of protein and some water are present. Since few bacteria thrive in acids or in the presence of much sugar, their destruction is less difficult in fruits and tomatoes than in vegetables such as corn, peas, and beans, or in meats, which are the most difficult of all foods to can safely in the home.

Bacteria in the growing state can be killed by subjecting them to moist heat at boiling temperature for variable lengths of time. Moist heat is far more effective than dry heat. Many kinds of bacteria have the power under adverse conditions of producing spores which are much more resistant than the vegetative or actively reproducing form in which the bacteria ordinarily are found. Bacteria produce spores for the purpose of meeting unfavorable conditions, and in this resting stage the living matter may lie dormant for a long time, as it were, awaiting favorable conditions under which the vegetative rapid reproduction form can be resumed. These spores may be compared to the seeds of higher plants in their ability to withstand unfavorable conditions. While most of the bacteria which do not produce spores can be killed at a temperature of 140° to 180° Fahrenheit, it is a well-known fact that some spores are able to resist heat at boiling temperature for sixteen hours or more. Many bacteria show great adaptability to temperature conditions. Drying or dehydration for a long period of time will kill many organisms, but, on the other hand, spores may withstand drying for years. Sterilization to kill spores as well as the ordinary bacteria forms may be accomplished by applying boiling temperature for a certain length of time on each of three successive days. Certain resistant spores will germinate within twelve to twenty-four hours after the first treatment; but heating on the second day will kill these; and the third treatment is a safeguard which will destroy all remaining "germs" in most cases. This intermittent or repeated sterilization with a constant temperature of 212° Fahrenheit is perhaps a safer method and will assure success more often than a single period of sterilization at the same temperature for a longer length of time.

Almost all the bacteria which are so resistant to heat when in the spore state are abundant in cultivated soil and therefore present in pods, husks, and different parts of such vegetables as corn, peas, and beans, which contain food upon which the spore-bearing forms thrive. The presence of these bacteria upon the parts of vegetables to be canned is therefore almost inevitable. The difficulty of sterilization is increasingly great when such vegetables have been bruised, allowed to stand, or have in them decayed portions. When fruit skin is broken, molds fall to work and open the way for bacteria to enter and start the decay. If the juices of these plants become infected with spores of these various species, the problem of sterilization is more difficult.

All bacteria in the spore state can also be destroyed by subjecting them to a temperature of 240° to 250° Fahrenheit, moist heat, but special apparatus, as the steam-pressure canner, is necessary to produce such temperatures. For this reason the method known as intermittent sterilization finds wide use among housekeepers and Canning Club members who do not possess steam-pressure canners. This method of fractional sterilization consists of applying boiling temperature to vegetables, already packed in glass or tin, for a certain period on each of three successive days, sealing the jar immediately after each boiling or "processing" if the lid has been loosened to take care of the expansion caused by the heat. Between each daily processing the containers are kept at ordinary temperatures, under which the spores not killed by boiling develop into the more easily killed vegetative or growing state, which are then destroyed by the next period of boiling. If spores are present in the jars or cans, rarely do they fail to thus develop and be destroyed by the third processing (Fig. 11). For peas and corn, properly selected and handled carefully, processing for one hour in a water-bath at boiling on the first day, and repeated on the second and third days, will ordinarily sterilize these foods in quart jars or No. 2 cans. The flavor of such vegetables thus processed is considered by many to be finer than when the vegetables are subjected to very high temperatures, as in the steam-pressure cookers. Treatment for one hour on three successive days is perhaps the safest method to follow with hot-water canners, when canning such vegetables as sweet potatoes, peas, corn, beans, etc. It is dangerous to use minimum periods of processing, because during some seasons there are occasional "outbreaks" where fields are infected with an unusual type or a larger number of bacteria than ordinarily exist. Some fertilizers cause the fibers of plants to toughen, and it is more difficult for heat to penetrate them, therefore a longer sterilization period is required. Every precaution should be taken to counteract the influence of such danger by cleanliness, careful handling, and rapid working from one stage to another during the entire process of canning.

Enzymes.—In addition to the action of "germs" or minute organisms, the spoiling of fruits and vegetables is hastened by natural changes, which result from the action of enzymes or unorganized fermenting agents found in nature (the pepsin of the stomach is an illustration) which, while not cellular organism like bacteria, do break down and decompose foodstuffs. These changes

FIG. 11.—*Bacillus butyricus* (rods and spores found in corn).

take place with varying rapidity in different foods and injure the quality of the food. The delicate flavors of many fruits are thus destroyed when they are allowed to stand too long, and become stale before being canned. This is an important reason why all fruits and vegetables should be canned as quickly as possible after being gathered. The canner need not pay great attention to enzymes, because they are killed as soon as heated.

Classes of Bacteria.—A classification of bacteria in reference to their need of oxygen is especially helpful to the canner; from this point of view, bacteria are of three classes:

1. Aërobic—require free oxygen.
2. Anaërobic—can live without free oxygen (Fig. 12).

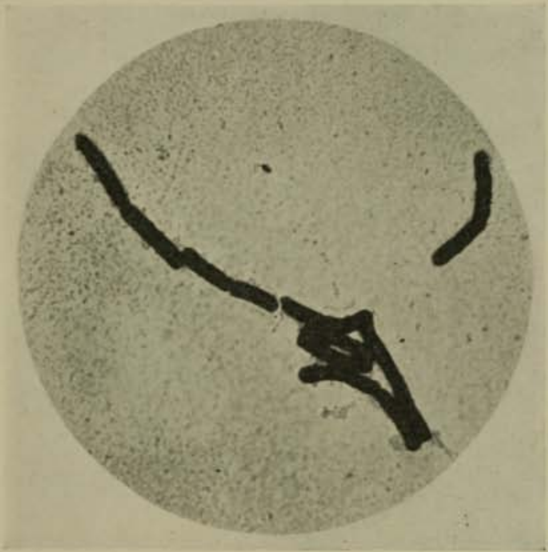

Fig. 12.—Anaërobic pea bacillus.

3. Facultative (Aërobic, anaërobic)—can live with or without free oxygen.

Aërobic bacteria obtain the oxygen necessary for the process of multiplication from the air, and if the air is cut off they either remain dormant or die. Anaërobic bacteria obtain their supply of oxygen from organic compounds such as carbohydrates and proteins. This class sometimes causes more violent fermentation when forced to grow in the absence of free oxygen than when growing naturally; being deprived of free oxygen, the tearing down of organic compounds is accomplished with great rapidity to supply the required oxygen, while the multiplication is lessened. This fact accounts for the rapid spoilage of goods which have been improperly sterilized. The anaërobic bacteria bring about decomposition with the evolution of a large amount of gas (Fig. 13). This gas may accumulate in quantities sufficient to bulge and even to break the container in which it is sealed (Fig.

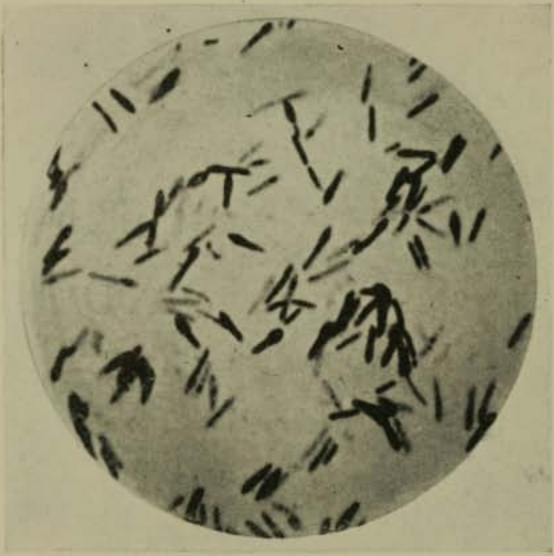

FIG. 13.—*Bacillus megatherium* (the vegetating forms as found in a can of peas).

14). When products in tin bulge from the presence of gas inside they are known as "swells." Some bacteria have been described which bring about decomposition in vegetables and meat without evolution of gas. They give evidence of their presence by the development of peculiar odors and flavors. These are known as "flat sours."

A large percentage of losses in canned goods is due to the facultative anaërobes. The anaërobic bacteria, however, cause spoilage in many cases where others are destroyed because the anaërobic belong to the soil and are spore-bearing and have the power to withstand very high temperatures and afterwards develop. Most all of the anaërobes are known as bacilli; that is, they are rod-shaped.

Facultative aërobic or facultative anaërobic bacteria belong to a class which accommodate themselves to whatever condition in which they may be placed:

Facultative aërobes are anaërobic by nature, but will grow in an aërobic state; that is, in air.

Facultative anaërobes are aërobic by nature, but will grow in an anaërobic state; that is, where air is excluded.

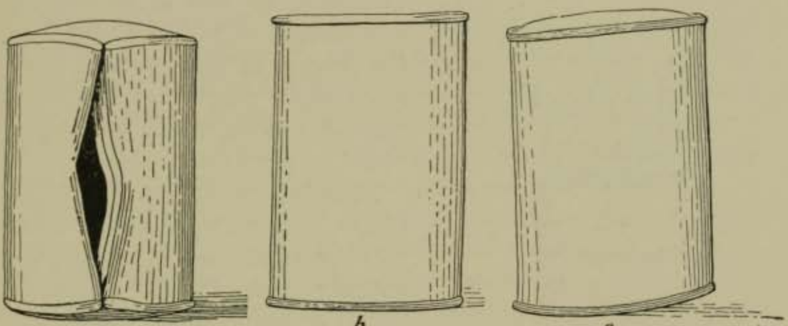

FIG. 14.—(a) Can bursted from pressure of gas generated: (b) a normal can, (c) a swell.

Nearly all bacteria found in improperly sterilized sealed containers are spore-bearing organisms, either anaërobic or facultative anaërobic. If there should happen to be a leak in the can, any variety may enter and set up decomposition. Non-sporulating varieties are always destroyed at boiling temperature (212° Fahrenheit); so unless there is a leak or the sterilizing is incomplete, this variety will not be present.

A partial vacuum is an ideal environment for the growth of anaërobic bacilli, since free oxygen interferes with the multiplication of these germs. On the other hand, they require oxygen for growth, but they must obtain it by breaking down substances that contain oxygen in chemical combinations.

Partially cooked material offers a more suitable medium for these germs, because the cellulose or fiber is softened and there is usually more surface exposed, and the juices are richer in carbohydrate or albuminous matter, as the case may be. The danger from these bacteria is not so great where absolute cleanliness is exercised and waste material is properly disposed of. Many bacteria which are capable of setting up putrefactive processes will thrive luxuriantly on a great variety of cooked foods, when, as a rule, they will not grow readily on whole raw materials.

Perfect Seal Important.—Putrefaction is sometimes found in imperfectly sealed and sterilized canned meats and vegetables. This may be due to insufficient sterilization or to leaky cans. In the process of putrefaction there are various ptomaines and toxic poisons formed which sometimes cause considerable trouble.

FIG. 15.—Testing the jar seal.

Testing the Seal.—(*a*) In glass. After fruits and vegetables are canned and set aside until entirely cold, the jars may be tested by removing the clamp and attempting to lift the lid from the jar. If the lid comes off, the jar was either not properly sealed or the contents are fermenting and may have to be discarded. If the lid remains tight, the chances are that the contents are keeping (Fig. 15). When faulty sealing alone exists jars may be reprocessed and the contents saved. However, protein foods are sometimes attacked by bacteria which thrive without the presence of air, and which decompose canned foods without producing any gas. When these have not been killed by processing, the food may appear good and the jar remain sealed when it is spoiled. These spoils in tin caused by bacteria which decompose food without forming gas are known as "flat sours"; with them the can is not bulged and shows no indication of spoiling. When such products are opened they are slimy and soft and they are acid to the taste.

(*b*) In tin. The time to detect the leak is when the can is first put into the sterilizer; a shower of bubbles will be seen coming from the defective seal. If the can is removed immediately and retipped or capped, the contents may be saved in good condition. Occasionally the attempt is made to save defective cans, when they are detected after the processing, by reopening the tip hole, repairing the can, exhausting and reprocessing for the regular time. Products handled by this careless method are very likely to cause most serious stomach and intestinal complications. This practice is a very dangerous one.

After cans are cooled, before stacking them, they are sometimes tested by tapping the end of the can with a piece of metal. A clear, ringing sound indicates that the can is air-tight. If a dull sound is heard when the metal strikes the lid, the can should not be stored with the lot. A trained or experienced ear can very quickly detect from the sound when all is not well within.

Substances Injurious to Bacterial Growth.—Many bacteria in growing give rise to substances such as acids which are more or less injurious to the cell life. The accumulation of acids and other substances produced by bacteria interferes with the bacterial growth and their power of multiplication. We have examples of this in the "flat sours" and also in the brining of vegetables. The acid present when frothing ceases above the brined cucumbers (lactic acid) is strong enough to kill most of the bacteria in the brine. It is this lactic acid which cures and keeps the vegetable if the air is excluded from it at this stage, and the forming of scum yeast at the surface of the brine is prevented. Many manufacturers do not know that their brine contains acid, yet the instant it does not contain it the pickle begins to deteriorate. A full explanation of this process is given in the chapter on "Pickling," page 190. One of the principal factors in the manufacture and preservation of sauer-kraut is the development of lactic acid in quantities sufficient to act as a preservative. Bacteria, yeast, and molds are of value in preparation of foods such as vinegar, pickles, sauer-kraut, cheese, bread, and butter.

Methods of Preserving Foods.—Just at this point it may be helpful and interesting to consider methods of preserving food, with a brief explanation of how each method accomplishes its purpose. To understand these fundamental reasons enables one to do canning and preserving more skilfully. The four methods commonly used are preservation of food by drying, by preservatives, by heat, and by cold.

1. *Preservation of Food by Drying.*—This method perhaps was one of the first known. In primitive times food was exposed to the direct rays of the sun for the purpose of drying it. This method is practiced at the present time, but more frequently the product is subjected to a higher temperature. In the process of drying a considerable portion of water is eliminated and many of the organisms present are destroyed. Bacteria, yeast, and molds cannot develop when the moisture in any food is very much reduced below the original amount. The same is true when certain disinfectants, such as smoke or the fumes of sulfur dioxide, are used in the cure. Meats and fish are frequently dried after a preliminary smoking or salting. Many food materials containing an abundance of starch are sufficiently dried in the natural process of ripening and drying; for example, certain nuts, such as chestnuts and the grains. Meats, meal, or flour containing the same amount of moisture as raisins or prunes would quickly spoil. Fruits are usually readily preserved by drying on account of their high sugar content. A dried or partially dried food should be sealed from the air to prevent gross contamination and to prevent moisture being absorbed due to its hygroscopic nature.

2. *By Harmless Preservatives.*—The most commonly used of these preservatives are salt, sugar, vinegar, and certain spices. In the presence of these, bacteria and yeast cannot grow successfully. Products such as jellies, preserves, and pickles are easily kept because of the presence of one or more of these preservatives. While the sugar or spices used may prevent fermentation, molds are likely to occur on these foods unless sterilized and sealed to protect them from the air. This can be done with all of the products, except jellies, by always processing and sealing after packing them into the containers. Jelly can be protected from mold by pouring over it a thin layer of melted paraffin when cold and covering it tightly.

Sodium chloride (salt) is used for dry-salting fish and sometimes other meats. The salt rapidly removes a part of the water and thus forms a medium which is not suitable for the growth of bacteria. This is a physical action, because it is brought about by greatly increasing the osmotic pressure. Some preservatives act chemically by direct antiseptic action upon the microörganisms. Preservatives that inhibit the growth of organisms by their chemical action as antiseptics belong in two classes: (*a*) those which are produced in the food as a result of fermentation of the food material being packed; (*b*) those which are added directly to the food.

(a) *Self-fermentation as Preservation.*—Among the products in which preservation is achieved through the results of fermentation, in the process of curing, are pickles, olives, onions, sauerkraut, cauliflower, and some pickled meats and various other raw materials. Lactic acid formed by the action of lactic acid bacteria upon sugar may develop in sufficient quantities in certain foods to preserve them indefinitely against further change if properly handled. The preservation of ensilage is largely due to the lactic acid and other acids which are formed during the process of curing.

(b) *Preserving powders* and other chemicals added to foods for their preservation are considered detrimental to health. Not only are foods containing them in quantity less wholesome, but their use encourages carelessness and the putting up of food which is unsound and unfit to eat. Benzoic acid and salicylic acid and their salts, and formaldehyde, boric acid, and borates are sometimes used. These compounds were purposely added by some of the early canners to shorten their sterilization period. Fortunately this method has largely been superseded by the more reliable and less expensive sterilization by heat only.

Some products, such as ketchups, sauces, and "fruit sundaes," preserved with such chemicals as salicylic acid, benzoate of sodium, and borax, are still on the market. In many cases this method is used because the buyer prefers this class of goods, even when he knows that preservatives have been used to keep them in an unfermented state. Hotel and soda fountain trade sometimes prefers goods treated in this way because they will not spoil so soon after being opened. Sometimes tomato ketchup and fruits for sundaes will not keep for more than a week after the bottles or jars are opened. Frequently fermentation sets in about the fourth or fifth day, and mold will sometimes be visible to the eye in five or six days, if they have been sterilized by heat only. So long as the buyers' trade will accept food which is bought in large containers and has been allowed to stand around open for days at fountains and in hotels we may expect these preservatives to be used. This method is cheaper and requires less care and skill than the putting up of individual packages for each patron's service. It is undoubtedly true that in a majority of cases it is advisable to preserve food materials whenever possible without the addition of antiseptics. They are unnecessary, and, though the actual effect on the body of some is unknown, the burden of proof rests upon those who employ them.

3. *By Means of Heat.*—Two methods of heat application may be used—pasteurization or sterilization. In pasteurization the food is raised to such a temperature that the organisms of certain types, but not necessarily all organisms, are destroyed. This process is ordinarily applied to milk and cream and to certain alcoholic beverages, such as beer and wine. In some cases this results in a prolongation of the time during which the food may be used.

Sterilization by heat implies the use of a sufficient degree of heat to destroy all organisms present; and when the entrance of other organisms into the sterilized food is prevented it may be preserved indefinitely. In the preservation of foods by heat it is necessary that a temperature be selected such that will destroy all organisms capable of producing undesirable changes and yet cause no undesirable changes to take place in the food itself. The antiseptic action of the acid found in some fruits and vegetables is so increased by the temperature of boiling water that it quite certainly sterilizes the product. Foods containing a large proportion of sugars are also easily sterilized by boiling. Vegetables such as corn and peas are much more difficult to preserve, inasmuch as they contain neither acid nor sugar in considerable quantities and are ordinarily infected with certain of the anaërobic spore-bearing bacteria which are capable of withstanding high temperatures.

The heat used in the preservation of food by sterilization produces few changes other than those which would be accomplished by ordinary cooking. Heat will not injure the flavor very much unless it is prolonged.

Since sterilization or preservation by means of heat is the best way to retain the natural flavors and wholesome qualities of fruits and vegetables, this book will deal chiefly with this means of keeping these foods.

4. *Preservation of Food in Cold Storage.* — Practically all foods can be kept for a time by the use of low temperatures. Cold does not kill, but arrests the growth of organism. Some foods can be kept indefinitely by freezing. Meats may be held for some time at this temperature without deterioration; in fact, for a time with marked improvement in tenderness and flavor. Some bacteria may develop at temperatures below freezing-point of water, but not if they are in a medium which is solidly frozen. The length of time that food products may be kept in cold storage without danger to the health of the consumer is a disputed question, but it undoubtedly varies widely according to the nature of the food.

QUESTIONS

1. To what is the decomposition of foods due? Mention some changes which take place during the decomposition of foods.
2. In what fundamental way do molds, yeast, and bacteria differ from the plants with which we are most familiar?
3. What is the distinction between parasites and saprophytes?
4. Describe briefly the characteristics of molds, including their necessities for growth and their manner of growing and reproducing.
5. Why do molds readily attack fruits?
6. How may mold be prevented from growing on the top of jelly? Explain your answer.
7. What is yeast? Describe briefly the manner of its growth and the necessities for it.
8. What are bacteria? State one way in which they differ definitely from molds and yeast.

9. Why is it more difficult to can beans and meat than it is to can fruits and tomatoes?
10. What is meant by spore-bearing bacteria? How do spores differ from bacteria in their tenacity of life?
11. Why are spore-bearing bacteria almost invariably present upon fruits and vegetables?
12. Why is it necessary to have sound fruits and vegetables for canning?
13. What tale does a bruise on fruit or vegetable tell to one versed in the elementary facts of bacteriology?
14. Why is intermittent processing at 212° Fahrenheit a surer method of sterilization than a single processing for a longer time in a water-bath?
15. What advantage has the product of fractional sterilization over that produced by a steam retort?
16. Why is it well to can fruit as soon as possible after it has been picked?
17. How can you explain the rapid spoiling of food which has been imperfectly sterilized?
18. Describe "swells." What is the cause of them? Describe "flat sours." What is their cause?
19. Why is a large percentage of spoilage in canned goods due to anaërobic bacilli? By what care can we reduce the danger of that to a minimum?
20. Why is a leaky can or imperfectly sterilized product extremely dangerous? What substances are formed in the process of putrefaction?
21. Under what conditions are bacteria, yeast, and molds of use in the preparation of food?
22. What four methods are commonly used in the preservation of foods?
23. Upon what principle is the preservation by drying based? Why are fruits more easily preserved by drying than are meats, fish, etc.?
24. Name the substances which may be classed as harmless preservatives. From the attacks of what forms of microörganisms do these protect foods? Explain the preserving power of two of these harmless preservatives.
25. Why should preserving powders be condemned even when their injurious effects cannot be proved?
26. What responsibility has the public in the continuance of the use of such powders?
27. What is the aim in the preservation of foods by heat?
28. What is meant by pasteurization? By sterilization?
29. Why are foods much more easily sterilized by boiling when there is present a certain amount of sugar and acid?
30. Why is much care and skill necessary in the preserving of corn, peas, etc., by heat alone?
31. Why can foods be kept for a certain length of time in cold storage?

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CHAPTER III

PREPARATION AND EQUIPMENT

THE same general conditions hold for canning indoors or out of doors. Convenient equipment, carefully selected and arranged, surroundings clean and free from dust, and a plentiful supply of water are among the essentials.

INDOOR CANNING

During certain seasons of the year weather conditions make it more comfortable to work indoors. Small quantities of fruit or vegetables can be more conveniently handled in the kitchen than out of doors.

Arrangement of Equipment.—When canning in the kitchen, a part of the work, such as sorting, washing, cutting, and peeling, may be done on the porch. Jars may be sterilized and brine and syrup made in the kitchen while the fruit is being prepared on the porch. After cooking, which with vegetables may include blanching and with fruits may involve plumping, the cooling and packing may be done on the porch, provided it is screened against bees, wasps, flies, and other insects which are attracted by the odors of the products being canned. The attractive odors of the fragrant fruits and spices are alluring to these insects (Fig. 16).

Utensils Used in Preparation.—Only the equipment necessary for convenient, accurate, and efficient work should be selected. First, it is well to consider the utensils necessary for the washing, peeling, coring, and slicing in the preparation of the fruit and vegetables. For washing, it is best to use small brushes having strong bristles, bowls for the water, and pans for draining. Some good types of knives for paring and peeling, selected with reference to comfortable handling and well-shaped cutting edge, are shown in the illustration. Since coring and slicing of fruit are constantly being carried on in cooking operations the year around, it is worth while to provide these inexpensive utensils, which will also add to the efficiency of these operations in canning. Good types are shown in figure 17.

FIG. 16.—A group of useful utensils for washing, peeling, coring, grating, and slicing fruit and vegetables.

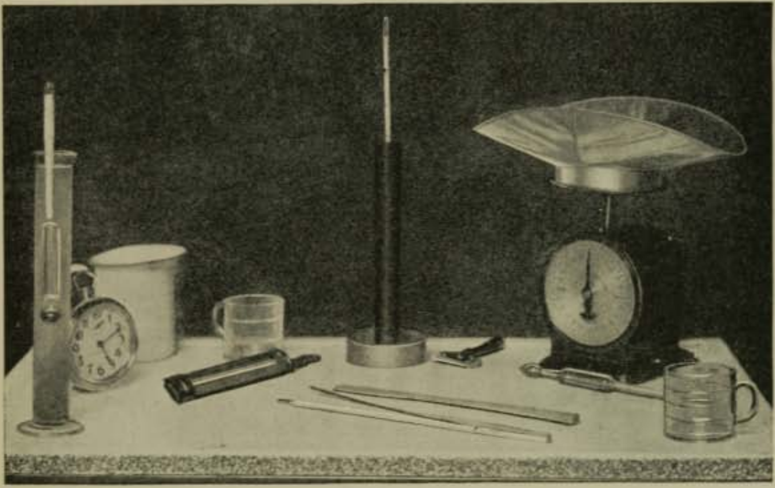

FIG. 17.—Special equipment necessary to obtain most successful and accurate results.

Successful results largely depend upon the accuracy with which directions are followed. With this idea in view, a small special equipment is suggested. For measuring liquids, the one-half pint glass cup and enamel or aluminum quart measure will be sufficient. Tin utensils are objectionable because fruits are discolored by them. In securing level measures of dry material the use of a spatula is suggested. It has many other valuable uses. A flat cane paddle used in packing may be substituted for the spatula. Scales are invaluable when undertaking canning in large quantities. The clock must be constantly consulted to insure correct time for the various steps in the processes of canning and preserving. The saccharometer is suggested for the purpose of measuring the density of syrups used in canning fruits; ther-

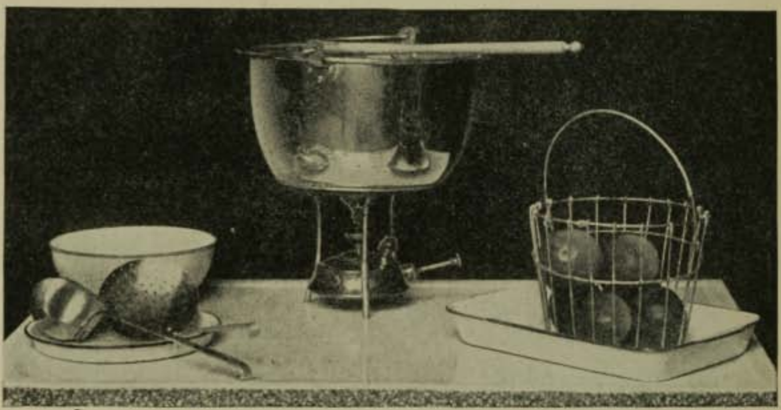

FIG. 18.—Utensils used in blanching and in cooking.

mometers aid in the jelly-making process, as well as in making jams and marmalades. A fuller description of their use is given in the chapter on "Preserving." A salt percentage scale is used to determine the density of brine for use in pickling (Fig. 17).

Utensils Used in Cooking and Processing.—The equipment thus far described is useful in preparation of fruits and vegetables for canning. Next to be considered are utensils for cooking and processing. In the blanching necessary for some fruits and vegetables a large vessel for boiling water is necessary. This must be large enough to immerse wire baskets containing the fruit to be blanched. The same pan or tray used later in the preserving serves here for transferring the dripping baskets or blanching cloth to the cold bath which follows the blanch in many cases. The large preserving kettle illustrated is useful in many ways. It might be used for the blanching vessel, the preserving kettle, and even as the processor. It is economy to have it of the most durable material possible. Two ladles—one cup-like with pouring lip for liquids, and the other flat and perforated for skimming—will be helpful during the cooking as well as when filling the containers (Fig. 18).

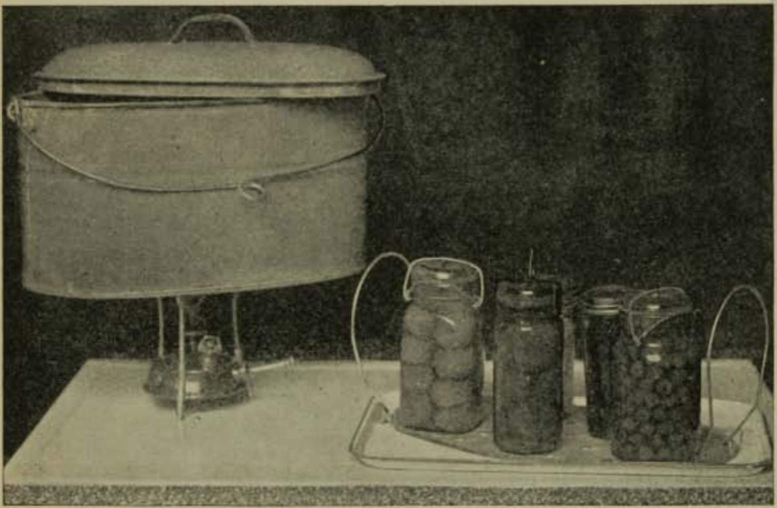

FIG. 19.—The processor and rack with jars ready to be sterilized. Note all clamps are raised and screw-top only partly screwed on.

In processing, which is described later, it is necessary to have a tightly covered vessel large enough to sterilize a convenient number of jars at one time. A rack which will raise the containers from the bottom of the sterilizer must be used to allow boiling water to circulate beneath as well as around the containers being sterilized. This rack is most convenient when it is supplied with handles so that all the jars on it may be lifted at one time (Fig. 19). Wire hot-jar lifters will prevent burning fingers (Fig. 20).

Coöperative canning also is a method of minimizing labor (Figs. 21 and 22).

OUTDOOR CANNING

There are many advantages and pleasures in canning out of doors, especially when large quantities of farm products are to be taken care of in the shortest possible time. Outdoor canning gives opportunity for coöperative work among clubs and neighbors. In coöperative canning the minimum amount of labor, if well organized, will give larger and better results. This work has stimulated many women and girls to spend more time in the open and bring other tasks out of doors. Choose a shady, green, cool spot convenient to the water supply for the canning. The fact has been mentioned before that insects are attracted by odors from the fruit being canned, and it might be well to consider baiting fly-traps near where the canning is done (Fig.

FIG. 20.—Tongs for handling hot cans.

23). Flies prefer nitrogenous food to sweets, and if the traps are properly baited with milk clabber or meat they will be less attracted to the products being canned (Figs. 23 and 24). In addition to the equipment already described above under "Indoor Canning," there are important matters of special concern in outdoor canning.

Arrangement of Tables.—Tables of the proper height should be conveniently arranged for different steps of the work. The diagram shown offers a suggestion for placing of tables with reference to the canner, especially when canning in tin (Fig. 25).

Table 1 is equipped for the sorting, washing, blanching, peeling, and coring. It should be as few steps as possible from the canner, to save time and labor in the blanching process.

Table 2 should be placed near Table 1, because the fruit is passed to this table for packing, weighing, and adding of brine or syrup.

Table 3, which is for capping and tipping and should stand evel, should be near the canner, because of the numerous trips

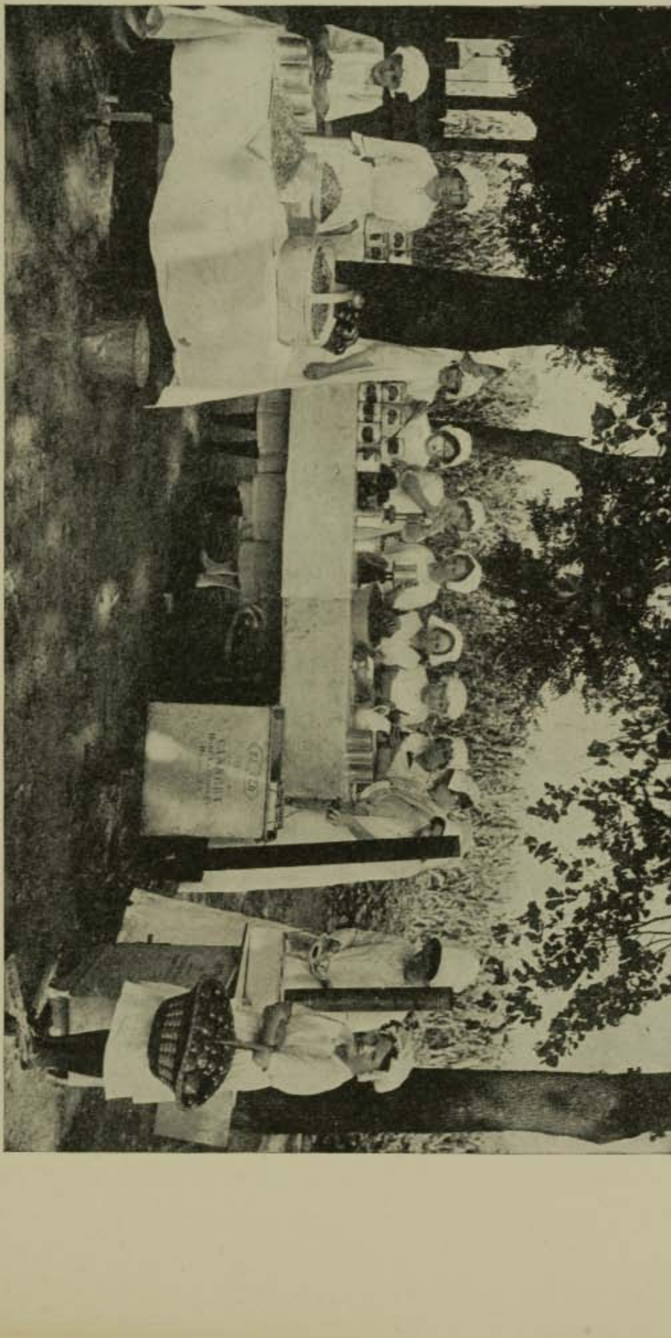

Fig. 21.—Coöperative canning minimizes labor; canning club girls in Anson County, North Carolina, at work.

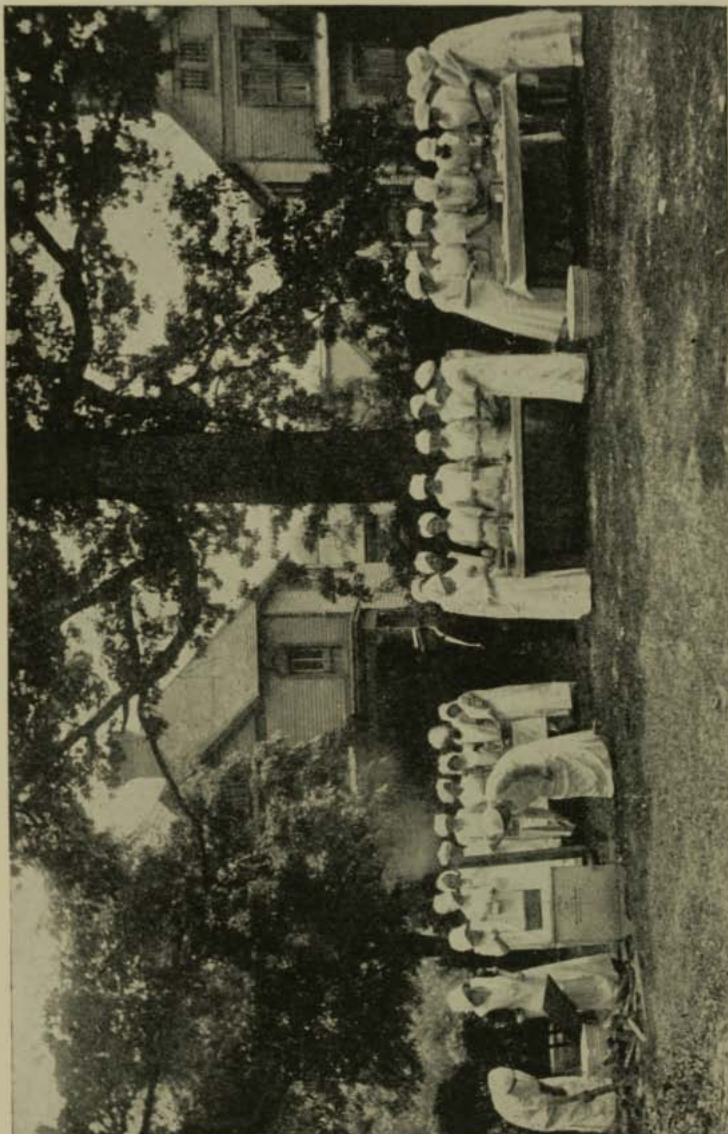

Fig. 22.—North Carolina county agents at Peace Institute, Raleigh, N. C.

to be made between them. Table 3 might be omitted if one is canning in glass only. Illustrations show other convenient arrangements of tables for out-of-door canning (Figs. 26 and 27).

When tin cans are used it necessitates the use of tipping copper and capping steel. Sometimes the same fire which heats the water in the canner is used to heat these tools. A little oil stove which burns a gas flame is certainly worth having for heating the tools. It gives a hotter and cleaner fire than the wood fire in the canner; it heats the steel more quickly and saves cleaning and retinning the tools so often (Figs. 28 and 29).

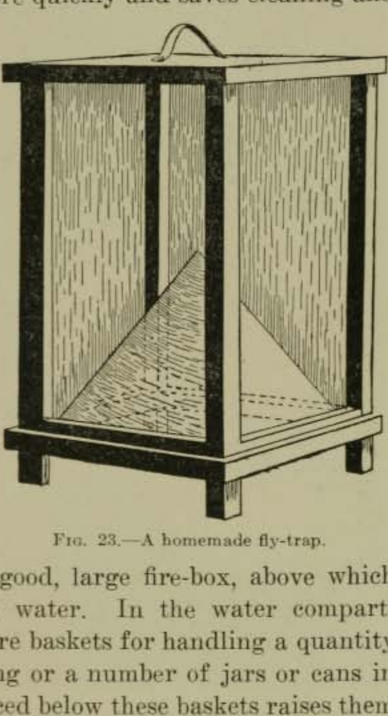

FIG. 23.—A homemade fly-trap.

A portable canner is a necessary convenience for out-of-door canning. This may either be homemade or purchased. There are a number of portable canners at reasonable prices on the market at present. Considering the fact that most concerns furnish tipping copper, capping steel, and blanching trays with the outfit, it is cheaper to buy one complete than to attempt to build one and purchase a set of tools. The essential feature of such a canner is a good, large fire-box, above which is a compartment for heating water. In the water compartment are placed two or three wire baskets for handling a quantity of fruit at one time in blanching or a number of jars or cans in processing. A wooden rack placed below these baskets raises them above the fire-box and allows circulation of the water around jars and prevents breaking during the processing. For this tank there must be a close-fitting cover (Fig. 30).

A large tub of cold water for cooling tins should be placed beside the canner. When canning in glass out of doors, a cloth should be provided to place over the jars immediately after removing them from processing, to prevent the cold breeze from striking the glass and breaking it.

SELECTING CONTAINERS

Types of Containers.—The type of container is very important and should be considered when the first equipment for canning is secured. The most essential feature to consider is a perfect closure; then the size and shape desired for different products.

FIG. 24.—Mississippi club girls building a fly-trap for out-of-door canning.

Tin Cans.—When canning is to be done in tin and the buying is to be direct from the manufacturer, it is very necessary to order the cans as early as possible to take advantage of the lower prices offered before July 1. Many firms close their factories after this date, and will not consider any order in less than carload lots. The same thing is true in some of the glass factories. If you anticipate canning in large quantities, make an estimate for your dealer or order early from the manufacturer. Tin cans are designated by number rather than by the measure of liquid they carry, as is the case in glass containers (Fig. 31). Flat

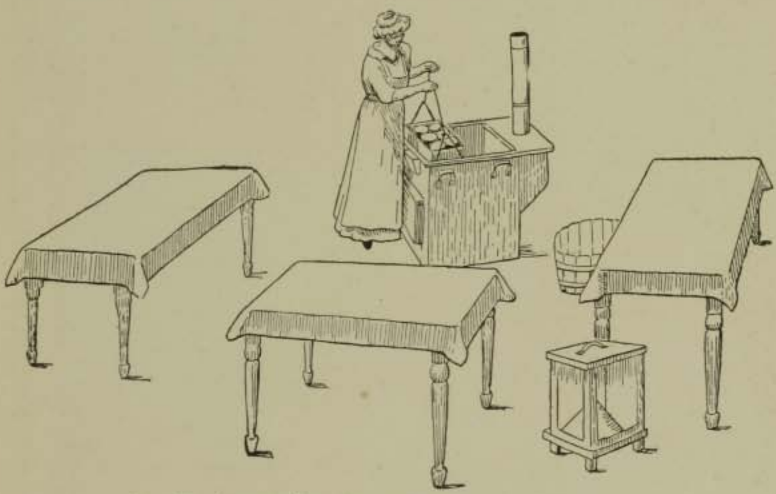

FIG. 25.—A convenient arrangement for out-of-door canning.

No. 1 cans are the smallest that are advisable for use in home canning, and their use is very limited. The No. 1 flat or squat can is more attractive than the tall No. 1 for the most of the products packed in so small a tin, and is especially desirable for such packs as sweet Spanish pimientos, figs, tomato paste, etc. The No. 2 tin can is the size most generally used for canned vegetables and small fruits. Corn and peas are more easily sterilized in this sized tin, and for that reason these products should not be packed in any larger container. No. 3 can is used more often in some localities than No. 2, especially for canning peaches, tomatoes, pears, etc. (Fig. 32).

FIG. 26.—Canning out of doors, State Normal School, Harrisonburg, Va.

FIG. 27.—Canning tomatoes from the scholarship plot, State Normal School, Harrisonburg, Va.

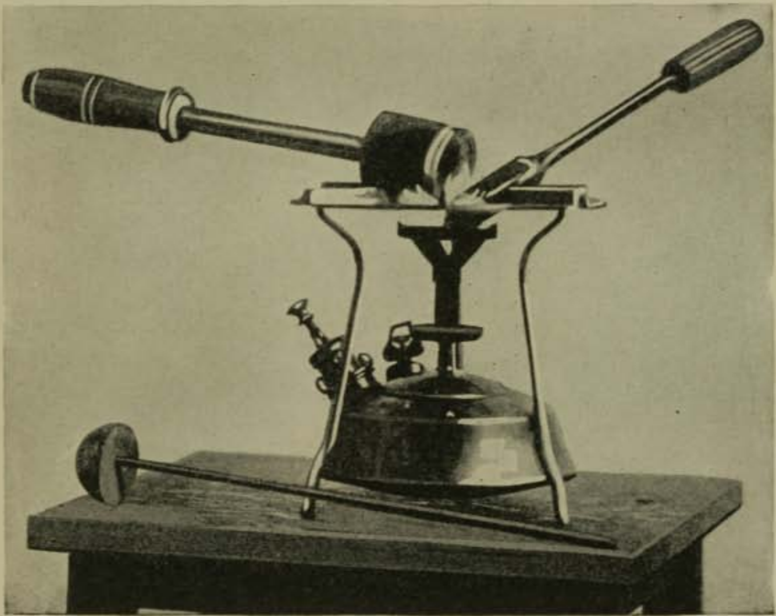

FIG. 28.—A kerosene stove which burns a gas flame for heating soldering tools.

The enamel-lined can is necessary when canning berries, plums, cherries, beets, pumpkin, and hominy, which may not be packed in the ordinary tin cans, because they are affected by the tin in such a way as to rapidly lose their color and flavor. Figs also will keep a brighter color when packed in these enamel-lined cans. When enamel-lined cans cannot be secured, these products should be packed in glass.

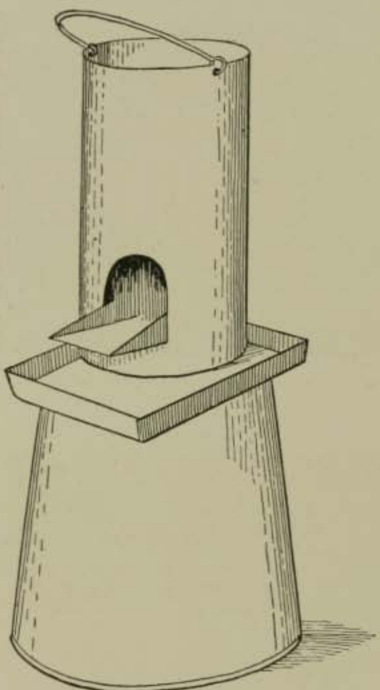

FIG. 29.—A fire-pot burning corn-cobs for heating tools. A gasoline fire-pot or charcoal bucket may also be used.

A No. 10 can is sometimes used for tomatoes and spinach, but in such a large container a great deal longer time is required to sterilize food; therefore it is better suited for hotel and institution canning. It is not generally advisable to pack in No. 10 cans unless processing is done under steam pressure. Sometimes fruits are packed in these containers in a thin syrup during the very busy season, then opened, cooked more, and repacked in marketable containers during the less busy season, as the orders come in. This is not practicable, however, unless a very large quantity of ripening fruit must be taken care of in a very short while, and time cannot be allowed for plumping and careful packing. Often semi-tropical fruits are handled in this manner in the orchards and shipped to the large packing-houses, where they are repacked in smaller commercial containers before marketing.

The square tin cans are sometimes used for asparagus tips. In California such a container is more generally used for this product than the round can.

The cans described above are those which can be secured with solder hemmed caps.

"Sanitary" Cans.—The so-called "sanitary" cans are widely

FIG. 30.—A folding portable canner.

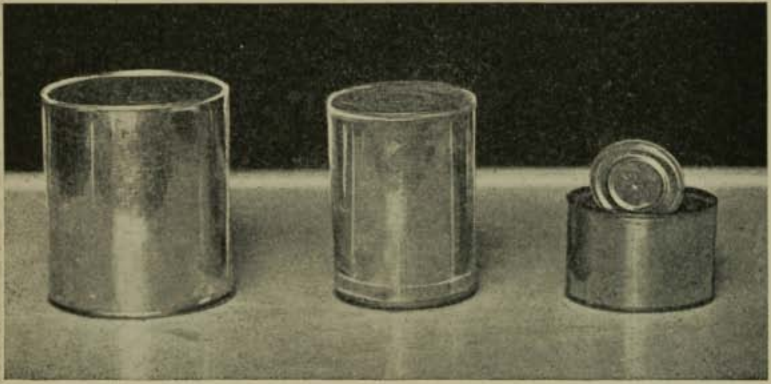

FIG. 31.—Standard sizes of tin containers.

used by commercial packers. They require a machine for sealing. A small hand machine for sealing special sanitary cans is illustrated here (Fig. 33). The cans with the proper closure to use in this machine are a little more expensive, perhaps, than the regular cans in stock, but the time and material saved by this process more than cover the extra charge. This method

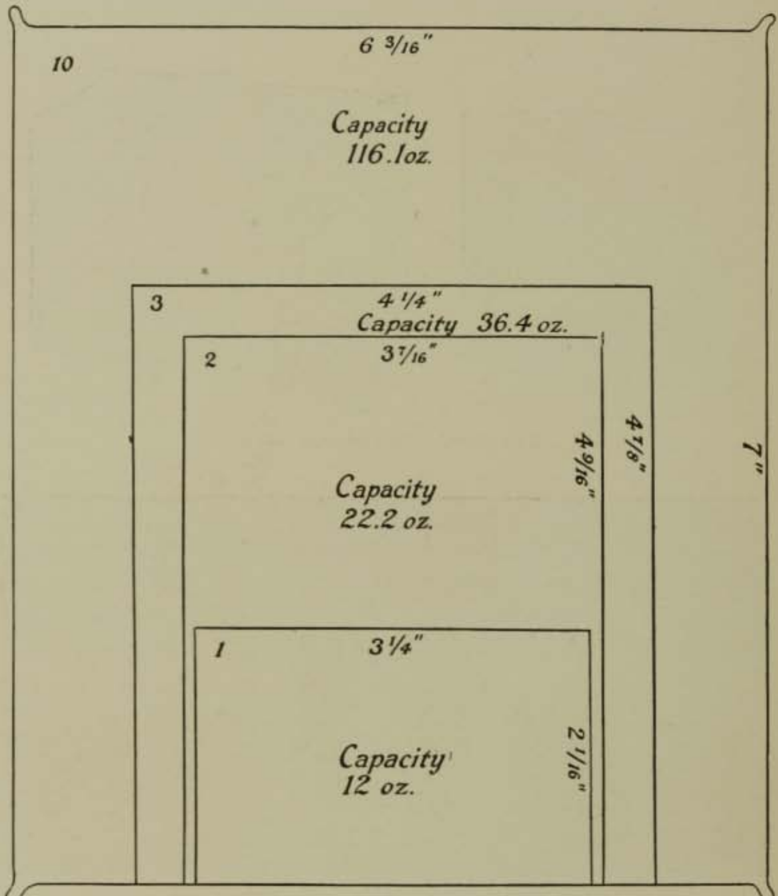

Fig. 32.—Size of cans used for household purposes.

eliminates the use of solder and canning flux in the sealing of cans. If machinery cannot be employed hand tools will be necessary (Fig. 34). It is necessary to designate the size when ordering cans, since the diameter of the opening should correspond with that of the capping steel to be used. There are two sized openings, $2^1/_{16}$-inch and $2^7/_{16}$-inch. Cans with the

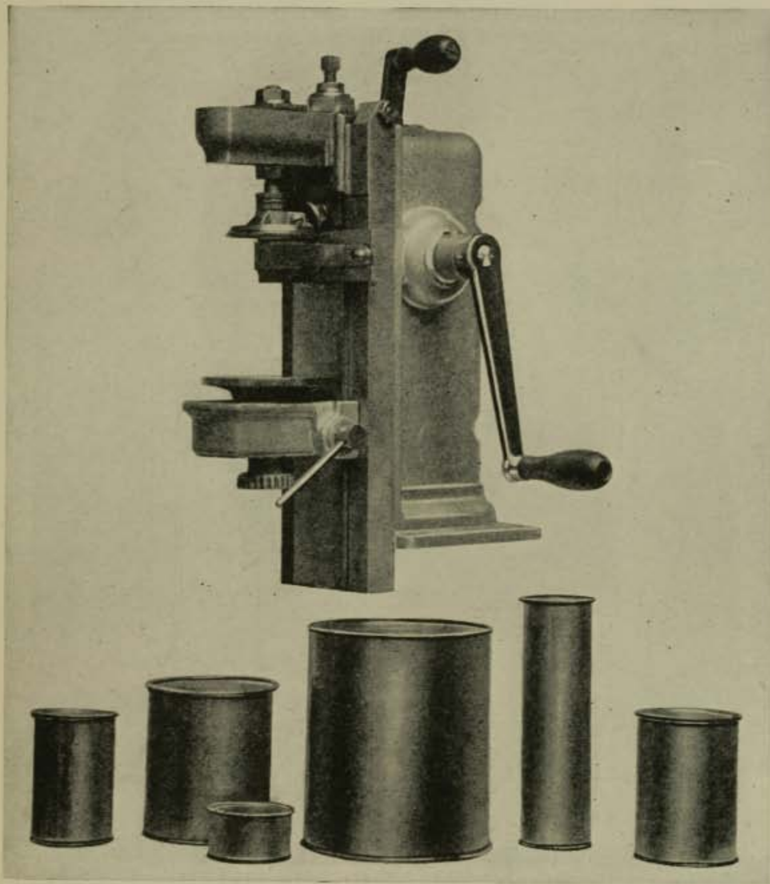

FIG. 33.—Hand machine for sealing special sanitary cans. (Courtesy of Bowers Can Seal Company, Boston, Mass.)

$2^1/_{16}$-inch opening are more generally used. The solder hemmed caps are preferable, because they save solder and time in putting them on. Plain tin caps are not worth considering.

Glass containers are more varied in sizes and shapes than the tin and lend more opportunity for displaying a variety of attractively packed products, both for the home pantry and for market. Throughout this book suggestions are made from time to time about salable products in commercial packages. This is for the purpose of encouraging the canning, preserving, and

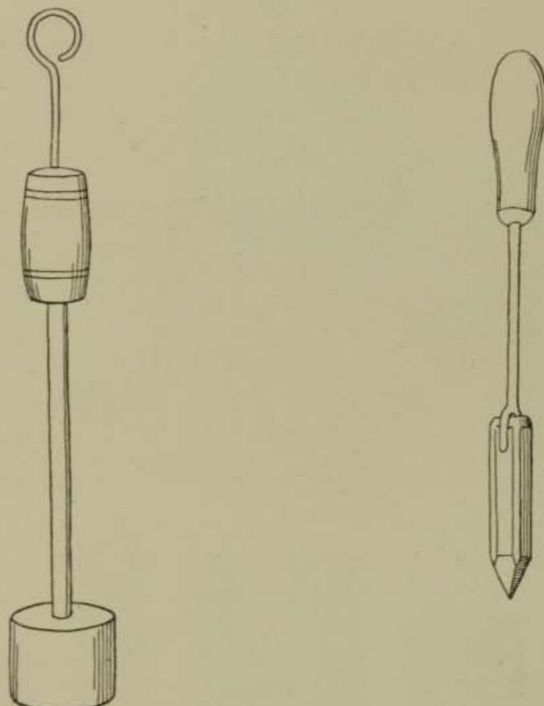

FIG. 34.—Capping steel and tipping copper.

selling of surplus products. The highest quality of commercial products on the market should tend to stimulate ideals and standards (Fig. 35). These jars can be obtained in one-half pint, pint, quart, and one-half gallon sizes.

Selection of Jars.—Jars should be selected with reference to suitable size and shape for the product to be packed, keeping in mind economy in the initial purchase and durability. Other important considerations are beauty of proportion, tint and quality of glass. Not only are these qualities considered by those who are packing for high-class sales, but also by the housewife who enjoys artistic expression through arrangement and preservation of beautiful form and color in skilful packing. The square jar is effective for showing quality and pack.

Lightning Seal.—The wide-mouth glass-top jar with wire clamp which is attached to the neck of the jar is a satisfactory one. A jar with this closure is known as one with a "lightning seal." This seal is made by different manufacturers and put on the market under various trade names. A jar with this closure is

FIG. 35.—A group of jars for household use.

an easy one to handle while the jar is still hot. Immediately after processing and sterilizing it is necessary only to push down the lower clamp around the neck of the jar. This gives the amount of pressure necessary to assist in the sealing of the jar as it cools. The rubber used is placed in the groove of the neck of the jar, and the cap fits down on the top of the rubber, which prevents the bottom of the glass top from coming in direct contact with the top of the jar. It is the rubber that makes possible this seal by adhering to both the top and the jar. Everything must be very hot to obtain a good seal, and for this reason directions are often given for cooking the fruit in the jar. This heating drives out some of the air, forming a partial vacuum in the jar. At this point the clamp is pushed down, preventing entrance of air as the jar cools. The jar is then sealed by the pressure of air on the outside. Sometimes a jar of this type is spoken of as a "self-sealing" jar. This sort of sealing has great advantage over the old screw-top jars.

Screw-top jars which demand handling while hot are difficult to screw on tightly enough to insure good sealing. If the tops

A B C

FIG. 36.—Commercial jars for special products: A. 10-ounce vase-shaped jar, hermetic top. B. 12-ounce glass-top, screw-rim jar, rubber used. C. 10-ounce jar with hermetic cap.

are screwed down by hand, the wrists become tired and cramped before many are sealed, and it is uncertain whether all are sufficiently tight. There is a simple tool on the market for screwing on tops.

The zinc top should not be used, because fruits and vegetables which contain acids are unfit to eat after contact with the zinc cap. New tops should be secured for all jars of this type. The glass used in this type jar is usually tinted. While the fruit will be easily kept in this glass, it gives the fruit an unnatural appearance, and it is not so attractive. When packing fresh fruit and vegetables for sale, the fair natural color enhances the value of the finished product.

Safety-valve Seal.—The jar with the safety-valve seal is beautiful. It is made of clear flint glass, and the seal is the same principle as the lightning seal. While being processed the lid is held in place by a wide black clamp which may be re-

Fig. 37.—Appropriate containers for exhibit purposes: A. Quart square jar. B. Champagne shaped ketchup bottle. C. Pint square jar.

moved when the jar is cold and sealed. It then presents a very attractive appearance. Jars of this type are more expensive than the other types mentioned. They are often used by select preserving kitchens that furnish goods for high-class, fancy trade (Figs. 36, 37 and 38).

The "Hermetic" Jar.—The hermetical sealing jar with the gold lacquered cap and wire clamp is used more often for commercial purposes, though there are some household jars of this type on the market. The cap is said to be washed in a gold lacquer that will not be affected by vegetable or fruit acids coming in contact with it. Around the inside edge of the cap a gasket or rim of sealing composition fills the space between the cap and jar, and this softens when heated and adheres to the jar. The sealing of this jar is practically the same as the lightning seal jar. Heating forces out the air and forms a partial vacuum in the jar; then the wire clamp, which should be

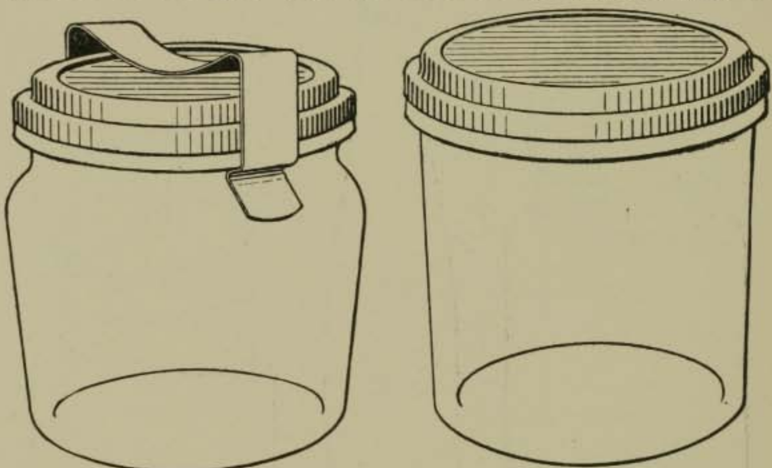

Fig. 38.—Individual containers: A. 4-ounce vase-shaped jar, hermetic cap. B. Straight-sided 4-ounce jar, hermetic cap.

placed on the jar at the beginning of the process, furnishes sufficient pressure to prevent cold air from rushing into the jar as it cools. It is the pressure of the outside air, nearly sixteen pounds to the square inch, which keeps the jar sealed. Commercial products are often packed in jars with this type seal. Because the sealing composition is under the edge of the cap and not exposed, it is not so liable to become punctured by mice and roaches nibbling it, as is sometimes the case where rubbers are used.

Rubber rings dry and deteriorate with age. They become porous and sometimes crack. When this happens, the air gets in and, because the partial vacuum is broken, the seal is no longer good and the product will spoil. A perfect seal, where the rubber ring is exposed, will hold only so long as the life of the rubber lasts. In selecting rubber rings it is wise to secure the best and always use new ones. The price of a dozen rings is less than the value of the contents of one jar, so it is economy to have new rubbers each year. The thick, red and gray rubber rings are among the best. The black one is better than the

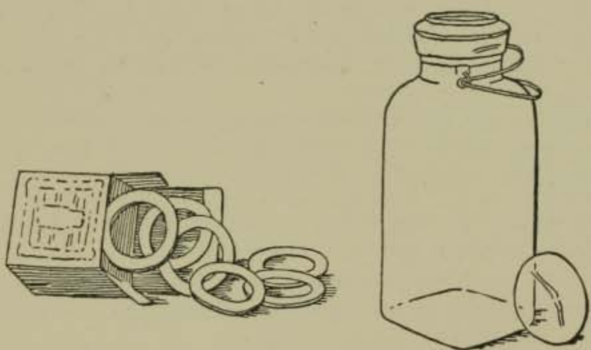

FIG. 39.—Box of rubbers and a jar.

white, because the chemicals used to bleach this kind cause it to dry, crumble, and crack in less time than the better-grade rubber (Fig. 39).

QUESTIONS

1. Describe the care necessary to protect the food from insects while working on the porch or under the trees.
2. When considering a piece of equipment, what would determine its selection?
3. What principles are involved in the arrangement of tables in Fig. 10?
4. State, in the order of their importance, the features to be considered in the selection of containers.
5. Why are plain tin containers unsatisfactory for some fruits and vegetables? What kind of containers would you use for these foods? When is glass preferable to any other?
6. Describe the principle of the so-called "lightning seal."
7. When a rubber ring is used in the seal, which kind would you select and why should it be renewed every year?

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CHAPTER IV

CANNING IN TIN

SINCE canning in tin is becoming much more widely used in the household, it may well be presented first. On the farm, for instance, where there is a large yield of fruit or vegetables to be canned, the canning process in tin can be handled with more speed, less danger of breakage, and at a very much smaller initial cost. For all these reasons, in many localities the canning in tin is preferred.

Preparation for Canning in Tin.—Special equipment for canning in tin should be assembled early in the season, as prices are better then and there may be difficulty later in securing certain supplies, as already suggested. The cans should be ordered early and the processing vessel, whether it be a commercial canner or one made at home, should be installed some time before the actual canning is to begin. When the canner is decided upon and the solder hemmed caps and cans ordered, the next to consider is the tipping copper, capping steel, and a file. To clean these tools, a canning flux should be made and some powdered sal ammoniac placed in a can to rub the tools with after heating.

Making Flux.—Put some commercial hydrochloric (muriatic) acid in a glass or crockery vessel (not metal), add strips of sheet zinc until no more can be dissolved. To this add an equal quantity of water. Label this "Flux" and use carefully. Very little must be used, and care must be had not to allow any of it to enter the can, as it will injure the contents. The use of flux is described under "Capping." When canning, have one vessel (a can will do) with enough flux in it to clean the tools. Keep separately, in a glass bottle, the quantity to be used in sealing cans.

Cleaning and Tinning the Steel and Copper.—It is of first importance to have capping steel and tipping copper in good condition. In case they are rusty, they may have to be filed. Otherwise, rubbing them with coarse sand-paper or on a brick will smooth them. Care must be taken to keep the edge of the capping steel true if the file is used. Both the tipping copper and capping steel must be kept tinned or coated with solder to make the solder flow evenly when sealing the cans. Place a handful of sal ammoniac mixed with a few pieces of solder (one-half cupful of sal ammoniac and three inches wire solder) into an old can. This proportion will be sufficient for retinning the tools one time. The sal ammoniac can be used again if more solder is added. Heat the already smooth tipping copper and capping steel until almost red hot, dip into the flux, then into the sal ammoniac and solder, turning them about and rubbing them until bright and well coated with solder; then dip into the flux again. The best sealing can be done with the least effort if the tools are kept in a clean, bright condition.

Plenty of clean white cloths should be at hand during the canning process. There should be wire lifters for handling hot cans and blanching trays. Sufficient wood should be piled near the canner for keeping up the fire. A tub of cold water for cooling the tins as soon as they are removed from the processor should be at one side of the canner, and there should be a water supply near at hand, because it will be necessary to change the water from time to time in order to have a cool supply. The equipment should be placed, if possible, where it can be used for the entire season.

Having outlined a convenient arrangement of this equipment, the various steps in the process of canning in tin may next be considered.

STEPS TAKEN IN CANNING IN TIN

1. **Selection of good sound fruit and vegetables** is of paramount importance. Unless the product to be canned is of the highest grade and in prime condition, it is useless to hope that special care and skilful packing will result in anything more than disappointment and failure. In securing fine quality, much depends upon having the vegetable or fruit absolutely fresh,

crisp, and clean, and kept cool. All steps, from beginning to end, of any lot of canning should be carried through as rapidly as possible. A good slogan is, "*One hour from the field to the can.*"

2. **Sorting and grading** should be done very carefully, according to the size and degree of maturity and ripeness. Use only uniformly well-ripened products (Figs. 40 and 41). Discard all defective ones, and use together those of the same size. In canning, the flavor is retained only when young, tender,

Fig. 40.—Sorting and grading tomatoes.

quickly grown vegetables are used. Commercial concerns sometimes have what they call grading paddles. They consist of a flat board with holes, which correspond to the opening in the glass jar in size. Peaches, for instance, which are too small are set aside to be packed as sliced peaches or for sweet pickles, and the ones which are too large are kept together, while all that slip through easily are made up together in one batch. This grading before cooking simplifies sorting when packing, saves much time, and gives a more uniform product throughout.

3. **Scalding, Peeling, and Coring.**—Some fruits, such as peaches and tomatoes, are scalded in order to peel them smoothly.

Put fruit or vegetables to be scalded into trays or squares of cheesecloth and lower into boiling water for one minute (Fig. 42). Remove at once to prevent cooking. Plunge into cold water, which prevents softening of the fruit and causes it to shrink, making the skin more easily peeled from the flesh. When the skin does not come off clean without tearing bits of flesh, it is an indication that the scalding has not been successful. This may be due to having the fruit too green, to overcooking, or to adding a large quantity of fruit at one time, which too

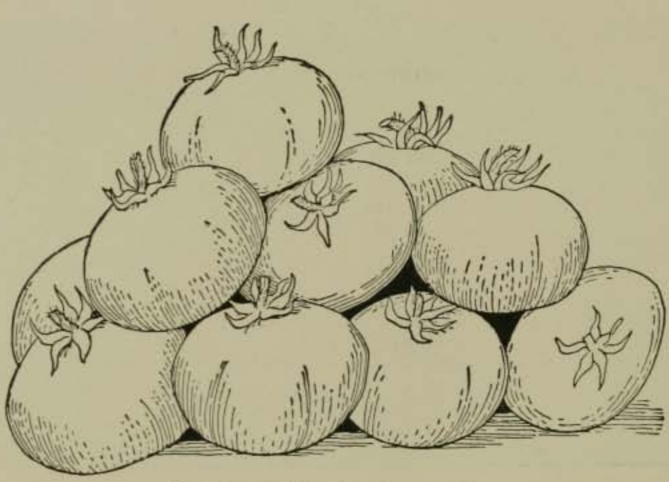

FIG. 41.—Uniform tomatoes together.

quickly cooled the water. A slender-pointed knife is useful for peeling and coring.

4. **Blanching** consists of plunging the vegetable or fruit into a large amount of boiling water for a short time. A wire basket or square of cheesecloth serves for handling large quantities of fruit at one time. The blanch gives a more thorough cleaning, because the scalding water tends to remove the bacteria from the surface of the fruit or vegetable. It also improves the flavor and removes strong odor and flavor from certain kinds of vegetables. The fruit shrinks in the blanch and becomes more flexible. A full pack is then more easily made. The time re-

quired for blanching varies with the state of maturity of the different fruits and vegetables. Blanching peaches and pears gives them a more transparent appearance, better texture, and mellow flavor. Using it for cherries will prevent splitting and cracking. Spraying fruit with cold water after blanching will make it finer. Sometimes it is well to drop the vegetable into a

FIG. 42.—Scalding tomatoes, using a square of cheesecloth.

cold salt-bath for an instant after the blanching to make it more crisp. In the case of green beans, peas, and okra, such a cold salt dip may help to keep the green color.

5. **Sterilizing containers** is very essential before packing them. This may be done while the fruit is being sorted. Wash the cans and drop into boiling water for ten to fifteen minutes. On removing them from the water, turn open ends down on a

clean towel to keep out dust and air. If stacking them, turn open ends of two cans together.

6. **Packing.**—The can should be filled as full as possible without crushing pieces. There should be no space which would allow the pieces to move about and bruise and break one another. In general, when packing in tin for the market, it is well to do sufficient weighing to insure minimum weights from falling below the standard chosen. Federal and most state laws require that cans be filled as full of food as is practicable for processing, and that they contain only enough liquor to fill the space and cover the contents. Plan in advance and work rapidly. Do not allow filled cans to stand before adding liquid and exhausting, because to do so will injure the product. Add seasoning and mark the cans with pencil or knife to show contents.

7. **Adding Water, Brine, or Syrup.**—Add the liquid to within one-fourth of an inch of the top. Shake the can and tap gently on the table to dispel air within the can. Now clean and wipe the groove around the opening and slip on the solder hemmed cap (Fig. 43).

8. **Capping.**—Use a small brush, cord, or little mop, made by tying a clean white cloth around the end of a small stick for applying the flux around the groove, being very careful to allow none of it to enter the can. The flux is used to make the solder adhere to the tin. Apply the clean, hot capping steel, holding the cap firmly in place with the center rod while lowering the steel. Turn the steel steadily until the solder flows: a half turn forward, a half turn back, with a sudden twist forward again to swing the melted solder around the groove evenly while lifting the steel. Hold the center rod firmly until the solder cools, making a perfect seal.

9. **Exhausting.**—Place the cans in trays and lower into boiling water to within one inch of the top to drive the air out of the cans. Let them stay the shortest time possible to drive out the air. Dense foods like corn and sweet potatoes require a longer time for exhausting than products which are more juicy. The denser foods are poorer conductors of heat, and it takes a longer time for the contents in the center of the can to become

heated. Ordinarily three minutes is long enough for exhausting cans not larger than No. 3. *Exhausting is necessary.* If omitted, the air left in the can expands, causing it to bulge. The can may not resume normal shape, or, if it does and is exposed to

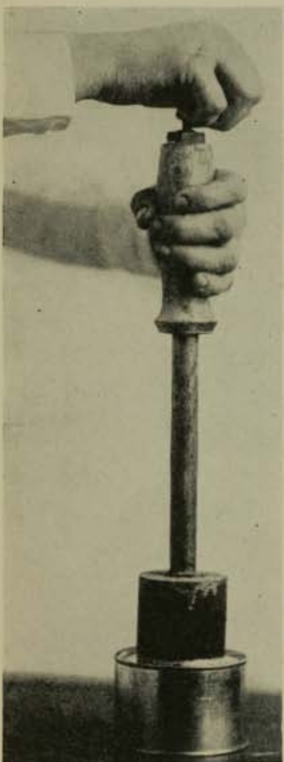

Fig. 43.—Capping

Fig. 44.—Tipping.

a warmer temperature, it may again expand, giving the appearance of a "swell." Future orders may be cut off because of a single can like this. The presence of air in the can may cause the tin to dissolve more rapidly and enter into the food.

10. **Tipping.**—Immediately after exhausting, close the small

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hole at the top of the can. Dry the cap, apply flux as for capping, and use a little wire solder (Fig. 44). Hold the hot tipping copper in the right hand, placing the point over the hole, and barely touch the solder to it. Bring the hot copper vertically over the hole and lift it so that only a bead will drop and make a neat, round tip.

11. **Processing** is heating to sterilize the contents of the cans, which have been packed, exhausted, and tipped. In a hot-water canner, the water should be boiling vigorously when the cans go in. Lower the can slowly under the water and watch for a shower of bubbles. If the bubbles are seen, this shows that there

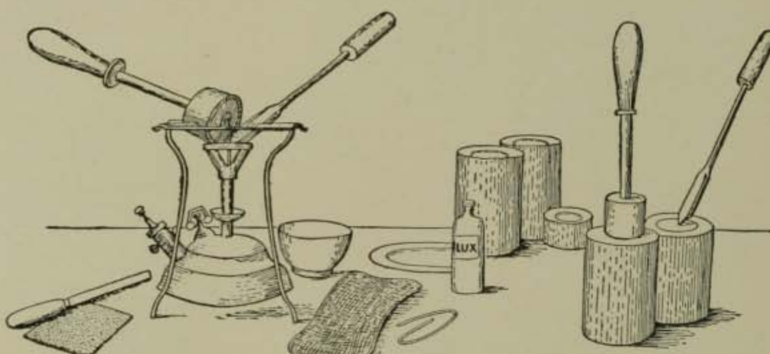

Fig. 45.—Heating tools, capping, and tipping.

is a leak at the point from which the bubbles come, and the can must be taken out and resoldered. Account should be taken of the time beginning when the water first boils after emerging from the cans. Keep it boiling continually. When processing in a steam-pressure canner, begin counting time when the gauge denotes the amount of pressure you wish to use in processing. In intermittent processing, the vegetable is processed for forty-five to sixty minutes at boiling temperature on each of three successive days. The time is sometimes reduced to two days with very young, fresh string beans and other more easily sterilized vegetables.

FIG. 46.—Students learning to can in tin. (Courtesy of Peabody College for Teachers, Nashville, Tenn.)

12. **Cooling.**—Cool all products in tin as quickly as possible after processing to stop the cooking. Overcooking breaks down the texture of fruit and injures the flavor and color. Plunge cans into very cold water immediately, especially when processing intermittently. Never stack cans together until entirely cold. The cans should be dried before storing to prevent rusting. This may be done by either drying them with a cloth or standing them in the sun after the plunge in cold water.

13. **Test for Defects.**—Tap the top of the can with a metal, and if the containers are sealed a clear, ringing sound is noticed. If the seal is imperfect a dull sound will be heard. It is a common sight in factories to see a workman beating a rapid

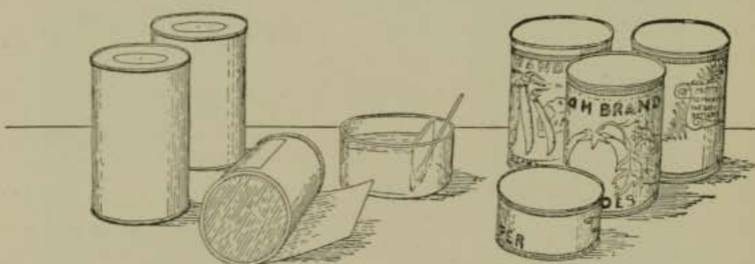

Fig. 47.—Labelling.

tattoo on the ends of cans with a metal. He can detect by the variation in sound or a single blow when all is not right (Figs. 45 and 46).

14. **Labelling.**—Cans should never be labelled until perfectly cold (Fig. 47). It is better to wait five or ten days so as to be sure that they are all sound. If products are to be sold, they should be freshly labelled just before shipping and have the net weight stated in pounds and ounces, with packer's name and address on each can. Place the sealed end down so the smooth end will appear at the top when standing on the shelf. The paste used should be placed only on the label at the end, so that no paste will touch the tin. It may cause rust if the paste touches the can.

Paste:

1 cupful of flour	1 cupful of cold water
1 teaspoonful of powdered alum	½ teaspoonful of oil of cloves

3 cupfuls of boiling water

Mix the flour and one cup of cold water thoroughly. Add the boiling water and bring slowly to the boiling-point, beating all the while to prevent lumps. Boil for five minutes. When cooked, add the alum and oil of cloves, pour into glasses with covers. This will keep for some time and make an excellent paste for use in labelling cans and jars.

Frequently the outside of the cans is lacquered before labelling to prevent rusting. In damp climates, where cans rust easily, this is advisable. An attractive label will add a great deal to the appearance of the finished product, and it should be chosen carefully with this idea in view.

Any one wishing to can for the market should look up the state laws and requirements about the matter. It is not so necessary to be familiar with the Federal laws unless interstate shipments are to be made. Detailed information on state laws and regulations may be obtained by writing to the State Food Commissioner, State Board of Agriculture, and Federal rules and laws can be secured from the Bureau of Chemistry, U. S. Department of Agriculture, Washington, D. C. Write for the publications and state what products are being packed for sale.

This information is given for the benefit of those who are canning for commercial purposes; every one who cans for the market should be encouraged to know the food laws. Such things sound more serious than they are, and one should not be overwhelmed with the seemingly endless details attached to the canning business. New facts pertaining to food conservation are being published constantly, and those who are interested in the various phases of the subject should keep informed by securing from their State Board of Agriculture, the U. S. Department of Agriculture, and the National Canners' Association, from time to time, all publications and reports.

QUESTIONS

1. What is the meaning of efficiency in canning?
2. Describe the equipment needed and its arrangement when preparing to can in tin.
3. How is "flux" made? For what is it used?
4. What is your standard for the external appearance of a tin of fruit or vegetable? What steps are necessary to secure this standard?
5. Describe how to coat with solder the tipping copper and the capping steel.
6. When such a tin has been opened, what standard should the contents equal? What steps are necessary to secure this standard?

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See end of Chapter VI, page 86.

CHAPTER V

CANNING IN GLASS

CANNING in glass is very similar to canning in tin. The same principles hold good throughout. The initial cost of containers is greater than when canning in tin, but for home use it is more economical, because glass is used year after year, while tin should be used only a single time.

The first four steps under "Canning in Tin" are also to be followed when packing in glass (see p. 60); the additional steps are given below. Convenient arrangement of all equipment is very essential before undertaking the work.

5. **Sterilizing.**—Jars should be washed and placed, side down, in a vessel and covered with cold water. The water should be slowly brought to a boil and allowed to boil for fifteen minutes (Fig. 48).

6. **Packing.**—After selecting and sorting the fruit or vegetable for uniformity in ripeness and size, and after blanching it, the fruit should be arranged in the jar with reference to symmetry and the best use of the space within the container. In placing the fruit or vegetables into a jar, a thin, flexible paddle or spatula, made out of cane or soft white wood, is useful. It is important to have a good, clear syrup. Clear, soft, or distilled water should be used. Sometimes better results could be obtained if the quantity of water used for making the syrup could be first boiled, strained, and cooled before using. Mix the sugar and water by stirring as it heats, to be certain the syrup is uniform (Figs. 49, 50, and 52).

7. **Paddling.**—A more slender paddle is used for taking bubbles of air out after the liquid has been added. This is done by running the paddle down the side of the jar and touching the bubble with the rounded end of the paddle. The air creeps up the paddle to escape and is displaced by the liquid. More liquid should be added after paddling in order to have the jar

full to overflowing. These paddles can easily be made at home (Fig. 51). Bamboo cane is suitable material for making them;

FIG. 48.—Sterilizing glass jars.

FIG. 49.—Packing uniform pieces of rhubarb.

an old fishing pole will do. Split the cane, cut the paddle nine to twelve inches long, leaving a joint at the top for a handle.

FIG. 50.—Well-packed jar of peaches.

Whittle the other end until flat, thin, and flexible. Then sandpaper. If green bamboo cane is used, place in the sun to dry after making the paddle.

8. **Adjusting the Rubber and Cap.**—Be sure the rubber is carefully flattened in its groove and no particle of fruit or seed is present on it before placing on the cap. When a glass-top jar with wire clamp is used, place the lid on evenly and raise both clamps up, the upper one fastened to hold the lid in place. When a screw-top jar is used, screw the cap evenly about half way. With a hermetic jar no rubber ring is necessary; simply fasten the cap in place on the jar with the clamp. The hermetic jar is self-sealing as it cools, and does not need to have any adjusting of the cap or clamp after processing, as is the case with each of the other above-named jars; simply leave the clamp in place until the jar is entirely cold.

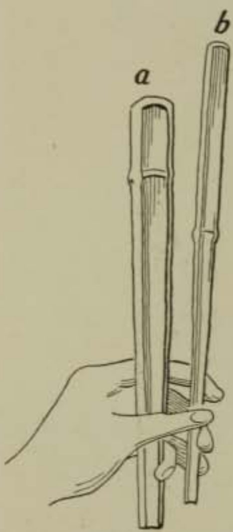

FIG. 51.—Paddles: a. Packing paddle. b. Syrup paddle.

9. **Processing.**—Place the jars on a wooden, galvanized, or wire rack to hold them off the bottom of the processor, which is directly over the fire. Sometimes a cloth is put in the bottom of the vessel before placing jars, but this is not a good practice, since the weight of the jars presses the cloth against the bottom of the processor and often causes it to stick and burn. A rack which holds the jars up an inch or two off the bottom is better. In a hot-water canner the water around the jars should be of the same temperature as the contents of the jar to prevent them from cracking, and the water should come within two inches of the tops of the jars. Have a tight cover for the vessel to keep in the steam. Do not count time until the water begins to boil. Keep it boiling steadily for the time required. Seal the jars air-tight promptly at the end of the processing, and remove them from the bath, being extremely careful not to allow a cold

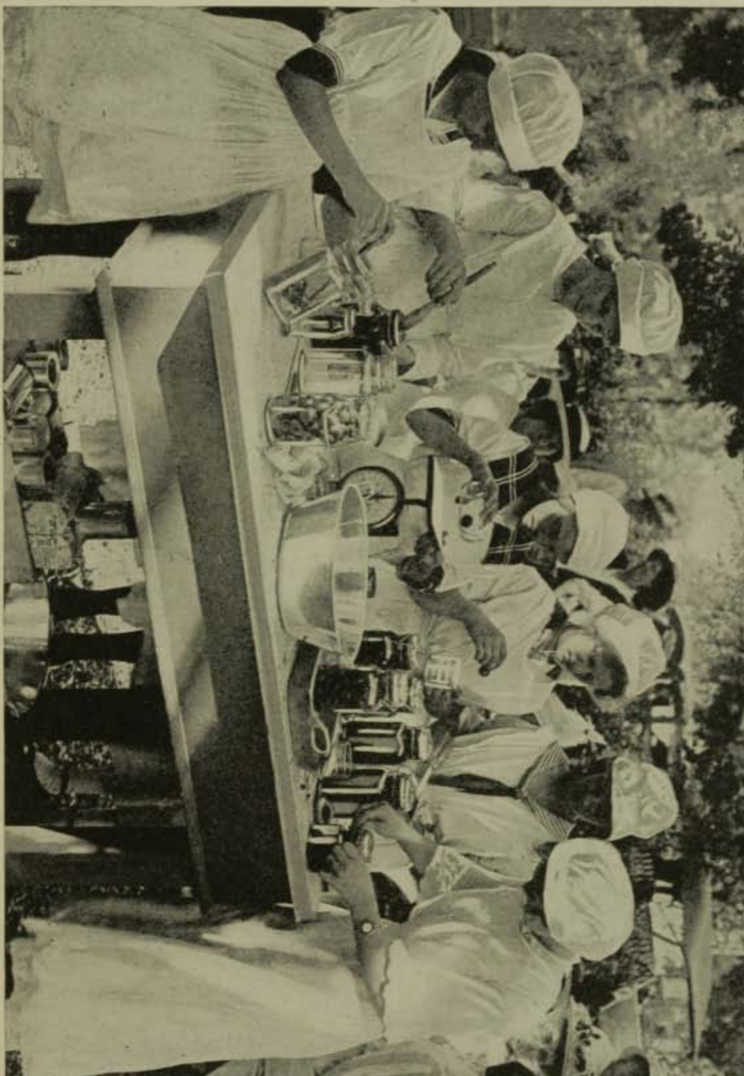

Fig. 52.—Canning in glass on campus of Peabody College for Teachers, Nashville, Tenn.

draught to strike them. In intermittent processing raise the clamp of the jar at the beginning of each processing to allow for expansion. Seal at the close of each processing. The hermetic jar is not a suitable one for intermittent processing. Processing in glass in a steam-pressure canner is described in a later chapter, "Processing at High Temperatures" (see p. 87).

10. **Labelling.**—Each jar should be washed and polished before labelling. Here again the choice of the label should be made carefully. One just large enough to have printed the necessary requirements is sufficient. Choose a neat label: white is preferable, with plain, simple black printing. A fancy colored label may not be in harmony with the color of the contents of the jar and will detract from the attractiveness of the product. Place the label on the plain side of the jar, midway between the seams and one-quarter inch from the lower edge. When labelling products to be sold, the name of the contents, name and address of the packer, and net weight in pounds and ounces must be stated.

Storing Canned Products.—Store the canned products in a cool, dry, dark place. Light will cause the color of the products in glass to fade, while products in tin are, of course, not affected by light.

QUESTIONS

1. Give in outline form and in order the steps necessary when canning in glass.
2. What steps in this process differ from the steps in canning in tin? To what are the differences due?
3. Which container is more economical for home use? Why is this true?
4. State definitely the principles which are the basis for all kinds of canning.

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See end of Chapter VI, pages 83 and 86.

CHAPTER VI

PROCESSING—HOT-WATER BATH

PROCESSING is the term applied to the operation of sterilizing or heating to destroy bacteria so that the canned goods will keep.

All fruits and juicy vegetables are better in color and texture if sterilized at or near the boiling-point (212° Fahrenheit). For this purpose the hot-water bath is commonly used. Sometimes these oufits can easily be made at home, according to the amount of canning which is to be done.

Homemade Canners.—If only a few jars or cans are to be processed at a time, then flat-bottom vessels, such as a wash-boiler, ham boiler, preserving kettle, or bucket deep enough to permit of being covered after the jars or cans are placed on the false bottom inside, will serve the purpose (Fig. 53). When any of these utensils are used it is necessary to have a false bottom on which to set the jars or cans while processing. Narrow strips of wood or wire netting made of medium-sized galvanized iron may be used for this rack. The vessel should be equipped with a tight cover, preferably tin, which is kept in place while the sterilizing is being done (Fig. 54). Such small outfits are intended for use on an ordinary cook stove or range.

A homemade canner for use out of doors, where larger quantities can be handled, may be made out of tubs or fifty-pound lard cans. Heat for these canners is furnished by portable stoves, or by furnaces made of brick or stone (Figs. 55 and 56).

Commercial Outfits.—The purchase of an expensive or especially made outfit in which to do the cooking is not necessary. There are, however, a number of inexpensive commercial outfits which give very satisfactory results. Some of these canners are well built and excellent work can be done, both for commercial purposes and for home use. These outfits range in size from those having a four-can capacity to those having a capacity of a few hundred cans. The price varies according to size of the canner and the number of tools and accessories included in the outfit.

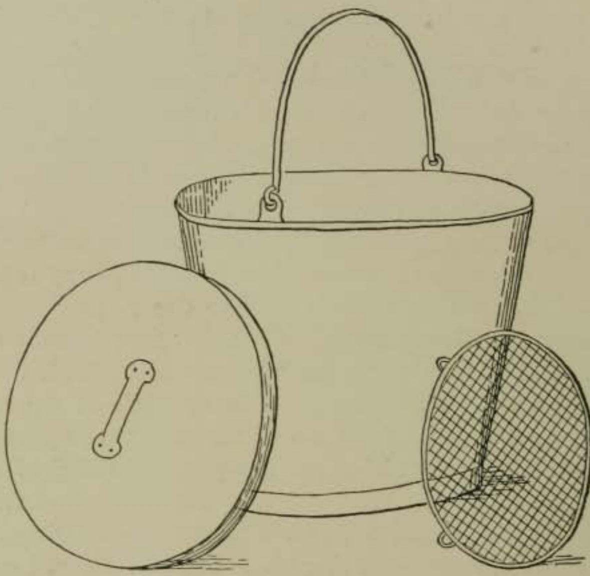

FIG. 53.—An ordinary bucket used as a processor.

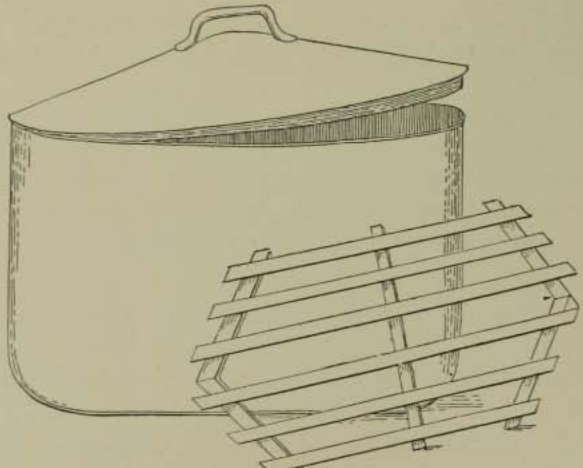

FIG. 54.—A wash-boiler with false bottom makes a convenient processor.

Manufacturers furnish catalogues having full descriptions and price-lists of these various outfits, and in order to secure a canner best suited to conditions a study of different catalogues will help to make the decision. The requisites of a good commercial hot-water outfit may be enumerated thus: First, good quality of material used and of workmanship in the construction; next, the convenience and cost of operation, in order that

FIG. 55.—Canner made of tubs for outdoor use.

the best results can be obtained with the least possible expenditure of time, labor, and fuel.

Equipment Accompanying the Purchased Canner.—The usual portable canner for out-of-door use consists of the following:

Canner	Accessories	Materials
Fire-box	Tipping copper	Bundle of wire solder
Return flue	Capping steel	Powdered sal ammoniac
Water tank	Can tongs	Bottle of flux
Trays or wire baskets	Tray lifters	Coarse sand-paper or file
Chimney	Fluxing brush	
Tight cover	Charcoal bucket or	
	Fire-pot for heating tools	

Some canners are round and some rectangular in shape. The lower section or fire-box has a small opening in the door through which the soldering tools may be placed for heating. The water in the upper section will heat more quickly if a smoke passage is placed in such a way that the water chamber is heated from the smoke passage as well as from the fire-box. Sometimes the chimney is attached at the front of the canner near the fire-box door; this necessitates the smoke returning from the outlet at the other end of the fire-box back to the chimney, and, if the water chamber extends down between the smoke passage and the fire-box, the extra heat obtained in this way will cause the water to boil more quickly, thus saving time and fuel. The baskets or trays for holding the cans in the canner are made of galvanized metal, with a wire bottom and wire handles. This basket serves as a false bottom and fits into the water tank, resting slightly above the top of the fire-box and smoke passages. A wooden rack should be placed below this basket when canning in glass so that the bottom of the metal tray will not rest directly on the fire-box. A basket full of cans may be lifted out with wire tongs. The top of the canner is fitted with a tight cover, which keeps in the heat (Fig. 57).

FIG. 56.—A homemade canner with brick fire-box and tub.

Canners should have water in the upper section before a fire is built; if this is neglected with the type of canner which is

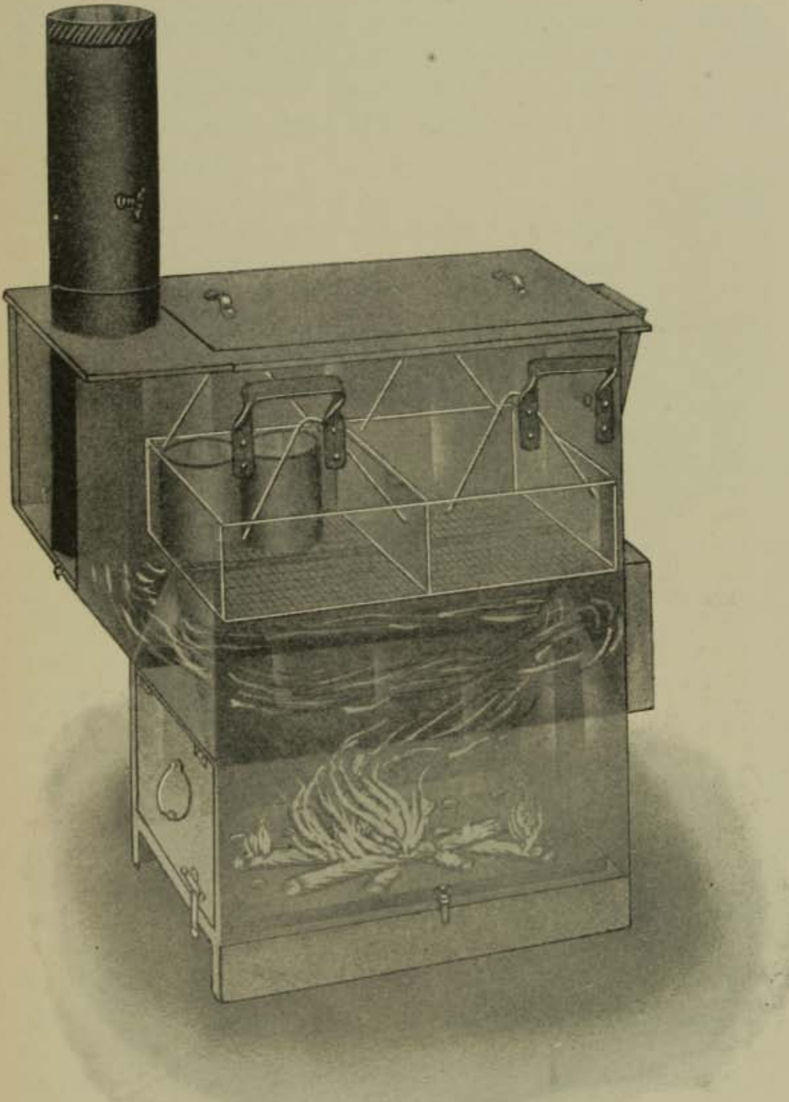

FIG. 57.—Showing construction of a hot-water canner. (Phillips & Buttorff, Nashville, Tenn.)

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soldered together, the solder will melt and the water will leak out, making the canner useless until it is mended.

The chimney should be tall enough to provide a good draught and to carry the smoke away. The smoke from a pipe which is

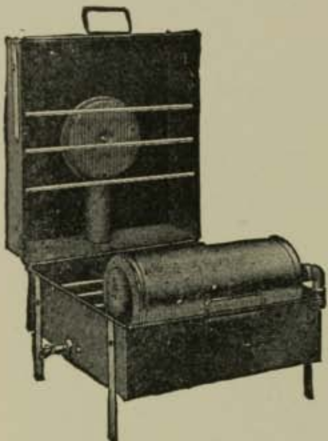

Fig. 60.—Tank fitting inside.

Fig. 58.—A kerosene stove burning a gas flame. (Globe Gas Light Company, Boston, Mass.)

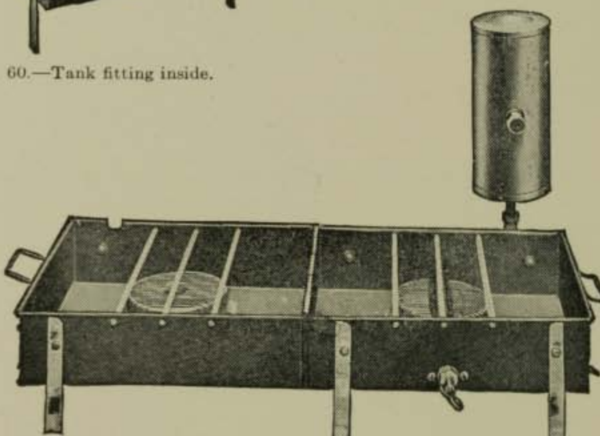

Fig. 59.—A folding two-burner gasoline stove. (W. J. Baker Co., Newport, Ky.)

too short is most objectionable to those who are canning (Fig. 57).

For Heating the Tools.—The tools may be heated in the fire-box of the canner, but the suggested fire-pot, charcoal bucket, or gas-flame stove is better for this purpose, since the tools heat more quickly and do not have to be cleaned so often (Fig. 58). An ordinary bucket with a hole cut out of one side near the bottom will make a good substitute for a fire-pot if charcoal or corn-cobs are burned in it. Care must be taken to have the fuel burned to a bed of glowing coals before attempting to heat the tools. This is necessary to keep the copper and steel smooth and clean (Figs. 58, 59 and 60).

A Time-table for Use in Canning Fruits and Vegetables When the Hot-water Process is Used.—To obtain satisfactory results with these outfits, consideration should be given to the length of the sterilization period, which is indicated in the table below, in the column headed "Process." Since the temperature cannot be controlled below the boiling-point, it is necessary to start counting the time when the water begins to boil and keep the boiling constant throughout the process. Complete sterilization can be obtained by following this table if the essentials as outlined in other chapters are fulfilled.

Intermittent Processing.—The vegetable is processed for forty-five to sixty minutes at boiling temperature on each of three successive days.

QUESTIONS

1. Describe an outfit for processing by the hot-water bath which may be made at home. Explain the principle which makes necessary each detail described above.
2. If purchasing a commercial hot-water outfit, what points should be considered?
3. How will the position of the chimney on a commercial canner influence the time needed to heat the water?
4. Describe a homemade fire-pot. What fuel may be used in it? In what condition should the fuel be before placing the tools in it? Why is this care necessary?
5. Why do starchy vegetables require a longer processing than those containing a large percentage of water?
6. Why is it necessary to keep the temperature constant during the processing?

CANNING VEGETABLES (HOT-WATER PROCESS)*

Do Not Attempt to Use this Table Without Reading All Directions Carefully

Vegetable	Blanch, minutes	Liquor	In tin			In glass	
			No. of can	Exhaust, minutes	Process	Jar	Process
Asparagus	3 to 4	Brine (heavy)	2	3	Intermittent or 2 hours	Pint	Intermittent or 2 hours continuous.
String beans	3 to 8	Brine	2	3	Intermittent	Pint	Intermittent or 2 hours continuous.
String beans	3 to 8	Brine	3	5	Intermittent	Quart.	Intermittent.
Lima beans	2 to 5	Salt, sugar, water	2	3	Intermittent	Quart.	Intermittent.
Beets	Cook ¾ done, peel	Hot water	2	3	1 to 2 hours	Quart.	1½ to 2 hours.
Carrots	Cook ¾ done, scrape	Brine	2	3	1 hour	Quart.	1 hour.
Corn	1 to 3 (blanch on cob)	Salt, sugar, water	2	10	Intermittent	Quart.	Intermittent.
Okra	6 to 8	Brine	2	3	Intermittent	Pint and quart	Intermittent.
Peas (very young)	1 to 3	Salt, sugar, water	2	3	45 minutes first day, 35 minutes second and third days	Pint	Same as No. 2 can.
Peas, medium	3 to 8	Salt, sugar, water	2	3	Intermittent.	Pint	Intermittent.
Potato, sweet	Cook ¾ done, peel	Pack dry and hot	3	15	4 hours	Quart.	4 hours.
Peppers	Roast and peel		1	3	25 minutes	Pints	35 minutes.
Rhubarb		Cold water	2	2	15 minutes	Quart.	15 minutes.
Soup mixture, conc'tr'd		Salt, sugar	2	5	2 hours or intermittent	Quart.	2 hours or intermittent.
Spinach	4	Brine	2	3	1 to 2 hours	Pints	1 hour.
Tomato	Scald, peel	Salt, sugar	2	2	20 minutes	Pint	15 minutes.
Tomato	Scald, peel	Salt, sugar	3	3	30 minutes	Quart.	30 minutes.
Sour Kraut		Brine	2	3	30 minutes	Pint	35 minutes.
Vegetable Macedoine		Brine	2	3	2 hours or intermittent	Pint	2 hours

NOTE.—String beans packed in No. 2 cans are preferable because more surely sterilized (Figs. 58, 59 and 60).

Corn, lima beans, and peas should never be packed in larger container than No. 2 and always be processed intermittently. Corn is cut from cob after blanching.

Soup mixture containing corn and lima beans should always be processed intermittently.

The brine used is made of 2½ ounces salt to 1 gallon of water, except for asparagus, which contains 4 ounces to 1 gallon.

Beets and rhubarb when packed in tin must be put in enamel-lined cans.

CANNING FRUITS (HOT-WATER PROCESS)

Fruit	Blanch	Syrup	In tin			In glass	
			No. of can	Exhaust, minutes	Process, minutes	Jar	Process, minutes
Apples	1 minute	No. 1	3	2	8	Quart	12
Berries		No. 3	2	2	10	Quart	12
Cherries, sweet	15 seconds	No. 3	2	2	20	Quart	25
Cherries, sour	15 seconds	No. 4	2	2	20	Quart	25
Currants		No. 3	2	2	15	Quart	15
Figs	Soda blanch	No. 3	2	2	25	Quart	20
Fruit Macedoine		No. 3	2	2	20	Quart	25
Gooseberries		No. 3	2	2	15	Quart	20
Guava	15 seconds	No. 4	2	3	20	Quart	35
Guava	15 seconds	No. 4	3	3	25	Pint	25
May haw		No. 3	2	2	20	Quart	25
Peaches	15 seconds	No. 4	3	3	15	Quart	20
Pears	15 seconds	No. 3	3	3	20	Quart	25
Plums	Prick with needle	No. 4	2	2	12	Quart	15

NOTE.—Berries, cherries, currants, figs, gooseberries, May haws, and plums when packed in tin must be put in enamel-lined cans.

To make the syrups recommended, boil sugar and water togethe. in the proportion given below until sugar is dissolved. Strain all impurities out of the syrup before using:

Syrup No. 1, use 14 ounces to 1 gallon water.
Syrup No. 2, use 1 pound 14 ounces to 1 gallon water.
Syrup No. 3, use 3 pounds 9 ounces to 1 gallon water.
Syrup No. 4, use 5 pounds 8 ounces to 1 gallon water.
Syrup No. 5, use 6 pounds 13 ounces to 1 gallon water.

The syrup for canned berries is made out of berry juice instead of water.

Syrups made by this table range in density from 10 degrees to 50 degrees as measured by a Balling saccharometer. Uniform results can be obtained without the use of a saccharometer. No. 1 syrup is of 10 degree density, No. 2 of 20 degree density and so on.

* NOTE.—This table is quoted from circular No. A-81, written by Miss Mary E. Creswell and Miss Ola Powell, of the States Relations Service, U. S. Department of Agriculture.

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CHAPTER VII

PROCESSING AT HIGH TEMPERATURE

Steam Retorts.—Iron boxes or steel cylinders, known as retorts, are used in processing by steam at a temperature above the boiling-point (*i. e.*, higher than 212° Fahrenheit). The retorts may be vertical or horizontal, the size being determined by the number of cans to be handled daily.

In the vertical retorts steam may be used alone or it may be introduced into water; in the horizontal retorts steam alone is used. Vertical retorts are used where canning under high temperature is desired in the home, and in small canning plants. The steam pressure may vary from five to fifteen pounds, thus giving a temperature of 220° Fahrenheit (105° Centigrade) to 255° Fahrenheit (124° Centigrade). The proper control of time and temperature is very important. This is regulated by recording thermometers and temperature controllers attached to the retort.

Small Outfits for Home Canning.—An expensive equipment is not necessary when canning in small quantities at home. A variety of small steam canners for home canning are on the market (Fig. 61). The prices vary according to the size and quality of material used in making them. The construction of these outfits resembles that of the regulation steam boiler. They are made of a high-grade metal, and the seams are so riveted, soldered, and joined as to make them water-tight and steam-proof. A band of packing is placed around the groove in the outer rim of the cover, which keeps the inside chamber steam-tight when the cover is clamped on. This part of the canner wears out after a time and should be replaced if the canner is to continue to give the best results.

A brass pet cock which allows for the free circulation of steam and escape of dead air is screwed into the cover. This should be left slightly open while processing.

Fig. 61.

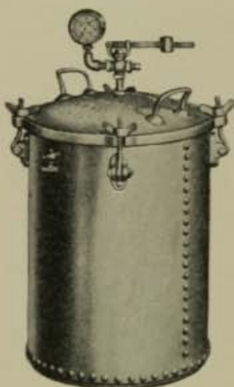
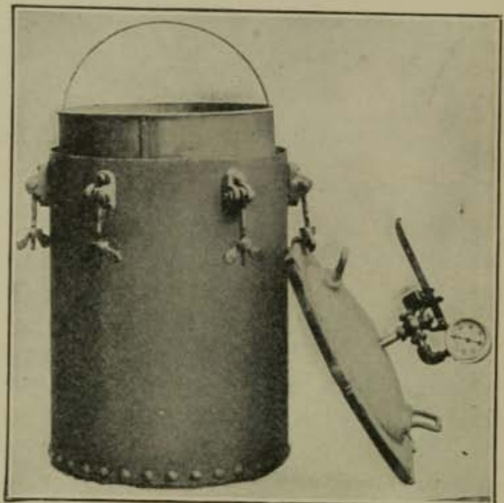


Fig. 62.



Figs. 61 and 62.—A steam retort for home canning.
(Northwestern Steel and Iron Works, Eau Claire, Wisconsin.)

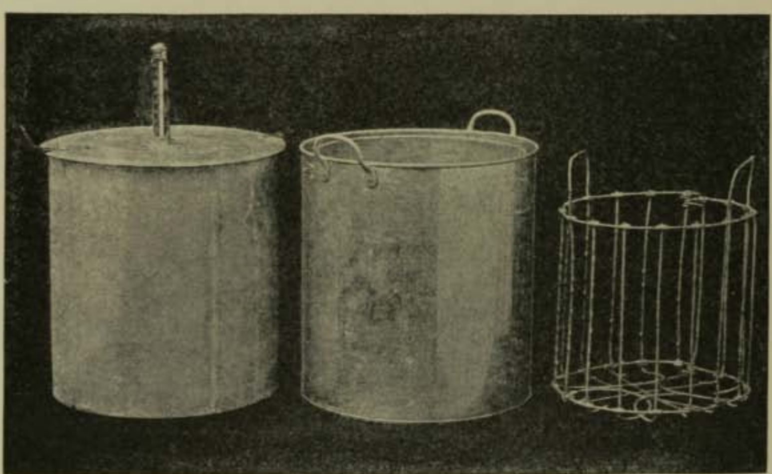


Fig. 63.—Another type known as the water-seal canner requires only a small amount of water and it can be raised quickly to the boiling point with the use of very little fuel. A slight pressure can be secured.

There is a dial gauge, the needle of which moves upward when the temperature of the interior of the canner rises above boiling (212° Fahrenheit). The figures on the face of the dial indicate the number of pounds of steam pressure and also its equivalent

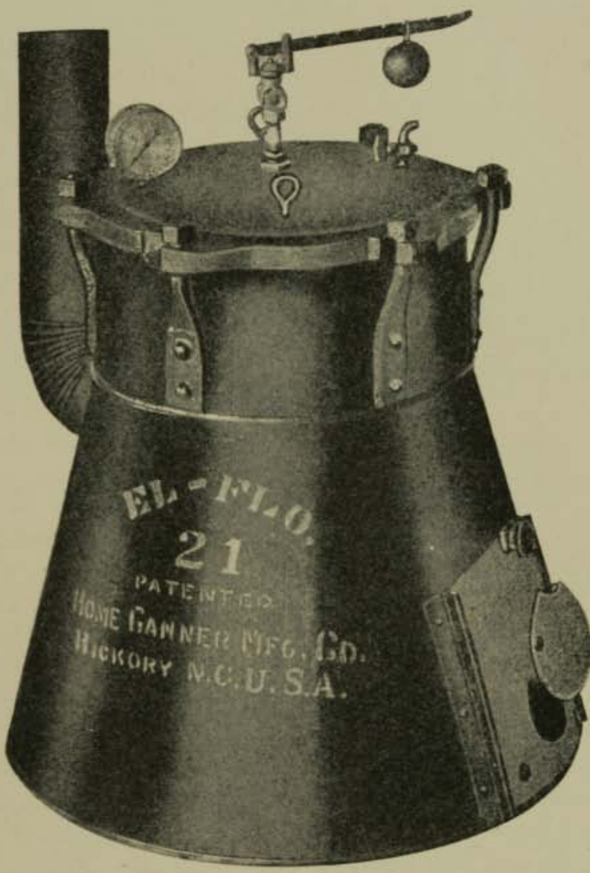


FIG. 64.—Another steam-pressure outfit for home canning.

degree of heat. A safety valve is also attached. The "weight and arm" style valve automatically regulates the pressure inside the retort from one to fifteen pounds. The weight on the arm may be set at any point on the lever, as it is made to slide back and forth.

When a certain time for the process is desired the steam gauge should be watched until it shows the required amount of pressure. Set the weight so that enough steam will escape from the valve to retain that temperature. After the processing the steam should be let off by raising the bar on the valve or by opening the pet cock before removing the cover of the canner (Fig. 64).

A wire basket or galvanized crate comes with the outfit. This is a great convenience, for it can be used in blanching, exhausting, and sterilizing. While sterilizing is in progress this basket or crate rests on a false bottom, which is sometimes made of galvanized iron. This permits of free circulation of steam underneath and around the cans. The capacity of a small retort is about 150 to 250 cans daily, and it will generate and hold about fifteen-pound pressure of steam. An outfit to be used in canning under steam pressure should be built of strong material and have sufficient attachments to determine and regulate the temperature. The results of processing under steam cannot be assured without a thermometer; a gauge for reading steam-pressure is a substitute, since, as indicated in the table below, a definite pressure gives a definite degree of heat (Fig. 65).

Fig. 65.—Pressure cooker.

A steam retort may be converted into a hot-water canner by filling the canner with water and keeping it at a temperature of 212° Fahrenheit. Some outfits require that the steam be piped into the retort from a boiler tank. This is more often true with the larger and more expensive outfits (Fig. 66). Separate retorts which can be used over a stove or out of doors are made, and often gasoline burners are sold with them as a necessary accessory. Charcoal furnaces and a gas-flame oil stove will give good results, and they are less expensive and more easily handled. Other canners have a fire-box built in; when used out of doors the fire is protected and steam can be obtained more quickly.

FIG. 66.—Commercial retorts where steam is piped in from the boiler. (Heinz Company)

TIME-TABLE FOR PROCESSING BY STEAM

Name of product	Blanch	Season-ing	Exhaust No. 2	Exhaust No. 3	Temper-ature, F.	Pressure in pounds	Time No. 2 can, pints
					Degrees		*Minutes*
Asparagus	Same	Same	Same	Same	240	10	30
Beans					240	10	45
Beets					228	5	30
Brussels sprouts	as	as	as	as	228	5	30
Corn					250	15	80
Egg-plant	for	for	for	for	240	10	55
Hominy					248	15	50
Okra	hot-	hot-	hot-	hot-	248	10	30
Peas					240	10	45
Potato, sweet					250	15	70
Pumpkin	water	water	water	water	240	10	65
Kraut					228	5	20
Spinach	can-	can-	can-	can-	240	10	35
Squash					234	8	65
Succotash	ning	ning	ning	ning	248	15	40
Vegetable soup					228	5	35

Much time, labor, and fuel can be saved by sterilizing some of the heavy starchy products under steam pressure (see table above and Fig. 66).

QUESTIONS

1. What is meant by the term "processing at a high temperature"?
2. For what kind of foods is this method particularly advantageous? Explain your answer.
3. What two points must be watched constantly while processing at a high temperature? Explain your answer.
4. How would you examine a steam canner to determine its value?
5. What part of the best canner will deteriorate with use?
6. What is the purpose of the "pet cock"? Where is it located? How should this cock be while processing? Explain your answer.
7. Describe how to secure the pressure desired while using a steam canner.
8. When a definite time is desired for the processing, from what point in this process will you count the time?
9. What precaution should be taken before opening the canner? Why is this necessary?
10. For what other method of canning may a steam canner be used? How can this be done?

BIBLIOGRAPHY

See Chapter VIII, page 122.

CHAPTER VIII

FRUIT JUICES

Value.—The many ways of using fruit juices make them a most valuable product to have on hand throughout the year.

Medicinal.—Fruit juices were used almost exclusively for medical purposes until recently. It is still a common practice in Europe for physicians to send their patients to the vineyards to drink the fresh juices as they come from the press.

Daily Menu.—The juices of such fruits as grapes, currants, cherries, blackberries, raspberries, plums, and apples make wholesome and delicious beverages, as well as being a pleasant addition to the daily menu. Nothing is more refreshing on a hot day than a cool fruit-juice drink, which may be easily prepared from bottled juices.

The dessert may be varied with very little expenditure of strength, time, and money by the use of different fruit juices. These may be used in making sherbets, ice-cream, puddings, sauces, and gelatine desserts.

Social Functions.—The combination of fruit juices makes an attractive fruit punch to be served at any social function.

GENERAL PREPARATION

Much depends on the methods used in picking, assorting, and cleaning the fruit used in making fruit juices, syrups, and vinegar.

Picking.—It is important to select only ripe fruit; green fruit gives too much acidity to the finished product, while over-ripe or spoiled fruit imparts a disagreeable taste. Shallow trays or baskets are better adapted for picking, because they prevent crushing and bruising of the fruit.

Assorting.—Even after careful picking it is well to sort over the fruit on the trays, selecting only the sound fruit and discarding the green and rotted fruit.

Washing.—The fruit should be washed carefully to free it from adhering dust and dirt, which are always found in more or less amounts on freshly picked fruits. This is best accomplished by placing the fruit in a wire basket or colander and allowing a spray of water to run over the fruit. Often the fruit is bruised with the hands when washing it in a deep pail of water, so this method should not be used. It is important to use utensils which will not be affected by fruit acids, and to preserve in glass storage containers, in all fruit-juice work.

EXTRACTING JUICES

The amount of work involved is relatively far less when the juice is extracted in large quantities than in small amounts, because of the many labor-saving devices that are applicable if one is handling material in quantities.

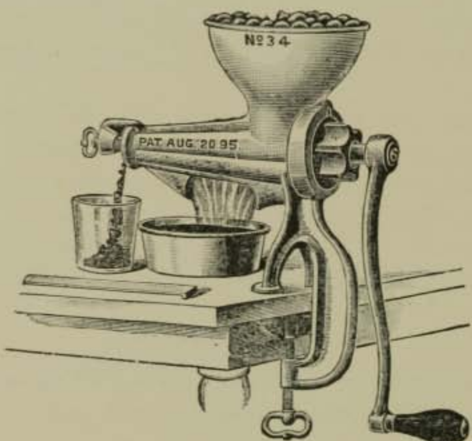


Fig. 67.—Household fruit-juice press.

Cold Process.—This process consists of crushing and then pressing the fruit to facilitate the overflow of juice. An ordinary cider mill may be used for handling the fruit in quantities, but if only a small quantity is to be taken care of, the fruit may be crushed with a potato masher, food chopper, or fruit-juice press (Fig. 67). After crushing, the fruit is then pressed in a cloth by twisting the two ends in opposite directions (Fig. 68) until the greater part of the juice is extracted.

A homemade press may be constructed as follows:

Figure 69 shows a very efficient lever press which any farmer who is handy with tools can make for himself from material which can be found on almost any farm at any time. The press consists of the following parts: Two upright posts (F) are set deeply and firmly in the ground, about twelve inches apart. It is well to attach cross-pieces (ordinarily known as "anchors" or "dead men") to the ends in the ground to prevent the posts from pulling out too easily. The lever (E) may be hung either between these posts by means of a bolt (T) or to the side of a building, or a hole large enough to admit the lever may be notched in a tree and

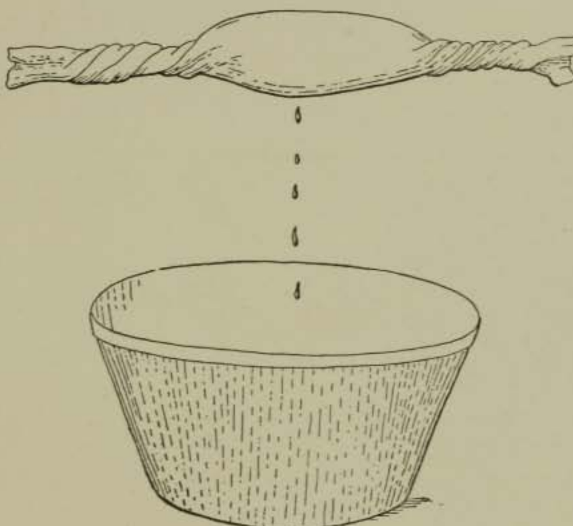


FIG. 68.—Cloth press being twisted.

a lever fastened by a bolt. At the other end are two posts, between which the lever can be raised by means of block and tackle. The press itself consists of two timbers (D) on which rests the press bottom (B). On this bottom is set a press basket (A), consisting of two sides and two ends held together by means of rods (L), and so constructed that it can be easily taken apart and put together again. The sides and ends are bored full of small holes, from three-eighths to one-half inch in diameter, through which the juice is pressed. When the press is filled with fruit, the top, which fits inside the basket, and the cross blocks (I) are put on and the lever caused to press down on them. A large tub (*C*) is placed under the press to catch the juice. The rope running through pulley block (*G*) fastened to cross-piece (*K*) is used to lift up the lever of the press; while pressure or weights on the end of the lever (*E*) work the press.

For ordinary purposes a press basket three feet square and two feet high, holding a ton of crushed grapes, will be found to

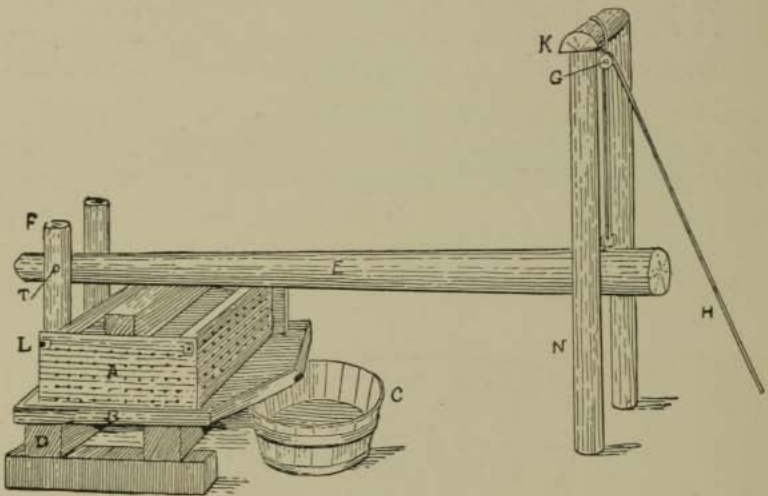


FIG. 69.—Construction of a homemade fruit press.
Drawing made from illustration in U. S. Dept. of Agriculture Farming Bulletin No. 758.

be a very convenient size. It is perhaps well to state that the longer and heavier the lever, the greater the pressure exerted on the fruit. When it is not convenient to make the lever very long, weights are placed or hung on the outer extremity in order to increase the pressure. With a little ingenuity any farmer can adapt this press to suit his individual requirements. (Figs. 70 and 71.)

Sometimes in pressing grapes for beverages only the "free-run juice" is desired. This is the juice which is found between the skin and the pulp. Only sufficient pressure to burst the skin is necessary to secure this "free-run juice." This gives a product which is more brilliant, clear, fragrant, and delicately flavored than the "total juice."

Hot Process.—Juices of small fruits may be prepared with or without previous heating, but heating before pressing increases the yield of juice, intensifies the color, and develops a more dis-

Fig. 70.

Fig. 71.

Fig. 70.—Fruit press ready for use.
Fig. 71.—Fruit press in use. (Courtesy U. S. Department of Agriculture.)

tinctive flavor than can be obtained by simply cold pressing. There are, however, a few exceptions. Juices flow more readily from fruit when heated than when cold. When the fruit juice is to be used for jelly-making the hot pressing is necessary, because heat is essential to develop the pectin, the jelly-making substance found in fruit juices.

If the berries or small fruits are to be heated before pressing, about one-half the quantity should be crushed with a wooden potato masher in the vessel in which it is to be cooked before heating. Place the utensil containing the fruit over a second vessel containing hot water, so that the fruit may be steamed instead of stewed until tender. A better color and flavor will be retained if the fruit is not allowed to come in direct contact with the fire. The less juicy fruits require addition of water and a longer heating to extract the juice.

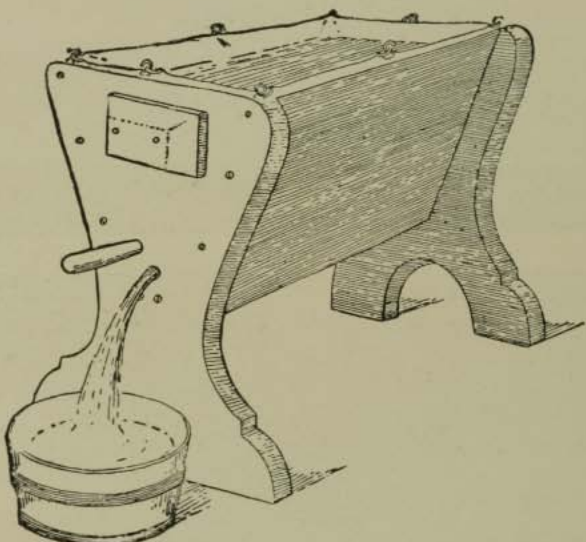


FIG. 72.—A homemade fruit-juice filter.

Usual factory methods render the pomace, or cheese (the remaining pulp), almost dry enough to burn. From an economical standpoint, squeezing the pulp is considered a good practice, except where the free-run juice alone is desired. When the juice is extracted it may be filtered by allowing it to drip through a flannel or felt cloth. Both the "free-run juice" and "total juice" should be carefully strained before bottling. After the juice has dripped through this filter, allow it to stand while the bottles are being sterilized, so that the suspended substances present will drop to the bottom and render the juice less turbid. Now the clear juice may be poured off without disturbing the sediment. The juice which has been strained should be protected from the dust. This can easily be done if a strainer such as shown in figure 72 is used.

PACKING

Reheating the Juice.—Some concentrated juices are packed cold, but thin juices will not keep unless heated to a temperature of 170° to 190° Fahrenheit. The temperature should never be allowed to go above 200° Fahrenheit. Fruit juices should never boil, because boiling injures the color and flavor. If a thermometer is not available to regulate the temperature, heat the juice in a double boiler and allow it to steam or simmer for five minutes.

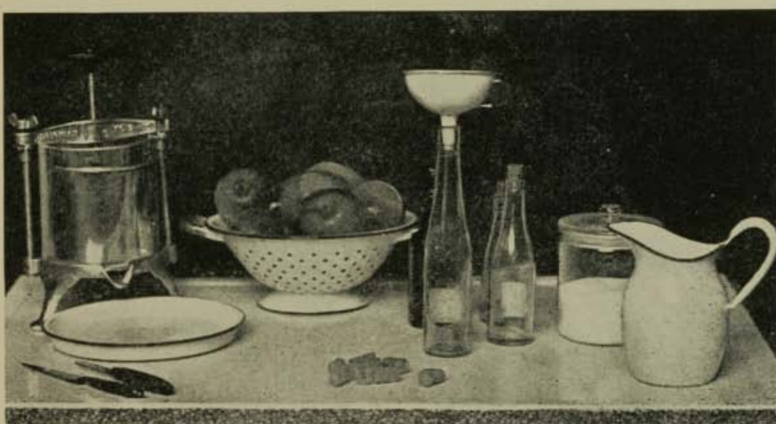


Fig. 73.—Bottling fruit juice.

Bottling.—The preparation of fruit juices for bottling in the proper season requires little time and skill (Fig. 73). The juice should be poured immediately into hot sterilized bottles, allowing about one inch at the top for the expansion when the juice in the bottles is heated. If the juice is strained cold into the bottles, more space at the top should be allowed for expansion than when juice is packed hot. When juices are bottled for beverages, the addition of a small amount of sugar will produce a finer flavor.

The proportion varies, but a fair allowance is one cupful of sugar to one gallon of juice. No sugar should be added to the juice when it is bottled if it is to be used for jelly-making later. This method of allowing the bottled juice to stand undisturbed insures the getting rid of tartaric acid crystals in grape jelly which are so objectionable. On standing, the tartaric acid crystallizes and the crystals settle. When the juice is to be used for jelly-making it should be poured off carefully, so as not to disturb the sediment which contains these crystals.

Corking.—Soak new corks for one-half hour in warm soda water (one teaspoonful of soda to one quart of water), and then dip them into boiling water immediately before using. The corks should be placed loosely in the bottle before pasteurizing. Sometimes a small circle of cloth is tied over the cork during pasteurization to keep it from blowing out. This is better than using a patented device. Neither of these will be necessary if sufficient space is allowed at the top of the bottle when filling with juice and the water-bath is kept at the proper temperature.

Pasteurizing.—The term "pasteurizing" is used here in place of sterilizing because of the low temperature used in heating fruit juices.

An ordinary wash-boiler makes a simple homemade pasteurizer if fitted with a false bottom. This false bottom prevents the bottles from coming in direct contact with the bottom of the vessel. A free circulation of water around all sides of the bottles will keep them from breaking. The vessel should be filled with water to within one inch of the top of the bottles. Heat the water slowly and allow it to simmer for twenty to thirty minutes, the length of time to depend upon the size of the containers used and the kind of juice being pasteurized. Testing the temperature of juice in the bottles with a thermometer gives greater accuracy. If this test is used, allow the corks to float on the water in the boiler until the pasteurization point is reached. Heat the juice to 140° to 150° Fahrenheit and hold this temperature for thirty or forty minutes, cork the bottles, and cool to temperature of 70° to 75° Fahrenheit before removing the containers from the water-bath.

Sealing.—Immediately after the pasteurizing the sterilized corks should be driven tightly into the bottles to seal them securely. Place the neck of the bottle on the edge of the table and with a sharp knife cut the corks off even with the tops of the bottles and seal air-tight with melted paraffin or wax (Fig. 74). After cutting the cork, turn the bottle upside down and dip one inch of the neck into the melted wax, turning the bottle as it is lifted out to give a smooth coating to the sealing wax.

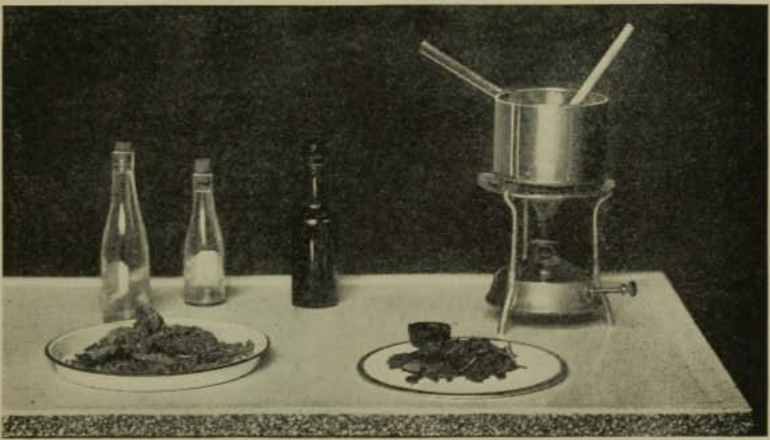


FIG. 74.—Making sealing wax.

Homemade Sealing Wax.—Melt together equal parts of shoemaker's wax and resin. This should be done in a pan over hot water to prevent scorching and to make it a pretty amber color. Dip the corked bottles into it after it has melted. Various colors may be obtained by adding the following in given proportions to the melted wax. To each three pounds of resin used add:

For red color, ½ ounce Chinese vermilion.
For black color, 3 ounces lampblack.
For green color, 5 ounces chrome green.
For yellow color, 5 ounces chrome yellow, 1 ounce shellac.

For a white sealing wax, melt together 2 pounds white resin, 1 ounce white varnish, 1 pound beeswax, and ¼ ounce zinc white.

Capping.—If a screw cap is to be placed on the bottle over the cork, the sealing wax should be omitted (Fig. 75). When a crown cap is used the bottles of fruit juice are usually pasteurized open and the cap crimped on by a hand machine immediately after the pasteurizing (Fig. 76).

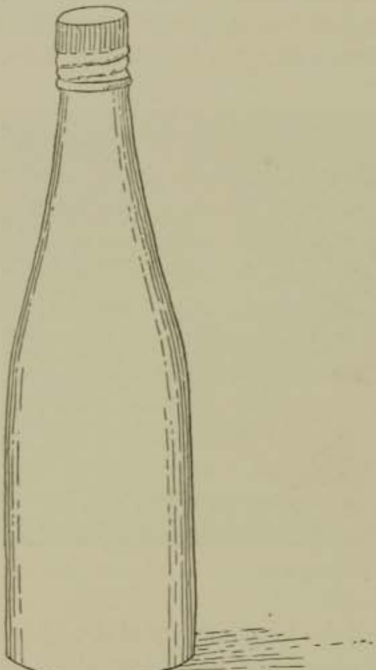


FIG. 75.—Screw-cap bottle.

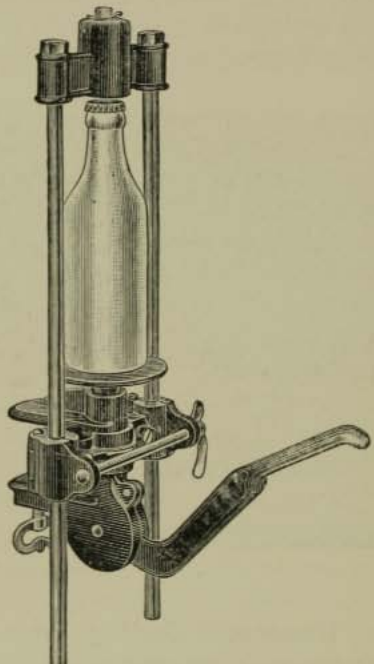


FIG. 76.—A hand bottle sealing machine. (Enterprise Manufacturing Company, Philadelphia.)

Labelling.—The appearance of the package depends a great deal on the label. Before labelling, wash and polish each bottle. Place the label midway between the seams of the bottle and one-fourth inch from the lower edge. On each label should appear name of product, net weight stated in pounds and ounces, and the name and address of packer. Fresh clean labels should be placed on commercial bottles just before they are packed for delivery.

Storing.—All bottled fruit juices should be stored in a cool, dark, dry place. If left in a bright light the color will fade and the juice will be less attractive. Unfermented juices properly made and bottled will keep indefinitely if not exposed to the air or to infection from mold germs. When a bottle is once opened the contents, like canned goods, should be used as soon as possible. The bottles or jars should be small enough so that the contents may be used at once, and not allowed to stand until they spoil.

SPECIAL PRODUCTS

Cider.—Cider making requires a comparatively inexpensive equipment and involves only a small amount of labor. Cider is not considered a profitable commercial product, because it is bulky and perishable. By following the methods given for bottling other fruit juices, fresh cider may be easily kept through the year. Usually cider is sterilized at too high a temperature, which destroys the delicate flavor of the fresh juice and renders it unappetizing. The length of time cider may be kept open before it ferments sufficiently to be considered as becoming "hard" or sour varies with temperature conditions and also depends on the presence of fermenting agents.

Concentrated Cider or Apple Syrup.—The sugar percentage is low in fresh cider, and it contains so much water that the market for it is limited. Methods of reducing its bulk and changing it into an article which will keep throughout the year have been devised. Attention has often been called to the fact that when ordinary cider freezes part of the water separates and freezes, leaving unfrozen a concentrated cider having natural cider flavor and a reduced water content, a higher percentage of sugar and other solids. Experiments in boiling down fresh cider to secure a concentrated syrup gave a product with a distinctly acid flavor, due to an excess of acid known technically as malic or apple acid. The problem resolved itself into removing the excess of acid, and this was finally accomplished by adding carbonate or milk of lime to the cider, which precipitates the acid and, after settling or filtering and boiling, yields a staple and attractive table syrup. This syrup has a fine flavor and will keep indefinitely in sealed containers like syrup made from cane or sorghum. Small quantities for home use can be made with ordinary utensils.

Method for Making Apple Syrup.—The average farm housewife who is provided with a large preserving kettle can easily make several quarts of apple syrup in her own kitchen. Although she may not find that she can sell her product profitably, she at least will find the method valuable in converting the windfalls of her own farm into a delicate and pleasant syrup for the use of her family. This product is a palatable and valuable food.

Method.[1]—To make one gallon of apple syrup, stir into seven gallons of apple cider five ounces of powdered calcium carbonate (carbonate of lime), which is a low-priced chemical, readily obtainable from a local drug store in the form of precipitated chalk or powdered marble-dust. Heat the cider and allow it to boil for a few minutes. As the cider will foam slightly, it is necessary to use a vessel at least one-third larger than the volume of cider. Pour the cider, after boiling, into vessels, preferably half-gallon preserving jars, which permit the condition of the liquid to be observed. Allow the liquid to settle until perfectly clear. This will take several hours or over night. After the liquid is perfectly clear and shows a distinct sediment at the bottom, pour off the clear portion into the preserving kettle, being careful not to pour off any of the sediment. Add to the clear liquid a level teaspoonful of the carbonate of lime and again stir thoroughly. The process is completed by boiling down the clear liquid. Inasmuch as the liquid when boiling down foams more than on the first heating, the kettle should be only one-third full when boiling commences. Where a large kettle is not obtainable, the liquid will have to be boiled down in batches. Allow the liquid to boil rapidly. If the housewife has a thermometer, she should allow the liquid to boil until it reaches 220° Fahrenheit. Where no thermometer is at hand, boil the liquid until it reaches about one-seventh of the original volume, or until a small portion when cooled rapidly

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[1] From Year Book Separate 639, U. S. Department of Agriculture.

and poured from a spoon shows about the same consistency as maple syrup. The aim is to make a thin syrup rather than one that will candy.

When the syrup has reached this point, pour it off into the jars and let it stand where it will cool very slowly. Slow cooling is *very* important in making the syrup clear, as it allows all sediment and added substances to settle out completely. A convenient way of bringing about this slow cooling is to put the vessels into a fireless cooker or to put the jars containing the syrup in a wash-boiler, surround them with hot water, and allow the whole to cool. When the syrup has cooled to room temperature there will be found a white sediment, which is known to chemists as malate of lime, a harmless compound of the lime and the acid of the apples. This is identical with the product known as maple sand, which occurs naturally when maple sap is boiled down into syrup. When the settling has been completed, carefully pour off the clear portion of the syrup into a kettle, heat nearly to boiling, and pour hot into sterilized jars, which should be at once sealed.

Another method would be to transfer the boiling syrup from the preserving kettle into the sterilized bottles and seal immediately. The sediment which appears at the bottom in no way affects the syrup. When ready to serve, simply pour off the clear portion, leaving the sediment, which is not easily disturbed, at the bottom. The syrup might also be bottled while cold, processed, and sealed as for fruit juices. The syrup will be a clear, ruby-colored product, possibly varying from a deep-ruby red to lighter shades, according to the character of apples used in making the cider. This syrup is similar in consistency to maple syrup, and can be used like any other table syrup. If made in accordance with these directions it will have a delicate and novel flavor, somewhat similar to that of the sugar which forms when apples are baked. It will be found that children will enjoy it on bread and butter, and that it will afford a new and useful flavoring adjunct or sauce for puddings or other desserts.

Muscadine Grape Syrup.—The process of making Muscadine grape syrup is very simple, and with proper care an inexperienced operator can succeed. Since the making of grape syrup is very similar to the methods used in making apple syrup, it is unnecessary to outline the procedure in detail.

Varieties.—The varieties having the highest natural sugar and lowest natural acid content usually make the most delicious and highest quality syrup and also yield the most syrup per gallon of fresh juice. The Scuppernong, Thomas, Luola, Mish, and other similar varieties of high quality make the best syrups. The James makes a syrup of fair quality, while the Flowers and Eden varieties make syrups which, relatively speaking, would be called acid and rough.

Pressing.—Cleanse the various parts of the press; scald it so that it will swell and will not leak. So soon as each pressing is completed it is important to remove all pomace from the press and to wash with clean water all the parts that have come in contact with the juice. This will prevent fermentation and souring at the press and the giving of foreign flavors to later lots of juice.

Crush the grapes and then press them cold. The free-run or first juice that comes from the press is more desirable for syrup making than that which is secured under pressure. This is principally due to the fact that the free-run juice is higher in sugar content and lower in acid content than the pressed juice. When pressure is applied the juice flows freely at first and then at a gradually slower and slower rate for many hours. The pomace should never be allowed to stand in the press longer than five or six hours. For many reasons it has been found desirable to press during the day, cook the juice the first time in the late afternoon or evening, allow it to stand in the precipitating jars over night, and boil it down to a syrup the next morning. A bushel of grapes will yield, when cold pressed, from two and a quarter to four gallons of fresh juice, depending upon the variety. Most varieties yield at least three gallons. On this basis, condensing the juice to one-ninth of its volume, which has been found to give a syrup of satisfying consistency, one bushel of grapes, cold pressed, should yield one and one-third quarts of syrup. Heated grapes yield more juice than cold-pressed grapes, but make a syrup of inferior quality.

Heating.—Heat the juice and strain it. To every six quarts of fresh Muscadine juice stir in two ounces of powdered calcium carbonate (carbonate of lime) to remove the acids. Boil for six or eight minutes as with apple syrup, and pour hot into sterilized glass jars or pitchers. Allow the liquid to stand over night. Pour off the clear portion into a cooking vessel, being

Fig. 77.—Utensils used in making Muscadine syrup. (Courtesy U. S. Department of Agriculture.)

careful not to pour off any of the sediment. Add one-sixth of a level teaspoonful of calcium carbonate for each six quarts of fresh grape juice which it represents.

Complete the process by boiling down the clear liquid, being careful to keep the caramel forming on the inside of the pan wiped off with a wet cloth so that scorched caramel will not fall into the syrup and cause it to have a burned flavor. Boil the liquid, being careful not to allow it to burn when it is nearly done. Skim during the cooking process and continue the cooking as for apple syrup.

Cooling.—When the syrup has reached the proper thickness, pour it off into the jars, cover, and place them in a hot-water bath or in a fireless cooker where they will cool very slowly. Slow cooling is important in order to obtain a clear syrup.

When the syrup has cooled to room temperature it can be bottled.

Bottling.—Pour off the clear syrup, leaving behind the sediment, which is not easily disturbed. Bottle, sterilize, and seal at once (Fig. 77).

Fruit Syrups.—Fruit syrups which are left over from canning either small or large fruits should be bottled, pasteurized, sealed, and stored away to be used for flavoring or making beverages. A delicious drink is made by adding two or three teaspoonfuls of fruit syrup and the juice of one-half lemon to a glass of cold water. They may also be used for flavoring ice-creams, sherbets, and other desserts.

Such fruits as peaches, strawberries, and pineapples give more satisfactory results when made into syrups before bottling. Sugar helps to develop the flavor of these fruits. Sauces for sundaes and for flavoring are often made from red cherries, plums, currants, red and black raspberries, strawberries, blackberries, apricots, peaches, rhubarb, pineapples, and lemons. A good proportion to use for berries and small fruits is two cupfuls sugar to each quart of juice.

For each quart grated fresh pineapple allow two pounds sugar to one cupful of water.

For each pound apricots, fresh fruit, allow one pound sugar to one pint of water.

For each two pounds peaches, fresh fruit, allow one pound sugar to one cupful of water.

For each quart rhubarb juice allow two pounds sugar.

For each cupful lemon juice, one tablespoonful of grated rind, allow one pound of sugar to one cupful of water.

General Method of Preparing Vinegar.—Cider vinegar is frequently made in the country home, but often when this product is put on the market it is found to fall short in one requirement or another. The need of a careful study of this process is necessary, because the expense attached to its production is small, since Nature does most of the work, and can be utilized in the home or sold as one of the by-products to increase the income of the farm.

MAKING CIDER VINEGAR AT HOME[2]

Why Study Was Needed.—The making of cider vinegar is a familiar operation in almost every farm home (Fig. 78). The final product is a necessity on every table, the small apples from which it is usually made are of practically no value for other purposes, the labor and expense of picking them up and pressing them are slight, and from the time the cider is in the barrel Nature does the work. Thus the process appears a simple one, easy to start, and self-operated to its termination in a salable commodity; so that the work-burdened farmer, with several barrels of cider in his cellar, may, in his few moments of leisure, think with pleasure of this farm operation which will bring him profit without further outlay of strength or money.

Yet vinegar is a food product and, as such, has come under the eye of state law, which says that to be legally salable the finished goods must meet certain requirements. Cider vinegar must contain 4.5 per cent of acetic acid and 2 per cent of cider vinegar solids before it can be lawfully sold, and frequently farmers who have made vinegar from pure apple juice only, and who have stored this under what they believe to be proper conditions for the proper length of time, find that their product falls short in one requirement or the other. Thus, without fraudulent intent or attempt at adulteration or dilution, the homemade vinegar falls under suspicion. Complaints of this condition reached the New York station in considerable number some years ago, and in an effort to find the cause or causes of the difficulty an extensive investigation of the subject has been made.

[2] These directions are quoted from N. Y. State Agricultural Experiment Station Bulletin No. 258, written by F. H. Hall.

Cider has been pressed during different years and from different varieties of apples, and has been stored under varied conditions, with and without additions of yeast, "mother" or additional malic (apple) acid. In all, thirty-six experiments have been carried through periods of time varying from forty-four months to seven years. Each sample of cider was analyzed monthly for ten months and at two-month or three-month intervals after that time, attention being paid to seven constituents in most of the analyses; so that a great amount of data has been collected, of much chemical interest and practical value.

Simple Yet Complex.—As seen by the farmer, vinegar making is a simple process; to the chemist, though less intricate than many other chemical transformations, it is complex; while to the biologist the various steps in the change of sugar in the fresh apple juice to the acetic acid of vinegar are manifestations of very complex life activities of many species of organisms, divided into two great groups, yeasts and bacteria, each group performing a specific function in the change. There may also come into action, under certain unfavorable conditions, other bacteria which hinder the useful transformations, or which destroy the products desired and thus lower the quality of the vinegar. This interplay of living organisms, sometimes for good, sometimes for ill, has not been studied in all its details, and has been considered, in this investigation, only as results were produced, the chemical transformations alone being considered.

Chemistry of Vinegar Making.—In a general way these transformations are two: Sugar, the ordinary cane-sugar and other forms known as invert sugars (dextrose and lævulose), in the sweet cider, is first changed into alcohol through the fermentative action of one group of organisms; then the alcohol, by the action of a second group of organisms, is changed to acetic acid.

Chemically considered, each molecule of sugar consists of six atoms of carbon, twelve atoms of hydrogen, and six atoms of oxygen. When this molecule of sugar is acted upon by the proper ferments, it passes through a series of chemical changes which may be said to result, finally, in splitting it up into two molecules of alcohol, each containing two atoms of carbon, six of hydrogen, and one of oxygen, and two molecules of carbon dioxide gas, each containing one atom of carbon and two of oxygen. This may be expressed in the form of an equation:

$$\underset{\text{Sugar}}{C_6H_{12}O_6} = \underset{\text{Alcohol}}{2C_2H_6O} + \underset{\text{Carbon dioxide}}{2CO_2}$$

Theoretically, we should be able to get from 100 parts of sugar by weight about 51 parts of alcohol and 49 parts of carbon dioxide; but because of evaporation and certain minor chemical changes we can get in practice only about 45 to 47 parts of alcohol or less.

After the alcohol is formed, the organisms which act upon it begin the transformation to acetic acid. In this process oxygen is taken from the air. The result may be similarly represented by an equation:

$$\underset{\text{Alcohol}}{C_6H_{12}O} + \underset{\text{Oxygen}}{O_2} = \underset{\text{Acetic acid}}{C_2H_4O_2} + \underset{\text{Water}}{H_2O}$$

Theoretically, again, we should obtain from 100 parts of alcohol about 130 parts of acetic acid, but we usually get less than 120 parts. So, starting with 100 parts of sugar in the apple juice, we may get under favorable conditions from 50 to 55 parts of acetic acid; therefore to have vinegar with 4.5 per cent of acetic acid we must have juice containing not less than 8.5 per cent of sugar.

Sugar in Apples.—This percentage, however, is found in practically all ripe, sound apples, although in a record of about 100 analyses of 80 varieties of American-grown apples, made at N. Y. station, in Washington, D. C., in Pennsylvania, and in Virginia, five samples, of as many different varieties, were too low in sugar to produce vinegar of the required acidity. The sugar in apples reaches its maximum in ripe fruit, being low both in those that are green and those that are over-ripe. It averaged, in the apples used in the tests at N. Y. station, 13⅓ per cent, and varied less than 2 per cent either above or below the average. A somewhat surprising fact to those not familiar with the chemistry of the subject is that "sweet" apples do not owe their sweetness to their large percentage of sugar, but to the small amount of malic acid they contain. For example, the sample of Red Astrachan juice contained 10.16 per cent of sugar and 1.15 per cent of malic acid; while Tolman Sweet and Sweet Bough contain about the same amount of sugar, but only 0.10 to 0.20 per cent of malic acid.

Alcoholic Fermentation.—Starting, then, with juice containing sufficient sugar, what are the conditions which will best promote the changes to alcohol and to vinegar and prevent loss? The sugar must first be acted upon by the enzymes, or ferments, which are produced by yeast plants. The yeast germs are usually present everywhere, so that they pass from the surface of the apples into the juice as it is pressed out, or fall into the cider from the air. It has sometimes been held unwise to wash apples before pressing them, for fear of carrying away the necessary yeast germs; but the apples used in all the station tests were washed without apparent interference with alcoholic fermentation. If apples have become dirty it is certainly best to wash them, as otherwise there is danger of introducing bacteria that interfere with proper fermentation. In ordinary cellar temperature, most of the sugar is changed into alcohol in five or six months, the change being slow during the first month, but quite rapid during the second, third, and fourth months. The process may be greatly hastened by storing in rooms warmer than cellars usually are during the fall and winter months. By placing bottles of vinegar in rooms of different temperature, running from 55° to 85° Farhenheit it was found that at 55° only 2¼ per cent of alcohol was formed in three months; at 60° and 65° Fahrenheit, more than 4½ per cent; and at 70° and 85° Fahrenheit, about 6½ per cent was formed in the same time. At higher temperatures than this, evaporation of the alcohol would be liable to cause loss.

The addition of yeast also hastens alcohol formation, so that at a temperature of 55° Fahrenheit cider with yeast added gave 6¼ per cent of alcohol, and at 70° Fahrenheit, with yeast, 7¼ per cent, both in one month. The use of any form of commercial yeast, if sufficiently fresh, will probably be found to give good results.

Acetic Fermentation.—After the yeast fermentation has been completed the acetic-acid forming bacteria begin to attack the alcohol and produce acetic acid. This process is ordinarily very slow for about three months after the sugar has all been changed to alcohol (that is, during the eighth, ninth, and tenth months of cellar storage), but advances rapidly from the tenth to the fourteenth month and is practically completed in two years. This process also moves more rapidly, when once well started, at higher temperatures; but differences of temperature appear to have little effect during the three months after the sugar has disappeared. Beginning with the tenth month of storage, however, and up to the end of two and one-half years, nearly twice as great a percentage of acetic acid was produced where the temperature varied from 50° to 90° Fahrenheit as where it was from 45° to 65° Fahrenheit. The percentage of acid formed at lower temperatures never became as great as at higher temperatures, though part of the apparent increase in the warm room was due to evaporation of the water. The best results were secured at temperatures of 65° to 70° Fahrenheit.

It is the ordinary practice to add vinegar, especially vinegar containing "mother," to the barrels in which vinegar is making; and the investigation proved the practice a most excellent one, as the acetic fermentation was more rapid and more complete in every case where this form of inoculation or "seeding" was used. This addition of "mother" is comparable to the addition of a "starter" in souring milk, for the "mother" is produced by the growth of the acetic bacteria in the presence of air and contains large numbers of these bacteria.

It appears to be of advantage in some cases to draw off the clear portion of the cider after alcoholic fermentation has been completed, leaving the dregs; and to continue the process in new, clean barrels or to wash out the settlings and return the clear liquid to the barrels. This proved of considerable advantage in the case of vinegars stored at low temperatures, but of less utility when the vinegar was stored at higher temperatures where the acetic fermentation proceeded rapidly. Possibly with cider made from uncleaned apples and carelessly strained juice the results along this line would be more striking; for the liability to contamination with undesirable germs would be greater in such cases.

Loss of Acetic Acid.—In both alcoholic fermentation and acetic fermentation the air should have free access, especially in the latter; for, as can be seen by the equation given to explain the process, oxygen must be added to alcohol to make the acetic acid, and this must come largely from the air. On this account the barrels should not be filled more than two-thirds or three-fourths full with the apple juice or with the "hard" cider. But when the acetic fermentation has ceased to be active and the amount of acetic acid is safely above 4½ per cent the vinegar should be drawn from the barrels and strained, the barrels cleansed, the vinegar returned, filling the barrels full, and the bung driven in tight.

Unless this is done, destructive fermentation may begin and the acetic acid decrease instead of increasing. In several experiments where the vinegar was held in loosely stoppered casks or bottles it lost all or nearly all its acid, and in some cases actually became alkaline in reaction. This destructive fermentation may be due to new species of bacteria introduced, or even in some cases to the same acetic acid-forming species which, when the alcohol is exhausted, attack the acetic acid itself.

As showing how complex may be the processes passing in vinegar, the case may be cited of four one-quart bottles of the same juice stored under the same general conditions. At the end of five years bottles A and B contained 5.74 and 5.44 per cent, respectively, of acetic acid, bottle C 2.10 per cent, and bottle D gave an alkaline reaction. Bottles A and C contained nearly three times and bottle B two and one-half times as much solids as bottle D.

Malic Acid.—The acid of fresh apple juice is not the acid of vinegar, but a fixed acid called malic acid. This has certain chemical characteristics which make it quite easily recognizable; and so its presence in vinegar has been considered an index to determine whether the vinegar was or was not truly vinegar from apples. But these investigations have proved that this acid disappears quite rapidly from vinegar, so that in twenty-four months it had shrunk from an average of 0.55 per cent to 0.02 per cent; while in some older vinegars it had disappeared entirely. The relation of malic acid to cider vinegar is being further studied.

Legal Standard.—The legal standard of the state for acid, 4½ per cent of acetic acid, has been upheld fully by these results; for apple juice from good ripe apples, properly managed in fermentation, should and does easily give 4½ per cent of acetic acid within two years at cellar temperatures and in less time at higher temperatures.

Concerning solids, the wisdom of the standard is not quite so clear. In several experiments made in this investigation, vinegars made from pure apple juice and well above the limit in acid contain less than two per cent of solids.

Conditions Producing Poor Vinegar.—Among the conditions which may produce vinegar below standard are these: (1) The juice may be poor to start with because made from varieties of apples low in sugar, from green apples or from over-ripe or decayed apples; or the juice may be watered either directly or by watering the pomace and pressing a second time. (2) The fermentation processes may be delayed or disturbed by using dirty fruit or unclean barrels, thus affording entrance to undesirable organisms and causing the wrong kind of fermentation; the temperature may be too low to insure the necessary activity of favorable organisms; or air may be excluded by filling the barrels too full or putting the bung in too tight so that the bacteria cannot live and work. (3) The acetic acid may disappear after its formation, destructive fermentation being encouraged by leaving the bung-hole of the barrel open or the barrel only partially full.

To Make Good Vinegar.—Briefly summarized, the method to be employed for the manufacture of good vinegar at home, without the use of generators, is this: Use sound, ripe apples, picked or picked up before they have become dirty, if possible, otherwise washed. Observe the ordinary precautions to secure cleanliness in grinding and pressing, and discard all juice from second pressings. If possible, let the juice stand in some large receptacle for a few days to settle, then draw off the clear portion into well-cleaned barrels which have been treated with steam or boiling water, filling them only two-thirds or three-fourths full. Leave the bung out, but put in a loose plug of cotton to decrease evaporation and to prevent the entrance of dirt. If these barrels are stored in ordinary cellars, where the temperature does not go below 50° or 45° Fahrenheit, the alcoholic fermentation will be complete in about six months; but by having the storage room at a temperature of 65° or 70° the time can be considerably shortened, and the addition of compressed yeast or its equivalent at the rate of one cake to five gallons of juice may reduce the time to three months or less. Use a little water to thoroughly disintegrate the yeast cake before adding it to the juice. The temperature should not go above 70° for any length of time, to avoid loss of the alcohol by evaporation.

FIG. 78.—Making vinegar on the farm.

After the sugar has all disappeared from the juice (that is, when the cider has entirely ceased "working" as revealed by the absence of gas bubbles), draw off the clear portion of the cider, rinse out the barrel, replace the liquid and add two to four quarts of good vinegar containing some "mother," and place at a temperature of 65° to 75° Fahrenheit. The acetic fermentation may be complete in three months or may take eighteen months, according to the conditions under which it is carried on; or if stored in cool cellars may take two years or more. If the alcoholic fermentation be carried on in the cool cellar and the barrel be then taken to a warmer place, as outdoors during the summer, the time of vinegar formation may be reduced from that given above to fifteen or eighteen months. Where the alcoholic fermentation is hastened by warm temperature storage and the use of yeast and the acetic fermentation favored by warmth and a good vinegar "start," it is possible to produce good merchantable vinegar in casks in six or twelve months.

When the acetic fermentation has gone far enough to produce 4.5 to 5 per cent of acetic acid, the barrels should be made as full as possible and tightly corked in order to prevent destructive changes and consequent deterioration of the vinegar.

RECIPES

Bottling Juice of Grape Fruit.[3]—Bring the grape-fruit juice to the boiling-point in a porcelain-lined or enamelled kettle, pour it while still hot into sterilized bottles, and seal hermetically. The juice when so handled will keep indefinitely, and provides a base for "grapefruitade" or other acid beverages having the characteristic acid, somewhat bitter, flavor of the fruit. Experiments show, however, that it is highly important that the bottle be completely filled, so that no layer of air will be left between the top of the juice and the cork or seal. When air in any amount comes in contact with the top of the sterilized juice it will cause the juice to change its color. In handling the juice it is particularly important that it be kept from coming into contact with iron or other metals easily acted upon by fruit acids.

The investigators found also that it was possible to freeze the grape-fruit juice into solid ice and then, by whirling the ice in a centrifugal machine, to take out a larger part of the water and leave the solids and flavoring matter of the fruit. This freezing and concentrating of the juice greatly reduces the bulk and

[3] This recipe was prepared by the Bureau of Chemistry, U. S. Department of Agriculture.

makes a product which can be sterilized by heating and kept indefinitely.

Clarifying Juice.—Those who wish to make a clear juice may filter the grape-fruit juice before it is heated by adding to it from two to three per cent (about three ounces avoirdupois to the gallon) of infusorial earth well washed with hot water. The mixture is then forced through a non-metallic filter-press and the clear juice reheated and boiled. With the freezing process, the juice is filtered after concentration, about twice the amount of infusorial earth being used per gallon of concentrate.

The chemists, in connection with this bottling of grape-fruit juice, notify the public that the same process is not suitable for bottling the juice of oranges and lemons, which will not retain their flavor if handled in this way.

While as yet, so far as known, there is no commercial market for sterilized grape-fruit juice, it is believed that many persons will find this juice, with the addition of water and sugar, a pleasant variation from lemonade or limeade. Those who like grape-fruit should find the beverage inviting. The method is so simple that those in regions where grape-fruit are cheap and plentiful can prepare this product on a small scale with ordinary household appliances.

Bottling Grape Juice.—Juice compressed from the various cultivated grapes can be bottled. Recipes follow for leading Southern and Northern varieties.

Scuppernong Grape Juice.—After washing the grapes, crush while heating them. Fruit juice will flow more readily when the fruit is heated, but the pulp should not be allowed to boil. When the pulp is thoroughly soft, strain through a double cheesecloth and squeeze as much juice through it as possible, then strain the juice through a flannel cloth without squeezing. This will give a clear juice. After this heat the juice to 180° Fahrenheit, skim and strain into sterilized bottles, place the corks in loosely, place the bottles on a rack in the water-bath, and pasteurize for fifteen minutes at a temperature of 180° Fahrenheit. Pound the cork in tightly, dip the top of the bottle into sealing wax, and store away in a dark, dry place. If this juice is to be used for a beverage and sugar is desired, it may be sweetened to taste before heating and pouring into the bottles.

Scuppernong juice packed in this way can be used for making jelly later in the season. However, the jelly made from this juice will not be firm enough unless half the quantity of the grapes used are green and the other half ripe. The green grapes will furnish sufficient pectin to give it the proper consistency, and the ripe ones will furnish the color and flavor.

Unfermented Concord or Niagara Grape Juice.—To every five pounds of Concord or Niagara grapes use one pint of water. Crush grapes, add water, bring to boil, and strain through jelly-bag. Add one-half cupful of granulated sugar to every quart of juice. Bring just to a boil and pour into sterilized bottles, pasteurize, and seal air-tight.

Berry shrub may be made of strawberries, raspberries, or dewberries. Select sound fruit, wash, measure, and place in a stone jar. For every four quarts of berries use one quart of vinegar. Cover the jar by tying a cheesecloth over it. Stir the berries daily for three or four days. If the weather is very warm do not let it stand over three days. Strain without squeezing and put into kettle, allowing one pound of sugar to each pint of liquid. Boil slowly for five minutes, bottle, cork, and seal. Dilute with cold water for serving.

WAYS TO USE FRUIT JUICES

Grape Cup.—To three pints of grape juice add four whole cloves, one cupful of sugar, the juice of four oranges with one-half grated orange rind and a few leaves of lemon verbena or mint. Bring to boiling-point, cool, and let stand to ripen for two or three hours. When ready to use, stir in the stiffly beaten whites of three eggs, a quart of unfermented grape juice, and a pint of water, and serve in tumblers with ice.

Fruit Cup.—Two tablespoonfuls of green tea, two quarts of boiling water, two cupfuls of sugar, juice of one orange, one cupful of currant juice, juice of two lemons. Pour water over tea, let stand five minutes, then strain over the sugar; add lemon and orange juices, cool, and let ripen in a cool place for six hours.

When ready to serve, add the currant juice, pour over cracked ice in deep glasses, garnishing each serving with a small, old-fashioned yellow rose or a sprig of mint. If desired, the cracked ice may be omitted, the punch being poured over raspberry ice or peach or pineapple sherbet instead.

Fruit Punch.—One quart of raspberry juice, one quart of currant juice, three lemons, one pineapple, two quarts of cold water, three oranges. Sweeten to taste.

Cherry Punch.—Take one quart of cherry juice and add a few crushed cherries. To one and one-half pints of hot juice and pulp add three-quarters of a pound of sugar, one cupful of water, juice of one lemon. When sugar dissolves, cool the mixture and freeze. When half frozen, add beaten white of one egg and one ounce of crushed cherries.

Grape Punch.—Juice of two lemons, juice of one orange, one pint of grape juice, one quart of water, one cupful of sugar, one cupful of shredded canned pineapple or one pint of cherries. Combine and let stand several hours to ripen before serving.

Orange Ice.—The juice of six oranges and four lemons, five cupfuls of sugar, and the grated rinds of two oranges. Pour boiling water over other oranges and lemon rinds. Let stand fifteen minutes and strain. Pour the flavored water over the other ingredients, and add enough cold water to make one gallon. Freeze and serve in orange glasses or orange skins.

Strawberry Ice.—Two cupfuls of water, three-quarters cupful of sugar. Boil from five to ten minutes. Add one cupful of strawberry juice, one-half or one tablespoonful of lemon juice, one or two sheets of gelatin. Soak gelatin in little water. Bring sugar and water to boil. Pour over gelatin. Stir until dissolved and strain into strawberry juice. Freeze.

Raspberry Ice.—One quart of raspberry juice, one quart of water, three tablespoonfuls of lemon juice, three and one-quarter cupfuls of sugar. Boil sugar and water for twenty minutes; cool, add berry juice and lemon juice, and freeze in three parts ice to one part salt. For a rose-colored ice use only the red berries, but for a rich wine color use part or all black raspberries.

Raspberry Float.—Take one-half cupful of red raspberry juice and one cupful of fruit. Mix in gradually two tablespoonfuls of powdered sugar. Beat the whites of two eggs until stiff and fold into them the sweetened raspberries.

Blackberry Flummery.—Boil one quart of blackberry juice. Rub together four tablespoonfuls of corn-starch and four teaspoonfuls of sugar, add to fruit juice, and boil for ten minutes. Strain, cool, and serve with cream or custard.

Grape Frappé.—One pint of grape juice and one pint of water. Heat to boiling-point and strain through cheesecloth. Add juice of two lemons and one-half cupful of sugar. Strain and freeze.

Fruit Nectar.—One quart of hot water, one pint of grapefruitade, one egg-white, one-half cupful of finely chopped mint leaves, two cupfuls of sugar, four oranges, four lemons. Boil the sugar and water for ten minutes. Cool, add the fruit juice, and freeze in three parts ice to one part salt. When half frozen, add the egg-white well beaten. Pack in ice and salt two or three hours to ripen. When ready to serve, half fill tall glasses with the ice and pour over the grapefruitade, which should be freshly opened. Scatter finely chopped, fresh, or candied mint leaves over each serving.

Apollinaris Tea.—Two quarts of apollinaris water, one gallon of strong tea, three dozen lemons, one-half dozen oranges cut in small pieces with peelings, one quart of cherry juice, one quart of grape juice; sweeten to taste. Serve with crushed ice in punch-bowl. This makes enough for one hundred people.

QUESTIONS

1. For what purposes may bottled fruit juices be used in the home?
2. At what point should care begin in our endeavor to secure a good bottled fruit juice?
3. Why cannot green fruit or over-ripe fruit be used in making an excellent fruit juice?
4. Why would bruising the fruit in packing or by careless washing produce an inferior product?
5. What is meant by the "free-run juice" of the grape? What method is used in obtaining it? For what purpose is it used? How does free-run juice differ from the total juice?
6. What advantage has the juice obtained by the hot process over that obtained by the cold process?

7. Why is the hot process necessary when the juice is to be used in jelly making?
8. How may the color and flavor be retained when using the hot process?
9. Why should fruit juices not be boiled? How may they be reheated without danger of boiling?
10. What precautions are necessary in handling the filtered juice that the product may be as clear as possible?
11. What is the difference between pasteurization and sterilization?
12. What precaution should be taken to prevent the corks blowing out during the pasteurization?
13. What fact makes necessary the false bottom in all canners and pasteurizers?
14. What is meant by the term "simmer"? How can you tell when water is simmering?
15. Why is it necessary to cover the cork and one inch of the bottle with wax?
16. Why is it necessary to store fruit juices in a dark place?
17. How will economy determine the size of the bottle prepared for home use?
18. Under what conditions would the making of apple syrup be economical on the farm?
19. Give an outline of the method for making grape syrup, including under each step the special care needed that the final product may reach the standard desired.

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CHAPTER IX

FRUITS FOR CANNING

Apples.—Only sound, smooth, medium-sized cooking apples should be canned. The late fall and winter varieties are usually slightly acid, and they retain their flavor better than do the sweet varieties. Apples shrink more in canning than most fruits, and for this reason they should be blanched for one minute, then plunged into a cold bath, packed, and covered with a syrup of 10 to 15 degrees density (see p. 132).

Process quart jars ten minutes. Exhaust No. 3 cans two minutes and process eight minutes at boiling temperature (212° Fahrenheit) in water-bath.

Apple Sauce.—Peel, core, and steam the apples until soft, run through colander, return to the fire and heat thoroughly, pack hot into cans or jars, and seal at once. Process ten minutes at 212° Fahrenheit in a hot-water bath.

Berries.—For dewberries, blackberries, raspberries, and Logan berries, practically the same methods of canning may be used. The condition of the fruit will have much to do with the quality of the product. The berries should be gathered in shallow trays or baskets and not in deep vessels which allow them to be bruised and crushed. They should be uniformly ripe, sound, and as large as possible. It is necessary to can all varieties of berries in glass or else to put them in enamel-lined cans, because if canned in ordinary tin cans the berries will lose both color and flavor very quickly, and be unfit for use or for sale.

The flavor of canned berries will be finer if sugar is used in canning. It is best to make this into a syrup. The use of berry juice instead of water in this syrup will give a richer color and flavor. For fine berries, use a syrup of 30 degrees density (about three and one-half pounds of sugar to one gallon of berry juice or water).

After the berries have been carefully sorted and lightly washed by placing in colander and pouring water over them (instead of putting into a pan of water), pack as closely as possible without crushing. This can be done better by putting a few berries in the jar or can, pressing them gently into place, and proceeding layer by layer, than by nearly filling the jar loosely and then trying to press them down.

Fill jars full of fruit and cover with cooled syrup. Fit the rubber in place and fasten the lid loosely on glass jar and then process pints for six minutes and quarts for twelve minutes, counting the time after boiling begins. When packing in tin cans, fill them to within one-quarter of an inch of the top, cover with syrup. Dry the groove around the opening with a clean cloth and cap. Exhaust in tin for three minutes and process No. 2 cans for eight minutes and No. 3 cans for ten minutes. No. 10's should be exhausted four minutes and processed for thirty minutes.

Cherries.—Cherries keep their flavor and color with difficulty in tin, even in enamel-lined cans. For this reason glass is preferable. The large black and sweet white cherries are usually packed unpitted, while the reverse is true of the acid cherries. The unpitted cherries present a better appearance, and many people like the distinctive flavor which the retained pit gives to the product. When cherries are canned whole they should be blanched in hot water at about 180° Fahrenheit for twenty or thirty seconds. This will slightly soften the fruit and prevent splitting. Then drop cherries into a cool syrup and they will plump considerably before packing cold into jars. For sour cherries use a syrup of 40 degrees density, and for sweet ones use a 30-degree syrup (see Syrup table, p. 132). Process quart jars for twenty-five minutes; exhaust No. 2 cans for two minutes and process for twenty minutes in a water-bath at boiling temperature (212° Fahrenheit). Both the exhausting and processing of cherries in quart jars are accomplished at the same time.

Figs.—Figs for canning should be sound and firm (Fig. 79). Treat them with a soda bath as for preserving. Rinse through two cold-water baths, drain and cook for forty to sixty minutes in the syrup (two cupfuls of sugar, four cupfuls of water). Cool, pack, and cover with the syrup and process for thirty minutes in quart jars. When canning in tin the figs retain a better color and flavor when canned in enamel-lined cans.

Gooseberries.—Because of extreme acidity green gooseberries can be safely canned without processing. The berries are picked when nearly full grown, but green. Stem, wash, pack into jars, cover with fresh cold water, and allow the jars to stand for ten minutes. Drain off the water and again fill to overflowing with fresh cold water and seal, using sterilized rubbers and lids. Gooseberries canned in this way are used for pies.

Rhubarb may be canned in the same manner as gooseberries.

Peaches.—Sort the fruit, using firm, sound, uniform peaches for canning, and putting aside the soft, broken ones for jam. A few very large peaches are sometimes canned whole in a heavy syrup and are called Melba peaches.

Firm, perfect peaches may be lye peeled, but if very ripe the fruit is made too soft by this process. The lye method of peeling is superseding the former methods of peeling by hand or by boiling water. The objections to this method were no doubt due in some measure to improper usage. Have ready a boiling lye solution (four tablespoonfuls of concentrated lye to one gallon of water). Drop the peaches into this for about twenty to thirty seconds, lift them out, and drop into clear boiling water for a like period. After this place them into a cold bath, when the skins will come off easily. Cut them into halves, remove the seeds, and immerse fruit in a hot syrup testing about 30 to 40 degrees with a "Brix" spindle. The percentage of solids in a liquid is indicated by the reading at the surface of the liquid when the Brix hydrometer is floated in it (pp. 131 and 132). Allow them to stand in this syrup until thoroughly cold, then pack, placing the halves in overlapping layers, the concave surface of each half being downward and the blossom end facing the glass. Fill each

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NOTE.—If the peaches are not firm, they may be peeled by lowering them in a wire basket or cheesecloth into boiling water until the skins slip easily (about one minute), remove, plunge for a minute into cold water, and slip off the skins (Plate I).

PLATE I

A B C

Attractive Packs of Canned Fruits

A. Whole pears. B. Cherries. C. Whole peaches.

FIG. 79.—Fig packs.

FIG. 80.—Attractive packs of canned fruits: a. Berries. b. Pears. c. Fruit salad.

FIG. 81.—A Balling hydrometer.

jar or can with strained syrup and paddle carefully to remove air bubbles. Exhaust No. 3 cans three minutes, process for fifteen minutes. In glass, process quart jars for twenty minutes and half gallons for thirty-five minutes.

Pears.—Select pears ripe, but not soft. Sometimes whole Seckel pears are canned, but the Bartlett pear is preferred to other varieties for canning, due to its texture and flavor. Pare, blanch, put into a cold soda bath (one teaspoonful of soda to one gallon of water), drain and pack rapidly. When packed whole, leave stems on and place each layer stems up, letting the second row fill the spaces between the two stems, and repeat. If the pears are to be cut they should be pared, evenly divided into halves, and cored. The fruit must be kept submerged in water after being pared or it will discolor quickly. Eight or ten large, perfect pieces, covered with syrup, will give a good pack. Pack pears, cover with a syrup of 20 to 30 degrees density, and process quarts for thirty minutes; exhaust No. 3 cans three minutes and process for twenty-five minutes at 212° Fahrenheit in a water-bath.

Plums.—The green-gage, yellow egg, and Lombard are the varieties of plums used for canning. Only sound, uniform fruit should be selected; stem, wash, grade, prick with needle to prevent bursting, pack as firmly as possible without crushing, cover with a syrup of 40 degrees density, and process quarts for fifteen minutes; exhaust No. 2 cans two minutes and process ten minutes, counting the time after the water-bath begins boiling. Enamel-lined cans are necessary when packing plums in tin.

Olives.—The canned ripe olive has been used in this country almost exclusively as a condiment, owing partly to price and partly to the irregularity of the product. It has unusually high nutritive value and a peculiar pleasing taste, two elements which commend it as a food, provided the consumer can depend upon getting these qualities. The methods of packing are in a more or less experimental stage, and improvement is constantly being made.

The Mission olive is preferred for canning, owing to the superior flavor and better texture. A recipe for handling olives is quoted under the chapter on "Pickling," p. 217.

Fruit Macedoine.—A combination of fruits makes an attractive pack in a 30- to 40-degree syrup, and it is a convenient product to have on hand, since it is ready to serve either as a fruit cocktail, salad, or dessert. Some of these combinations may be more easily obtained in one section of the country than another. Any light-colored fruits will make a pleasant mixture:

(*a*) Green-gage plums, pears, and gooseberries.

(*b*) Pineapples, kumquats, figs.

(*c*) Peaches, pears, and cherries.

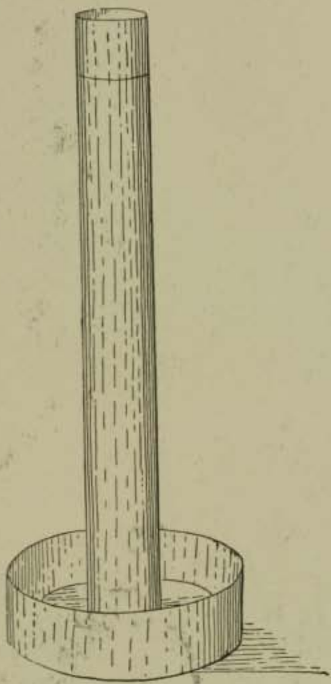

FIG. 82.—A brass cup which can be used in place of glass cylinder for testing density of syrup and brine.

Very often fruits such as berries are not included in these combinations, because they would discolor fruits of lighter color and would have the tendency to lose their form (Fig. 80).

Golden dressing is a pleasing addition to this mixture when served in any of the above-mentioned ways.

Special Hydrometers.—In order to proceed with certainty, instruments called hydrometers have been devised for accurately measuring the density of liquids. The one used for the special purpose of measuring the density of sugar solutions is known as a saccharometer. There are three different kinds of sugar hy-

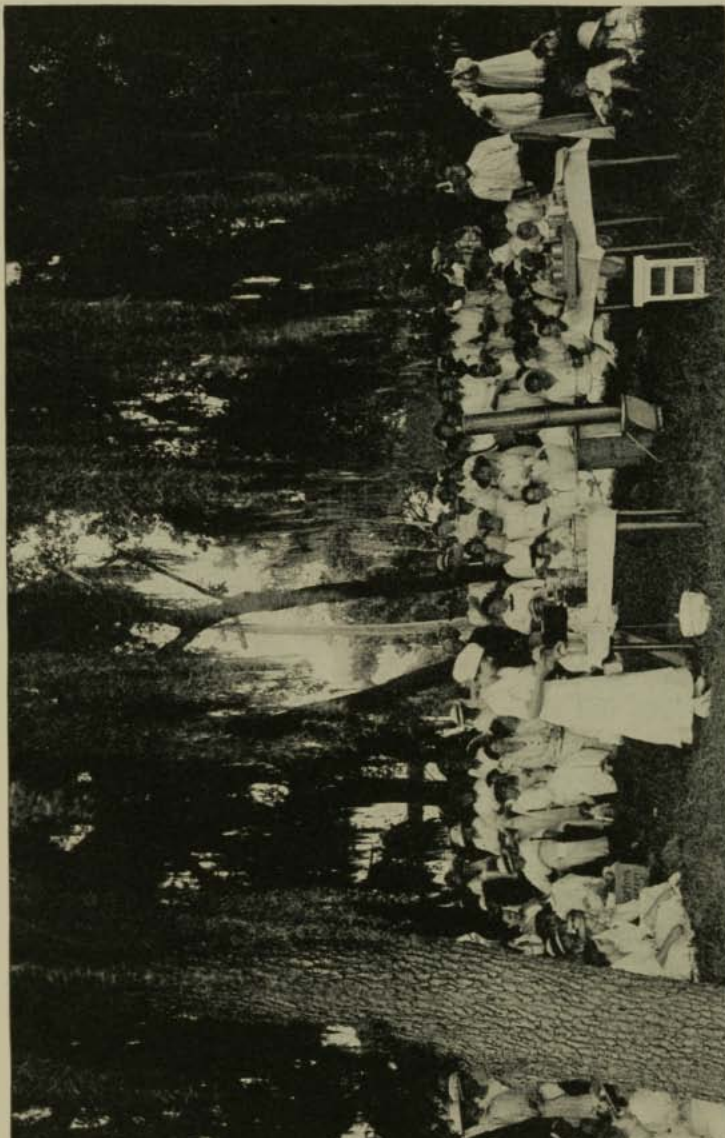

Fig. 83.—A demonstration in canning, Florida.

drometers used; namely, Balling, Brix, and Baumé. The readings are the same on the Balling and Brix instruments. Both indicate the percentage of sugar present in a solution of water. If the Baumé is used, a table showing the percentage of sugar corresponding to the degrees Brix is necessary for these recipes. This hydrometer is not suitable for use in preserving, since the readings should be converted into terms of either Brix or Balling. The Brix instruments may be secured with a range of zero to 30 degrees or 30 to 60 degrees graduated in tenths of a degree, and the Balling with a range of zero to 70 degrees graduated in halves of degrees (Fig. 81). This latter instrument is the one shown in the illustration. Its range prevents the necessity of

FIG. 84.—Cleansing rubber rings.

buying two spindles, and it is accurate enough for ordinary use in canning and preserving. For testing fruit juices in jelly making, an instrument with scale ranging from zero to 30 degrees and graduated in tenths of degrees is used. The Balling scale shown in the illustration is inexpensive.

Using the Instruments.—When placed in sufficient water to cover it, the spindle floats and the reading at the surface will be zero. If put in a heavier liquid than water, it will float, but at a different level. By adding solids, in the form of sugar, to water, the density increases and the spindle rises. In using a saccharometer it is necessary to have a vessel of sufficient depth in which to float it to make the readings. This should be very narrow so as not to require a large quantity of syrup to measure its density. A 250-cubic centimetre glass cylinder or a brass saccharometer cup is used (Fig. 82).

Sometimes a tall, slender olive bottle will serve this purpose. The instruments are fragile and only accurate when used for testing syrups at the temperature indicated on the spindle. These instruments will lose their accuracy if too frequently dipped into very hot solutions. The spindles may be secured mercury weighted or weighted with shot.

Amount of sugar used for syrup of different degrees, using a gallon of water as a basis to which the sugar is added:

Sugar Syrup Table.

Density, degrees, Brix or Balling	Quantity of sugar		Water
	Pounds	Ounces	
5	..	7	Per 1 gallon water.
10	..	14.8	Per 1 gallon water.
15	1	7.5	Per 1 gallon water.
20	1	14.75	Per 1 gallon water.
25	2	12.5	Per 1 gallon water.
30	3	9	Per 1 gallon water.
35	4	7.75	Per 1 gallon water.
40	5	8.75	Per 1 gallon water.
45	6	13	Per 1 gallon water.
50	8	5.25	Per 1 gallon water.
55	10	4	Per 1 gallon water.
60	12	8	Per 1 gallon water.

If a hydrometer is not available, see note under Syrup table, page 85. Working without hydrometer.

QUESTIONS

1. Why are glass or enamel-lined cans necessary for canning berries?
2. Describe how to pack berries that the best results may be obtained.
3. Of what should the syrup be made which is to be used in the canning of berries?
4. Why may green gooseberries be safely canned without processing?
5. Describe in detail the "lye method" of peeling peaches. What are the advantages in using this method? When is it unwise to use it?

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See Chapter X, page 147.

CHAPTER X

VEGETABLES FOR CANNING

Brine used for packing most of the vegetables is made of two and one-half ounces of salt to one gallon of water, except for asparagus, for which a heavier brine is used which contains four ounces of salt to one gallon of water.

Seasoning.—A seasoning mixed in the proportion of one part of salt and two parts of sugar is used in some canned vegetables. Two level teaspoonfuls of this mixture should be added to each quart jar or No. 3 can of tomatoes, and one teaspoonful added to each No. 2 can. This mixture is also used for peas, lima beans, and corn. The flavor of these products is much superior to those canned without sugar and salt seasoning.

Asparagus.—Select only young, tender asparagus for canning. It should be packed immediately to preserve it at its best. The stalks should be graded as to size and washed carefully to prevent any staining from the soil. The stalks are tied into bundles and blanched from three to four minutes. On account of the tips being more tender than the stalks, place the lower ends in the blanch first, allow them to stand for two or three minutes, and then emerge the entire bundle for one or two minutes longer, then plunge into cold water. The asparagus is again carefully graded into white and green lots and packed carefully, having the tips up. Fill the cans or jars with brine (four ounces of salt to one gallon of water) and process intermittently for one hour on each of three successive days in a hot-water bath; or in a steam canner for thirty minutes at a temperature of 240° Fahrenheit, under ten-pound steam pressure. Asparagus which has been allowed to stand over night has lost much in color and flavor; it should be canned immediately after cutting.

Artichokes.—A very small amount of this vegetable is packed in this country. The domestic artichokes have a thicker "biscuit" on the base of the leaves than the imported.

Select burr heads uniform in size, remove the larger outer leaves and tie the others together, then blanch for five minutes, pack into jars and cover with brine (two and one-half ounces of salt to one gallon of water). Process pint jars and No. 2 cans in boiling-water bath for one hour. Sometimes just the hearts, or "biscuits" as they are often called, are packed. The base of the flower should be one to one and one-half inches in diameter and half an inch thick when the leaves are removed. The vegetable is blanched and dipped into a cold bath before being trimmed. They are then packed into the jars and covered with brine and processed in the same manner as the whole heads.

This vegetable is considered a delicacy. It is used almost exclusively in the hotel trade. One difficulty in packing this vegetable is that it turns dark while packing and becomes unattractive in appearance, though the flavor may be unchanged.

String Beans.—The green "Refugee" and "Stringless Green Pod" are good varieties for canning. Beans should be picked while still young and tender and should be canned very fresh. When the beans within the pods have grown to any size canning is more difficult and the finished product is poor. The beans should be graded according to thickness, and only small, tender beans should be used for canning. String the beans and cut them into two-inch lengths; cutting diagonally, or "on the bias," gives an attractive product. Blanch for three to five minutes in a soda bath (one teaspoonful of soda to one gallon of water), plunge into a cold salt bath (one tablespoonful of salt to one quart of water) for twenty to thirty seconds. This treatment will assist in preserving the green color, and the finished product will be more attractive. Drain well and pack quickly. The beans may be packed in log-cabin fashion in square jars. If the beans are to be packed whole, they should be cut into even lengths, packed in the jars, covered with brine (two and one-half ounces of salt to one gallon of water), and processed in the hot-water bath intermittently; or they may be treated in a steam canner for forty-five minutes at a temperature of 240° Fahrenheit, under ten pounds steam pressure, which will be sufficient to sterilize beans in quart jars and No. 2 cans.

Wax Beans.—The wax beans are handled in the same way as the string beans. Sometimes the seasoning of sugar and salt is added to this product when packing. Exhaust No. 2 cans three minutes and process intermittently.

Lima Beans.—There are two varieties of lima beans—the vine or pole variety and the bush variety. The first named is used for drying and the last for canning green. This vegetable should be gathered when the beans are in prime condition and sorted carefully. The very large beans, that look starchy and have the appearance of soaked beans, are often canned for succotash in the section of the country where corn and beans mature at the same time. After blanching the beans, fill the cans, add brine (two and one-half ounces of salt to one gallon of water), exhaust and process in the same manner as for string beans.

Baby Beets.—Beets used for canning should be of uniform deep-red color throughout. The best variety of beets for canning is the "Detroit." From a standpoint of quality, only young, tender beets should be canned. Sort, putting uniform sizes together, steam for about twenty minutes, or boil until three-fourths cooked, to loosen the skins. Do not allow cold water to touch the beets after they have been cooked, as it sometimes causes them to lose color. Peel and pack whole those beets which average one inch in diameter; those above two inches are cut into slices. Cover the beets in the cans with clear, hot water. The flavor of the finished product is better if no seasoning is added during the canning. Process quart jars one to two hours, exhaust No. 2 cans for three minutes and process same as for quarts, or in a steam canner for 30 minutes at a temperature of 228° Fahrenheit.

Beets should never be packed in tin unless the cans are enamel lined. About thirty baby beets to each No. 2 can is considered a good pack; by weight sixteen ounces of beets and four ounces of liquor give a standard pack (Fig. 85).

Carrots.—Carrots used for canning should be young and tender and not more than one and one-half inches in diameter. They are washed, scraped carefully, steamed or boiled until three-

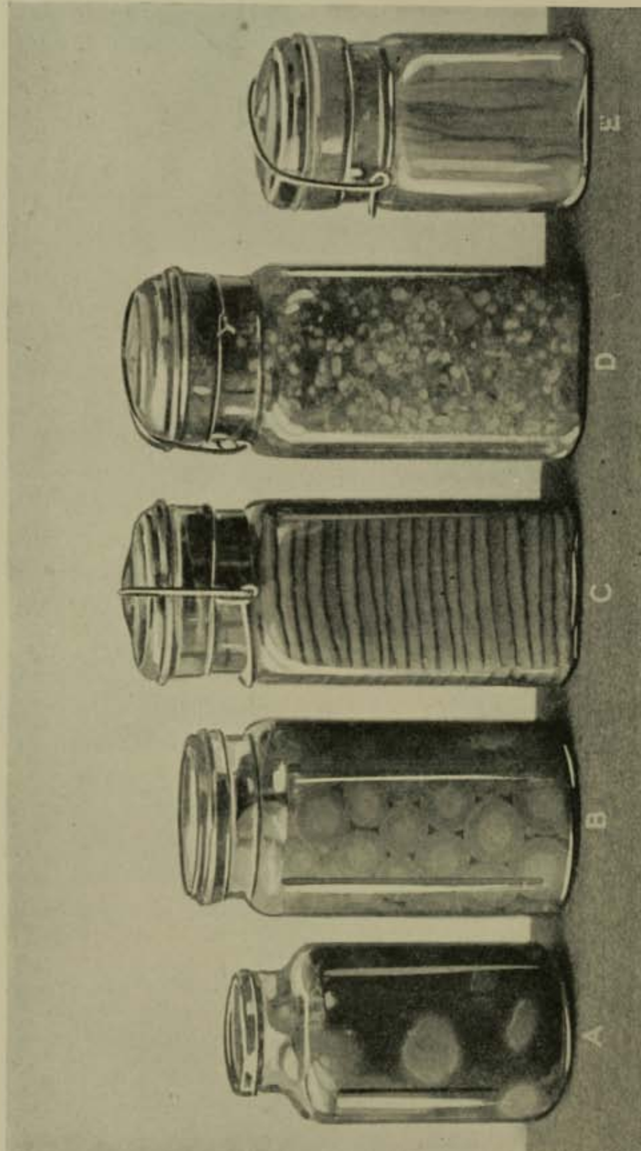

FIG. 85.—Fancy packs of canned vegetables: A. Baby beets. B. Carrot circles. C. Log-cabin pack of beans. D. Concentrated soup mixture. E. Okra.

fourths cooked, and cut into lengths of the can, sliced or diced. Fill the jars or cans and cover with brine (two and one-half ounces of salt to one gallon of water) and process for one hour.

An attractive pack of carrots in glass may be made by placing the circles in layers, fitting the second layer into the space left by the first layer and repeating until the jar is filled. The center should be filled in as each outside layer is placed against the glass.

Corn.—In the canning of corn much depends upon the careful selection of tender, juicy corn before it reaches the starchy stage. If allowed to grow beyond the point of greatest succulence it becomes tough and dry. The sweet white variety is preferable for canning. The Western yellow corn is less succulent. Corn grows stale very quickly and loses its flavor, therefore it should never be allowed to stand longer than a few minutes after being snapped from the stalks before canning. Blanch on the cobs from one to three minutes. There are different procedures followed in cutting the kernels from the cob; the kernels may be cut very close to the cob and no scraping done; this will give a canned corn with nearly whole separate kernels in the brine. By another method the cutting may be done in such a manner that the outer end of the grain is cut off first, and then the lower part of the kernel is removed by a second cutting; this cutting will give a creamy consistency to the finished product. Another style of cutting the corn from the cob is to slit the end of the kernels and squeeze out the contents; this will give a hull-less product similar to the commercial "Kornlet." After removing the corn from the cob it may be packed into the jars or cans cold to within one inch of the top; add one and one-half teaspoonfuls of the salt-and-sugar mixture to each jar or can and cover with clear water; paddle to allow the liquid to permeate to the bottom of the containers. Exhaust No. 2 tin cans for ten minutes, process intermittently, cooling immediately after each processing by plunging the cans into cold water. If canning in glass, process quart jars intermittently, raising the clamp during each processing; for corn expands in cooking and the jars may be broken unless the lids are loosened during each processing.

A product of more uniform consistency can be obtained by heating the corn with the seasoning (sugar, salt, and a little water) before packing it into the cans. This will cause the expansion of the kernels before packing, and the result will be a fuller pack and shorten the time of the exhaust to five minutes instead of ten minutes, if the corn is packed hot into hot cans. It may seem that the heating of the pulp complicates or lengthens the process, but the time saved in exhausting and the condition of the finished product make it worth while.

Take every precaution to have good rubbers, and keep the process at boiling-point for the entire time. The steps in the canning of corn should follow in rapid succession, allowing one hour from the time the corn is gathered until it is sealed in the can ready for the process. If processed or sterilized in a steam retort, eighty minutes under a fifteen-pound pressure will be sufficient for heavy corn; or, if a water-bath is used, canned corn should be processed intermittently for one hour on each of three successive days.

Lye Hominy.—Use the sweet flat corn. Most early varieties of sweet corn, of which "Stowell's Evergreen" is an example, have the flat kernels. To obtain best results in preparing lye hominy, dissolve two ounces of concentrated lye in one gallon of boiling water; drop the corn into this solution and boil rapidly for twenty-five to thirty minutes. Drain and drop into cold water. If possible, allow cold water to run over it for three or four hours to remove all traces of the lye. After this, place in a barrel churn and turn the churn for five to ten minutes to remove the hulls and black eyes. After removing the hulls, place the corn in an enamelled kettle, cover with clear boiling water, and cook until tender. Wash again and remove any hulls or eyes which you failed to take off in the churn. Enamel-lined cans or glass should be used for packing hominy. Fill the cans to within one-half inch of the top and cover with brine (two and one-half ounces of salt to one gallon of water). Cap and exhaust for ten minutes. Process in No. 2 cans intermittently in a hot-water bath, or in a steam canner for fifty minutes under a fifteen-pound steam pressure. This product is more easily sterilized in No. 2

cans. It is very important that all trace of the lye be removed before packing the hominy into the cans.

Okra.—Select young, tender pods, removing the stem end without cutting into the seed sections, blanch in the soda bath (as for beans), plunge into the cold salt bath, drain, pack into jars, cover with brine, and process the same as for beans. This product is used almost exclusively in Southern cookery and is not generally known in the North. If the okra is to be packed for soups, it may be sliced after blanching, as it is hard to cut after canning. If a steam canner is used, process for thirty minutes under a ten-pound steam pressure (Fig. 85).

Peas.—Peas are more difficult to can than most other vegetables, and special care should be taken in handling them. Use only fresh, young peas. They should be gathered in the early morning and canned as soon as possible. Work should be done rapidly, and the peas should not stand after being shelled. Shell and sort, putting peas of the same size and grade of maturity together. Be sure not to use hard, ripe peas among the tender ones. The peas are blanched according to their age and size until well done; this prevents a cloudy liquor and makes the peas tender, also removing some of the gluey substance which sometimes coats the peas. The very young, tender peas need scarcely more than one to two minutes' blanch, while the very old ones may need twenty minutes'. The time should be sufficient to make the peas tender, otherwise they will remain hard in the processing. The peas are blanched in the soda bath and dipped into the cold salt water for twenty to thirty seconds after blanching, the same as for beans. Pack the peas to within one-half inch of the top of the jars or cans. If the cans are too full, some of the peas may burst during the processing and make the liquor cloudy. Put one and one-half level teaspoonfuls of the salt-and-sugar mixture in each No. 2 can. Cover the peas with water, exhaust No. 2 cans three minutes, and process in hot-water bath intermittently one hour on each of three successive days. If the peas are very small and tender, forty-five minutes to each processing will be sufficient. Cool the tins quickly after each processing. This may be done by plunging the cans into cold water. Process quart jars one hour on each of three successive days. No. 2 cans of peas may be sterilized in a steam retort for forty-five minutes under a ten-pound steam pressure.

Pimientos.—The peppers should be picked in the early morning and handled carefully to prevent bruising. This can be done by placing them in shallow trays, from which they can be easily sorted. The medium-sized, uniformly sound peppers should be canned whole. The irregular, broken ones may be cut into strips and canned or used in relishes, sauces, or soup mixtures.

Select sound, uniform pimientos of medium size. To remove seeds, cut around the stem of each with a slender paring knife and remove the inside partitions. To peel, place the peppers in a hot oven from six to ten minutes (until the skin blisters and cracks), being careful not to allow them to burn. Then remove the skin with a slender paring knife. Flatten the peppers and pack in horizontal layers. No liquid is used in canning pimientos. The processing brings out of the pimientos a thick liquor, which almost covers them in the can or jar. Cap and exhaust No. 1 cans for two minutes and No. 2 cans for three minutes. Tip and process in hot water at boiling temperature (212° Fahrenheit), the No. 1 cans for twenty minutes, the No. 2 cans for thirty-five minutes. When canning in glass the pint jars should be well filled, then capped and processed for twenty-five minutes at 212° Fahrenheit (Fig. 86).

Chile Peppers.—The long, sweet green Chile peppers are picked and canned when full grown. Unlike the pimientos, the Chile peppers are canned before any tint of red appears. The pods may be dropped into hot oil to loosen the skins from the fleshy part. As soon as they are cool remove the skin, stem, and press out the seeds, leaving the Chile as nearly whole as possible, roll the Chile peppers and pack into cans, cover with brine, using one ounce of salt to one gallon of water, process the same as for pimientos (Fig. 87).

Pumpkins.—The best pumpkins for canning are those which color and ripen evenly. Wash the pumpkin, cut into slices, and steam until tender. Remove the pulp from the shell and heat it thoroughly in a pan over boiling water. A double boiler is a convenient utensil to use for this purpose. Spices may be added to the pumpkin if desired, and the flavor obtained by cooking the spices in at the time of canning is better than making the addition at the time of using. The following proportion of ground spices is generally used: For each quart of steamed strained pumpkin

FIG. 86.—Roasting and packing pimientos.

add one-half cupful of brown sugar, two teaspoonfuls of cinnamon, one teaspoonful of salt, and one teaspoonful of ginger. Stir the pulp until of a smooth, even consistency, pack into cans or jars while hot, and process in a water-bath intermittently one hour on each of three successive days or process in a steam-pressure outfit for sixty-five minutes under ten pounds pressure.

Rhubarb.—Select rhubarb which has matured quickly. Trim off the upper and lower ends, wash and cut into even lengths. It may be packed in long strips in glass or it may be cut into inch lengths. Fill the jars as tightly as possible without crushing the pieces, and add water or syrup. As sugar is necessary when using the rhubarb, it is better that it be added at the time of canning.

FIG. 87—Attractive pepper packs in the center.

ning. If syrup is desired, use one-half cupful of sugar to one quart of water. Rhubarb when packed in tin must be put into enamel-lined cans. It is usually preferred when canned in glass. Process No. 2 cans and quart jars in hot-water bath for fifteen minutes at 212° Fahrenheit.

Spinach.—Prepare the spinach by picking off all the dead leaves and cutting off the roots. Cover one peck of spinach for two minutes with scalding water in which you have dissolved one teaspoonful of soda to a gallon of water. Wash thoroughly, using a large tub of water so dirt can sink to the bottom; drain and boil rapidly in boiling water four to six minutes. Drain well and pack into sterilized jars or cans, cover with boiling salt water, using one tablespoonful salt to one quart of water. Process in a water-bath for one hour at 212° Fahrenheit, or in a steam canner for 35 minutes under ten pounds pressure.

Other Greens.—Young, tender beet tops, Swiss chard, and dandelions may be canned by the method outlined for spinach.

Squash.—Squash is canned by the same method as pumpkin, omitting the spices.

Sweet Potato.—Sweet potatoes should be canned as soon as possible after digging. A potato which is dry and mealy when canned is desired for market. The Nancy Hall is one of the best varieties for canning. The Triumph and Southern Queen are also used. When the potatoes are allowed to stand before canning they bruise easily and start to decay at the points where the rootlets emerge. Select absolutely sound potatoes, sort, putting together those of the same size—those under one and one-half inches in diameter in one lot and those above one and one-half inches in diameter in another—boil or steam until the potatoes are about half cooked, when the skin will slip off easily. Peel as soon as the potatoes are cool enough to handle, and pack hot into cans or jars as quickly as possible to prevent discoloring. For a fancy pack the potatoes are placed in layers, but a standard pack can be made by mashing the potatoes, heating thoroughly, and packing the potatoes hot. All space in the can should be filled with potato, as the presence of air will cause discoloration. Exhaust No. 3 cans for ten to fifteen minutes. The exhaust should be very hot, as the sweet potato is a poor conductor of heat, and the heat penetrates through the sweet potato to the center of the can very slowly. Process for four hours straight in boiling water or seventy minutes under fifteen pounds steam pressure.

Tomatoes.—The fruit should be gathered in shallow trays and the picking done in the shortest posible time. The tomato is a delicate fruit, and if it is allowed to stand several days before canning, or if it is picked before being ripe and allowed to stand, it does not develop its characteristic flavor. Sort and grade the fruit. Wash, putting into trays or squares of cheesecloth, and lowering into boiling water for one minute. Remove at once to prevent cooking. Plunge into cold water to make the fruit firmer. Peel promptly. Cut out the core with a slender-pointed knife, being careful not to cut into the seed-cells. Pack only red, ripe, sound tomatoes, whole or in large pieces. Add two teaspoonfuls of the sugar-and-salt mixture to each No. 3 can or quart jar, and one and one-half teaspoonfuls in each No. 2 can;

FIG. 88.—Tomatoes packed for salad (the thick sauce has been drained off).

exhaust for three minutes and process No. 2 cans for twenty minutes and No. 3 cans and quart jars for twenty-five minutes.

In canning tomatoes in tin no addition of tomato juice in excess of the amount present in the tomatoes canned should be allowed if the product is to be put on the market. Any water or extra tomato juice is considered an adulteration. When it is desired to keep tomatoes whole for exhibits or home use, they may be packed carefully in glass. A thick tomato sauce poured over them will aid in keeping the tomatoes whole, plump, and of a better color than is possible when they are packed in a thin liquor. From an economical standpoint, a jar of tomatoes packed in sauce is a fine product; the sauce may be used for soups and whole tomatoes for salads (Fig. 88).

Tomato Purée.—Small, irregular, and undersized tomatoes can be made into purée or soup. For this purpose they should be cooked and strained at the time they are canned rather than canned fresh. The tomatoes are washed, graded, and cooked until tender, then run through the colander and put over the fire again. The mixture is then concentrated to from one-half to one-third of the original volume. This concentrated tomato sauce may be canned and processed by the method outlined for tomatoes. The concentrated mixture, of course, requires fewer cans and jars, as the amount of water canned is reduced, and, with cans costing as they do, this is an important consideration.

Soup Mixture.—A good combination to use for this mixture is one quart of thick tomato pulp, two cupfuls of corn or tiny lima beans, and two cupfuls of okra, with seasoning of salt, sugar, pepper, and sliced onion (Fig. 89). Cook this mixture together for ten minutes, pack in No. 2 cans or glass jars, exhaust for five minutes, and process for two hours, or in a steam canner for thirty-five minutes under five pounds pressure.

Turnips.—Canned turnips are not generally used. Sometimes they are packed commercially for hotel use. Only small, tender turnips should be canned. Wash, scrape, blanch for five to eight minutes, pack into cans, cover with hot brine (two and one-half ounces of salt to one gallon of water) and process for two hours, or intermittently one hour on each of three successive days.

Creole Sauce.—Two cupfuls of corn, three tablespoonfuls of chopped onion, one tablespoonful of celery seed (crushed), three tablespoonfuls of butter, one cupful of sliced okra, one bay leaf, one clove of garlic (chopped), one quart of tomato juice and pulp, one cupful of chopped sweet red pepper, one cupful of chopped sweet green pepper. Salt and pepper to taste. Strain

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Fig. 89.—Vegetables packed fresh for soup mixture.

the seeds and skins out of the cooked tomatoes, keeping all pulp possible. Cook chopped onion in butter until yellow. Add the prepared vegetables and seasoning. Simmer until the corn is tender. Pack hot in twelve-ounce or pint jars or No. 2 cans. Process in the glass jars for twenty minutes. Exhaust No. 2 cans for five minutes and process for fifteen minutes.

Mushrooms.—Directions for canning mushrooms may be obtained from the bulletin "Preserving Wild Mushrooms" (see Bibliography).

QUESTIONS

1. State a general outline to be followed in the selection, preparation, and canning of most vegetables. If any step should be omitted for special vegetables, note the step, naming the vegetables for which it should be omitted; if there should be any steps added for special vegetables, describe them, naming the vegetables for which they are necessary.
2. What is the usual strength of brine used with vegetables?
3. What is the proportion of sugar and salt in the sugar-and-salt mixture?
4. For what vegetables should a tin can not be used unless it is enamel lined? Why is this true?

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CHAPTER XI

PRESERVES

A PRESERVED FRUIT is one which has been cooked in cane-sugar syrup until it is clear, tender, and transparent. It should keep its form and plumpness and be crisp rather than tough or soft. When finished, the cells of the fruit should be filled with the flavored syrup in place of the fruit juice.

In general, all the principles thus far discussed in canning are to be applied also in preserving. The special problem in preserving is to be able to introduce the syrup gradually enough to make it possible for the syrups to permeate the fruit thoroughly without shrinking and toughening it. When fruit is dropped at once into hot syrup that is too dense, the juice of the fruit will be drawn out so rapidly by this heavy liquid as to shrink the fruit. Then the outside surface becomes so coated with thick syrup that little can enter the fruit. In order to prevent this toughening and shrinking, it is necessary to start the cooking of the fruit in a thin syrup. Most preserves should be begun in a syrup testing about 30 to 40 degrees Brix or Balling and gradually have the syrup thicken by boiling with the fruit in it (Frontispiece).

Cooking Preserves.—Preserves should be cooked over a very hot fire as rapidly as possible to have the finished product sparkling bright, clear, and of a good color. If slowly cooked, the result will be a dull, dark, unattractive product. The fruit, while cooking, should be well covered with the syrup so that no top pieces will dry on the surface and shrivel before a sufficient amount of syrup has entered the pieces to plump them. Sometimes the syrup becomes too thick before the fruit is sufficiently clear and tender, as may happen when a small quantity of fruit is cooked in a large pan. In this case the water in the syrup evaporates more quickly on account of the broad surface exposed, and the syrup should be thinned by adding a small amount of water or a quantity of thinner syrup. Beginning the process of preserving fruit in a thin syrup, cooking rapidly until pieces are clear and allowing the fruit to stand immersed in the syrup over night will cause more of the syrup to permeate the fruit and plump it. If this process be carried on gradually enough, the fruit may be completely saturated with syrup (as in the case of crystallized

FIG. 90.—Packing watermelon rind preserves, Peabody College for Teachers, Nashville, Tenn.

products) without shrinking. The finished product should keep its original form, be plump, mellow, and clear.

For preserving such fruits as chayotes, pears, and watermelon rind (Fig. 90) a syrup not heavier than 30 degrees Balling (p.

129) should be used to begin the cooking. Juicy fruits like berries may be put at the beginning into a heavier syrup, about 40 to 45 degrees Balling, because the abundant juices of the fruit quickly reduce the density of the syrup before shrinking can take place. Finished preserves are packed in a syrup ranging in density from 50 to 60 degrees Balling. When acid fruits are added to the syrup some of the sugar is inverted or changed to a form which will not readily crystallize, and for this reason the syrup may be made heavier without danger of crystallization. Since long cooking injures the color and flavor of fruits, it is desirable to cook delicate fruits, such as berries, for as short a time as possible.

Fig. 91.—A chemical thermometer—Centigrade.

Cooling Preserves.—Cooling rapidly after cooking gives preserves a better color and flavor than can be secured when they are packed hot. Standing immersed in the syrup after cooking helps to plump the fruit. Shallow enamelled trays or pans are desirable for cooling. Running cold water underneath the pans will help to cool them more rapidly (Fig. 92). Tin utensils should not be used, because the fruit juices will discolor in it.

Packing.—Pack preserves cold. Bring the syrup in which they have been standing to boiling, strain, test, and, if proper density, pour over the packed preserves, paddling the packed jars to remove all air bubbles. If not of the right weight for packing, the syrup must be concentrated to the proper density by boiling it. A well-packed jar of preserves will contain fruits or pieces of fruit of uniform size appropriate for filling the space within the jar. These pieces should be arranged in rows or layers in such a way as to give the entire pack a symmetrical or well-balanced appearance. A little more time and care is required to pack in this way, but the space is economized and the quality of the finished product is enhanced (Fig. 93).

Sealing Preserves.—To seal properly and to insure safety from mold, it is necessary to process all preserves after packing them into the sterilized jars. This processing may be done in a water-bath by heat below or at the boiling temperature, depending upon the kind of products packed and upon the length of time the heat is applied. Since preserves contain so much sugar, which acts as a preservative, it is only necessary to process against molds. This may be accomplished by placing the filled jars in a water-bath, heating it to a temperature of 180° to 190°

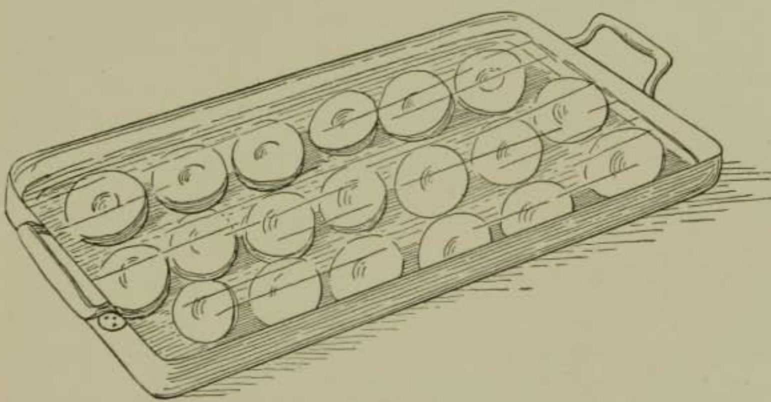

FIG. 92.—Cooling and plumping preserved fruits.

Fahrenheit, and holding that temperature for about thirty minutes. This method preserves a better texture and flavor in the fruit, than can be retained when processing is done at a higher temperature.

Process preserves or jams in twelve-ounce or pint jars for twenty minutes at 180° Fahrenheit (temperature of simmering water). When jars with glass tops and screw caps or wire clamps (lightning seal) are used, leave the pressure of the clamp on the top of cap until the jars are entirely cold.

Special Equipment.—Success depends more upon the perfect freshness of the fruit than any other feature. "From the patch with dispatch," is a good slogan.

Uniform results may be obtained more easily if some special equipment, such as good enamel or aluminum vessels, scales, measuring cups, wooden spoons, paddles, thermometers, and saccharometers, is secured. A thermometer which gives readings by degrees Fahrenheit for each degree from zero to 250° is useful in determining the finishing point in preserves (Fig. 91); 105½° to 106½° Centigrade, or 222° to 224° Fahrenheit is recommended as the finishing point for most fruits. The syrup

FIG. 93.—Packing preserved figs, Walton County, Florida.

will not reach 224° Fahrenheit until a sufficient amount of water has been driven off by the boiling. The temperature test is perhaps the simplest test for the finished preserving syrup. All of the different batches of preserves should be cooked enough and be of uniform consistency. Some sour fruits, such as cherries and currants, when preserved are cooked to a higher temperature because of the acid present. 106° to 108° Centigrade or 224° to 226° Fahrenheit is a good finishing point for these products.

The saccharometer is a little more difficult than the thermometer to handle, since sufficient syrup must be taken from the kettle, poured over the spindle into a cylinder or bottle deep enough to float it, and the reading taken, or the spindle may be floated in the kettle if it is deep enough.

Proportion of Sugar.—Usually three-fourths pound of sugar for each pound of fruit is allowed for preserves. Firm fruits

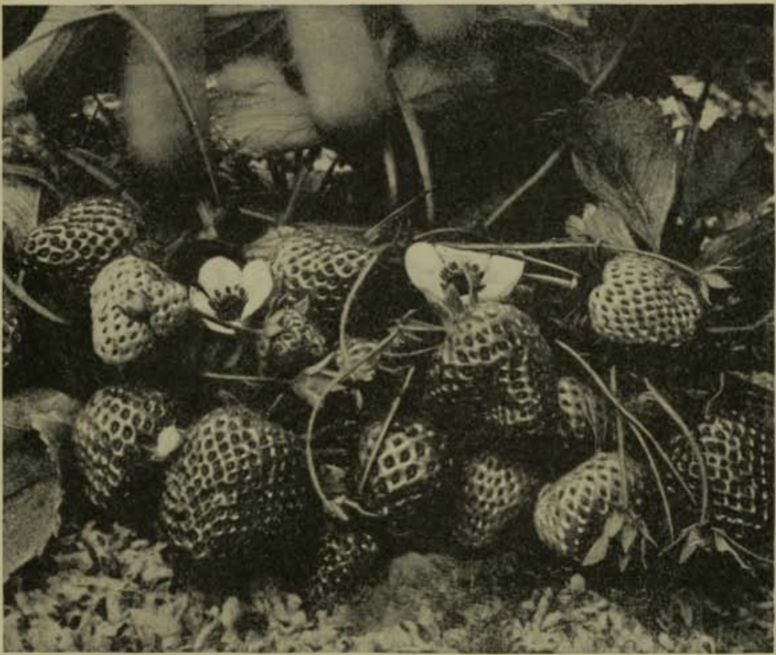

FIG. 94.—Only freshly picked berries should be preserved.

like quinces, melon rinds, hard pears, and crab apples are better if cooked in boiling water until tender before adding them to the syrup.

The use of preserves in the daily menu should be limited, since they are so much richer than fresh and plain canned fruits. Strawberries, plums, sour cherries, quinces, and melon rind are more palatable when preserved than when canned.

Berries.—Only freshly picked berries should be preserved (Fig. 94). Practically the same methods are to be followed in the preserving of all berries. Berries should be gathered in shallow trays or baskets, and not in deep vessels which allow them to be bruised and crushed. They should be uniform, ripe, and sound; only large, firm berries should be selected for preserving. All berries should be carefully sorted and lightly washed by placing in colander and pouring water over them rather than putting them into a pan of water.

The following proportion is recommended: two pounds of whole berries—two and one-half pounds of sugar—one pint of berry juice.

If the best possible color and flavor is to be secured for the finished product, the syrup for preserved berries should be made of berry juice, obtained by crushing, heating and straining the softer broken berries. Boil together the berry juice and the sugar and skim and cook the syrup before dropping the berries into it, to prevent shrivelling and toughening the fruit. Return to the fire and bring slowly to a boil in a covered pan. Remove the cover and cook until the fruit looks clear, being very careful not to overcook; the berries should remain whole. If a thermometer is used the cooking may be finished at 222° to 224° Fahrenheit. Skin and cool in a covered pan. If berry preserves are covered for five minutes before removing from the fire and the vessel left covered while cooling the product will be more plump. The fruit will be better if allowed to cool in shallow trays or pans and stand in the syrup over night; it improves the shape and flavor, as the berries absorb more of the syrup, become heavier, and pack better. Lift the berries out of the syrup carefully and pack cold, filling the sterilized jars with berries before pouring the syrup over them. A good pack requires more berries than syrup. Cap, process pint jars for ten minutes at 180° Fahrenheit, seal, and store in a dark dry place.

Packing syrup for berries should have a density of 50 to 55 degrees Balling (see p. 129).

Strawberry Preserves.—

2 pounds of berries ½ cup of berry juice
1½ pounds of sugar

Wash, cap, and stem the strawberries. Make a syrup of the sugar and juice and add the berries. Cook to 222° Fahrenheit or 105½° Centigrade, or until the syrup is very thick. Cook quickly, pack into sterilized jars, and seal as for preserves. More of the natural flavor is retained by using this method, and no syrup will be left over, which means a saving in sugar, but the yield is not so great and the fruit does not remain whole and plump as in the first method given above.

Currant and Cherry Preserves.—White currants and cherries may be preserved by following the same directions given for strawberry preserves, except that in using a thermometer to determine the finishing point for cherry preserves the temperature should be run up to 226° Fahrenheit or 107° Centigrade. A heavier packing syrup is more necessary for sour cherries than for the sweet ones.

Sun-cooked Preserves.—Cherries, currants, raspberries or strawberries alone, or a combination of two-thirds currants and one-third raspberries, may be cooked by this method. Dampness is a great foe to successful sun cookery. The berries should be washed, capped, stemmed, drained, and measured. Allow an equal weight of sugar for fruit. For each two pounds of berries measure one-fourth cupful of berry juice and heat with the sugar. Cook and pour over the whole berries in shallow trays. Stand in the sun for three or four days, bringing indoors each night. Allow the fruit to remain in the sun until it is well plumped and the syrup has thickened almost to a jelly. If the sun fails to shine, keep the preserves in a cool oven.

Sour Orange Preserves.—The peel of the native sour orange, which is found in the southern part of the Gulf States, makes delightful preserves. Grate off evenly all yellow, cut the oranges into quarters, and peel. Soak the peel in salt water (one cupful of salt to one gallon of water) for two or three days, changing the water twice daily. Cover with clear water and boil for ten minutes, drain, and repeat the boiling twice to remove all bitterness. When the peel is tender drop it into a heavy syrup (two cupfuls of sugar to two cupfuls of sweet orange juice) for each two pounds of peel, and cook rapidly until clear and transparent. Cool before packing, pack into sterilized jars, process pints for fifteen minutes at 180° Fahrenheit, seal, and store.

Preserved Whole Kumquats.—

2 pounds of whole kumquats (after cooking)	2 pounds of sugar
	1 quart of water

Scrub the kumquats with soap and warm water, scald them with boiling soda water, using a cupful of soda to five quarts of water. Allow fruit to stand in the soda bath until cool, drain and slit each kumquat with a sharp-pointed knife to prevent them from bursting open while cooking. Drop into boiling water and cook for ten or fifteen minutes (until tender). After this the seeds can easily be removed. Boil the sugar and water together for ten minutes, add the drained kumquats and cook until clear and transparent. The fruit will keep its shape better if the cooking is done in a covered pan. Carefully place the fruit into trays, pour the syrup over it and allow to remain over night to plump. Pack the kumquats into sterilized jars, strain and pour the syrup over them, process pint jars for fifteen minutes at 180° Fahrenheit, and seal tightly while hot.

Kumquat Preserves.—

1 pound of kumquats	¾ pound of sugar
1 pint of water	

The kumquat pulp, which remains in the filter after the juice has been drained off for jelly, may be made into a preserve. The seeds should be removed when the fruit is first prepared for the jelly. Pass the pulp through a food chopper, weigh, and allow three-fourths pound of sugar for each pound of pulp. Cook the water and pulp together for twenty minutes, add the sugar, and continue boiling rapidly until the mixture becomes bright and clear and of proper consistency. If Satsuma orange juice is used in place of water in these kumquat recipes an even more delightful flavor may be obtained in the finished product.

Preserved Peaches.—

1 peck of peeled peaches	3½ pounds of brown sugar
3 pints of cider vinegar	½ ounce of nutmeg
1 ounce of cloves	1 ounce of cinnamon

Peel the peaches and put them into a stone jar. Break up spices, scald, and then strew them through the peaches. Boil sugar and vinegar together for ten minutes and pour over the peaches while very hot. Repeat this for three consecutive days, then boil all together for ten minutes, cool, pack, and process.

Plums may be preserved by the same method as for peaches but adding one pint less of vinegar.

Preserved Pears.—

1 pound of pears	1 cupful of water
¾ pound of sugar	

Pears may be preserved whole, in halves, or quarters. Seckel pears are often preserved whole. If Keifer pears are used, they should boil in clear water after being pared until they can be easily pierced with a darning-needle. Then place them in the syrup, cook, cool, plump, pack, process, and seal the same as for all preserves.

Ginger Pears.—Use hard or under-ripe pears, pare, core, and cut into very thin slices. To eight pounds of pears allow ~~eight~~ 6 pounds of sugar, ~~one~~ cupful of water, juice of four lemons. Cut the lemon rinds into thin strips and add. Also add ~~one-eighth~~ 1/4 pound of ginger root cut into pieces. Simmer until thick as marmalade. Pack like peach jam.

Ginger Apples.—Hard varieties of apples are delicious when preserved by the method just outlined.

Apple Preserves.—

1 pound of apples	1 cupful of water
1 pound of sugar	½ lemon sliced thinly

Whole crab apples, packed with or without the stems, make an attractive preserve. Pare, allow the apples to remain whole, and follow same directions given for plain preserved peaches.

After the apples have plumped in the syrup over night it may be necessary to pour off the syrup and boil it for ten minutes, or until it is of the desired consistency. Strain the syrup and pour it over the apples, which have been carefully placed so that all stems will be upward. Process and seal as for all preserves.

Large, firm apples, if used for preserves, are perhaps better if pared, cored, and quartered before cooking in the syrup. The parings and cores may be boiled for fifteen minutes in the water and strained out before the sugar is added to make the syrup. This will add color and some pectin to the preserving syrup. Pectin is the jelly-making substance found in some fruit juices.

Golden Pumpkin Chips.—Remove the skin and seeds from a medium-sized pumpkin which has been cut into quarters; then slice the pieces across, cutting each piece about one-quarter inch thick. Prepare a syrup as for preserved apples, allowing three-quarter pound of sugar to each pound of pumpkin, and proceed by the directions given in that recipe.

Preserved Watermelon Rind.—

1 pound of melon rind	1 lemon
1 pound of sugar	1 ounce of lime (CaO)
2 quarts of water	

Cut the rind into one-inch squares, remove peel and all pink part, and weigh. Soak over night in lime water (one ounce of lime to two quarts of water). The lime (calcium oxide) may be secured from a drug store. The following morning allow the rind to stand for two hours in clear water. Drain well, then drop into boiling water and boil rapidly for ten minutes. Drain again and add gradually to the syrup (made by boiling together two cupfuls of sugar and one quart of water). Add to this the juice of one-half lemon and three extra slices of lemon. Cook until the melon is tender and transparent. Allow to stand covered with the syrup until cold, arrange the pieces attractively in the jars, garnishing with slices of lemon. Cover with the syrup testing 50 to 55 degrees. Process and seal (see p. 129).

Gingered Watermelon Rind.—

1 pound of melon rind	1 ounce of ginger
1½ pounds of sugar	½ lemon

Follow the same method as for melon rind preserves until after the rind has been freshened in cold water. Then drain well and boil rapidly for fifteen minutes in strong ginger tea (one ounce of ginger to one quart of water). Finish cooking in a 30-degree syrup made by using two pints of the strained ginger tea with two pints of water and one and one-half pounds of sugar. Cook rapidly until tender and transparent (about one hour). After rind has boiled for one-half hour, add one-half lemon, cut into thin slices. Cook until rind is tender and transparent. Cool, pack, and process like preserves.

Gingered watermelon rind, chopped finely, is excellent to combine with canned sweet red pimientos for making the Spanish chutney (see p. 206).

Preserved Figs.—

6 quarts of figs	1 cupful of baking soda
4 pounds of sugar	6 quarts of boiling water
3 quarts of water	

Select firm, sound fruit, discard all over-ripe or broken figs. Sprinkle one cupful of baking soda over the selected figs and cover with about six quarts of boiling water. Allow them to stand for fifteen minutes, drain off this soda solution, and rinse the figs well in clear, cold water. Let the figs drain while syrup is being prepared. Mix sugar and the three quarts of water, boil for ten minutes, and skim. Add well-drained figs gradually so as not to cool the syrup. Cook rapidly until figs are clear and tender (about two hours). When the figs are transparent, lift them out carefully and place in shallow pans. If the syrup is not heavy enough (testing about 50 to 55 degrees with a saccharometer), continue boiling until it reaches the desired density, then pour it over the figs, being careful to see that the fruit is entirely covered. Let stand over night. Next morning pack the figs cold in sterilized jars, having stems all the same length and placing the figs so that all stems will be upward. Fill each jar to overflowing with the syrup of 55 degrees density (p. 129). Cap, clamp, process, and seal immediately.

Yellow Tomato Preserves.—

4 pounds of fruit	¼ ounce of ginger
6 pounds of sugar	½ lemon
2 quarts of water	½ ounce of cinnamon

Boil together water, sugar, lemon, and spices for fifteen minutes, or until 217° Fahrenheit is reached; add fruit gradually and cook gently until the fruit becomes bright and clear, stirring occasionally and being careful not to allow it to burn. If a thermometer is used, cook to 222° Fahrenheit, pour into trays, stand over night, pack the tomatoes cold, and strain the syrup over them. Process as for other preserves.

Small green or red tomatoes may be preserved whole by this same method.

Pineapple Preserves.—

1 pound of fruit	¾ pound of sugar

Peel, core, and slice the fruit, place alternate layers of sugar and fruit in a bowl and allow to stand over night. Next morning drain off the syrup and boil it for ten minutes, add the fruit and continue cooking fifteen minutes, remove from the fire, skim and pack into jars, process pint jars at 212° Fahrenheit for fifteen minutes in a water-bath.

Cherry Preserves.—

4 pounds of cherries	1 cupful of cherry juice
3 pounds of sugar	

Make a syrup of the sugar and fruit juice, cool, add seeded cherries, and cook rapidly until fruit is clear and syrup is of the proper consistency. If a thermometer is used, finish cherry preserves at 106° to 108° Centigrade, or 223° to 226° F. Cool, pack into jars, and process as for other preserves.

Cherries (Vinegarette).—

4 pounds of sweet cherries	3 pounds of sugar
1 quart of vinegar	1 cupful of cherry juice

Carefully remove the stones, place cherries in trays or pans, and cover with diluted vinegar (two cupfuls of water and one cupful of vinegar). Allow to stand over night, drain well next morning, and cover the four pounds of fruit with a heavy syrup, made by boiling together three pounds of sugar and one cupful of cherry juice. Allow to stand in this syrup in the sun for three or four days to plump. Pack into jars and strain the syrup over them. Cherries preserved in this way are sometimes called homemade maraschino cherries. This product may be artificially colored with vegetable coloring matter, which can be secured from the druggist. A small amount of the coloring should be added when the cherries are put in the heavy syrup.

Candied Fruits.—Whole cherries, apricots, peaches, and pears

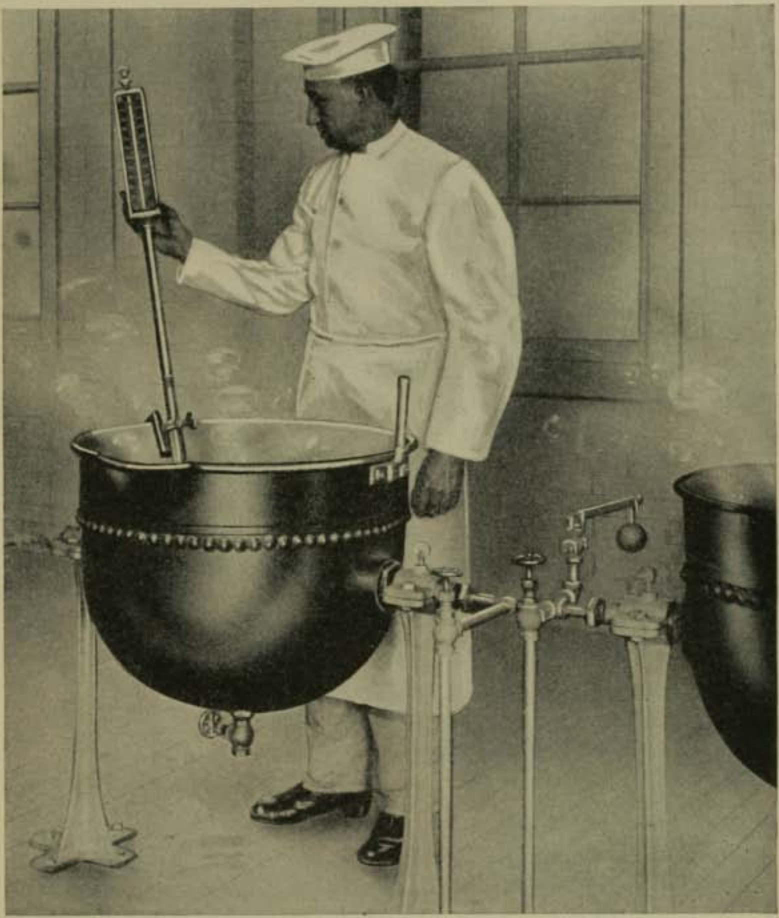

FIG. 95.—A steam-jacketed preserving kettle. (Heinz Company.) Note use of thermometer and arm and ball weight valve to control steam pressure.

in halves, sliced pineapples, and whole figs are often prepared in this way. It is a lengthy and tedious procedure. It calls for

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slow cooking on the instalment plan, and shallow trays for plumping the fruit are necessary.

First, the fruit to be candied should be washed, peeled, or pared, if necessary, cut or sliced and dropped into boiling water for two or three minutes. Drain well, cover with syrup made by boiling together one pound of sugar for each pound of fruit with one cupful of water. Boil rapidly for fifteen minutes, remove from the fire, and allow to stand over night. The next morning boil for ten or fifteen minutes again, and repeat the heating and cooling for four to six days, according to how rapidly the water is drawn out and the syrup is absorbed. The fruit plumps slowly, and the gradual increase in the density of the syrup caused by the many cookings insured tender fruit which is filled with syrup. After the fruit is transparent and bright, lift it from the syrup and dry in the sun or in a cool oven.

Crystallized Fruit.—If a crystallized fruit is desired, use fruit prepared by the preceding recipe. When the fruit is dry, cover it with a 60-degree syrup (see p. 129) and allow it to stand for two or three days; then drain off the syrup and dry the pieces of fruit in the sun or in a cool oven.

QUESTIONS

1. What is meant by preserved fruit? What is the standard for such?
2. What is the *special* problem in preserving?
3. What preliminary step is it wise to take when preserving hard fruits, as quinces, hard pears, etc.?
4. Why should preserving be done over a hot fire? What is the effect of slow cooking?
5. What is the difference between preserved, candied, and crystallized fruit?
6. Describe a good saccharometer to use in preserving, stating its name, purpose, and method of use.
7. How may a thermometer be used if no saccharometer were at hand?
8. Describe how each instrument may be used to determine when the final point in cooking has been reached.
9. When preserving, how will you decide how dense the syrup shall be into which you place the fruit?
10. Why should preserves be allowed to cool before packing?
11. When packed, at what temperature should they be processed? What is the purpose of this processing?

BIBLIOGRAPHY

See Chapter XIII, page 188.

CHAPTER XII

MARMALADES, JAMS AND CONSERVES

MARMALADES, jams and conserves, when well made, always show a jelly-like appearance, thus denoting that there must be some pectin present in the fruit which is used. Pectin is the jelly-making property found in some fruit juices (see description under "Jelly Making," p. 174). Marmalades, jams and conserves should be cooked very rapidly over a hot fire in order to retain the best flavor and a bright color. These are the most attractive features of the finished products.

Marmalades.—If large fruits are made into marmalades they are thinly sliced and cooked in a clear syrup as in preserving. The finished product shows the fruit appearing in small pieces throughout the mixture, and it is smooth in consistency.

When marmalades are made of citrus fruits, such as grapefruit, orange, kumquat, and lemon, the pectin is found in the white inner skin; none is present in the juice. The yield of the finished product of marmalades made by the three-day process is greater, but it is perhaps no clearer nor more jelly-like in consistency than that which is made in a single day. The pectin in the fruit is extracted by standing, heating, and reheating with the acid present. Cool marmalade to 176° Fahrenheit or 80° Centigrade before pouring into glasses or jars. This prevents the pieces from rising.

Jams.—Whole small fruits are used in making jams, but the fruit does not remain whole in the preparation of jam. The syrup is bright and the mixture is alike throughout when the product is finished. Practically the same methods are followed in making jams of all berries. The ripe broken ones give a fine color and flavor, but one-half of the quantity of the berries selected for making jam should be slightly under-ripe; this is necessary to give the jelly-like consistency to the finished product. More pectin is usually present in rare-ripe or under-ripe fruit than in prime ripe fruit. Cooking in small quantities will also help to retain the color and flavor. A more delicate flavor will be retained by allowing three-quarters pound of sugar to each pound of berries than by using an equal proportion by weight of each.

Jam should be cooked rapidly in a porcelain-lined vessel and stirred with a wooden spoon or paddle. Frequently move the spoon across the center of the pan, first toward you and then from you, and around and across the pan, being careful to move the mixture from the bottom of it. Do not stir too rapidly or beat the mixture. A thermometer is useful in making jams, cooking to 222° Fahrenheit when finished. They will then give the same test as for jelly: cool a small quantity in a spoon, and when it flakes off the side of the spoon instead of coming off in drops it is finished, and should be removed from the fire immediately. Jams are thicker when cold than when hot, and care should be taken not to cook them too long.

By processing jams in pints or small jars in the hot-water bath for twenty to thirty minutes at 180° Fahrenheit the flavor and the color are better preserved than when processed at boiling temperatures or over. A perfect seal may be secured by tightening the cap immediately at the end of the processing.

Fruit butters and pastes are those products made from the edible portion of the fruit which has been passed through a sieve and which has had the excess of water driven off, by cooking, until its consistency is somewhat similar to the dairy product butter, but not quite as thick. The fruits used for the making of butters should be ripe, as immature or green fruit will noticeably affect the flavor of the product, and the fruit must be sound, as any decayed portion of the fruit entering into the manufacture will affect the taste and is readily detected by chemists, the use of partly decayed fruit being in violation of the Federal and state food laws. In the process of making butters it is necessary that the edible portion be passed through a colander or a sieve of some description. The size of the mesh of the sieve will tend to affect the texture of the finished product. Only a small amount of sugar is required, and most of the fruit butters have some spices added to them. The excess of water is driven off by cooking until the consistency is somewhat similar to the dairy butter. Fruit butters are generally used in the same manner as jams and marmalades.

Fruit pastes and rolls are somewhat dryer than the butter and are used for sandwich fillings and often as a confectionery.

Conserves.—Conserves are made either of small or large fruits, or both combined, with sometimes the addition of nuts and raisins. Rapid cooking and constant care are essential when making conserves. Nuts, when used, should be added five minutes before removing from the fire.

MARMALADES

Orange Marmalade.—

3 pounds of oranges	1½ pints of water
3 lemons	3 pounds of sugar

Wash, remove the peel and seeds, cutting one-half of the peel into very thin strips, and add it to the pulp and balance of the peel, which has first had the yellow portion grated off and has been passed through a food chopper with the pulp. Cover with water and let stand over night. Boil for ten minutes the next morning, allow to stand for twelve hours, add the sugar and again stand over night. Cook it rapidly the next morning until the jelly test can be obtained. This is indicated by the flaking and sheeting from the spoon., Cool to 176° Fahrenheit, pour into sterilized glasses, and seal with paraffin.

Sour Orange.—

1 pound of peeled sour orange	¼ pound of peel removed from oranges
1 quart of water	
1½ pounds of sugar	

Wash the fruit, remove the peel in uniform sections, using only the portions which are free from blemishes. Cut the peel into as thin slices as possible, cover with water, and boil for ten minutes. Drain, cover with boiling water, and repeat the process four or five times to remove the bitter flavor.

Weigh the pulp, slice, and for each pound of oranges allow one quart of water and boil until very tender. Pour into a flannel jelly-bag, press until no more juice can be obtained, and filter the juice through another clean flannel jelly-bag without pressing. Measure and pour the juice into the kettle, add the sliced peel, and 1½ pounds of sugar for each pound of fruit taken, and boil rapidly until it reaches the jelly point.

Grapefruit.—Make this according to directions given for sour orange marmalade, adding three-quarter pound of sugar to each pound of fruit, instead of one and one-half pounds.

Kumquat.—Clean the kumquats with a brush and water. Cover them with scalding soda water (one-half cupful of soda to one gallon of water) and allow them to stand for five minutes. Rinse in clear water, slice the fruit, and remove the seeds. Remove the centers from one-fourth of these slices, parboil them for three minutes. Place all except slices in a preserving kettle, and for each pound of pulp allow one quart of water. Cook until tender. Strain, measure, and add one pint of sugar for each pint of fruit juice. Add slices or circles of the rind and cook all together until the jelly stage is reached. Cool, pour into sterilized containers, and seal. The pulp and rind which remains may be made into a delicious jam.

Combination (Orange, Grapefruit, and Lemon).—

1 orange
1 grapefruit
1 lemon

Wash and shred the fruit, add three times the bulk of water, boil for fifteen minutes, and let stand over night. Next morning boil for ten minutes and let stand again. When cold, measure pint for pint of sugar and cook over a rapid fire until jelly stage is reached.

Crab Apple.—Wash and core crab apples and put them through a food chopper. Place in a preserving kettle and add water, not quite covering the top layer of apples. Cook until tender. Weigh and add three-quarters of a pound of sugar to each pound of fruit. Cook until the jelly stage is reached; pour into sterilized glasses, cool, and cover with paraffin.

JAMS

Berry.—While wild berries may be used in all these recipes, the quality of the cultivated berries is better. The Eldorado is the best variety of blackberries, and the Cuthbert is the best variety of raspberry for jam. Follow general directions for making jams of all berries (see p. 163).

Grape.—Remove the grapes from the stems, wash and press the pulps from the skins. Boil the pulp until tender, and run it through a sieve to remove the seeds. Add the skins to the pulp and weigh. To each pound of fruit allow three-quarters of a pound of sugar and cook together for fifteen to twenty minutes, or until the skins are tender. Two hundred and twenty-six degrees Fahrenheit will prove a satisfactory finishing point if a thermometer is used. Pack hot into sterilized jars and seal immediately. Spices may be added if desired—cinnamon, white pepper, and cloves.

Fig Jam.—Select ripe figs, remove all stems, treat them with scalding soda solution, and rinse thoroughly as for preserving. Cook in quantities not larger than three pounds at one time. Allow one and one-half pounds of sugar to each three pounds of figs. Add barely enough water to start the cooking (about one-half cupful), crush the figs, heat to boiling and add the sugar. Cook rapidly to 220° Fahrenheit. Pack and process like preserves (see pp. 150 and 151).

Peach Jam.—

2 pounds of peaches
½ cupful of peach juice
1 cracked peach seed
½ teaspoonful of allspice
1 sprig of mace
1 pound of sugar
2 teaspoonfuls of bark cinnamon (broken in small pieces)
1 teanspoonful of cloves
1 inch of ginger root

Tie spices into cheesecloth bags; cook all materials together until a temperature of 222° Fahrenheit is reached. Remove spice-bag. Pack hot into sterilized jars, clamp on hot caps, and put away to cool.

BUTTERS

Apple Butter.—

10 pounds of apples
4 pounds of sugar
2 tablespoonfuls of ground cloves
6 quarts of cider
2 tablespoonfuls of ground allspice
3 tablespoonfuls of ground cinnamon

Wash, slice, and weigh the apples. Put into a kettle with the cider and cook until the apples are very tender. Pass them through a sieve to remove the skins and seed. Add sugar and spices to the pulp. Cook until the mass is as thick as desired, stirring frequently to prevent burning. Pour into sterilized crocks or jars, and when cool cover with paraffin.

Peach Butter.—

1 bushel of peaches
1 gallon of peach juice
5 pounds of sugar

Prepare the juice and allow it to stand until slightly fermented. Combine peaches, juice, sugar, and one-half dozen peach kernels. Cook and pack as for apple butter.

Guava Butter.—Cook guavas until tender in just enough water to keep them from burning. Press through a strainer to remove the seeds. Measure the pulp, and for each quart of pulp allow three cupfuls of sugar; cook and pack hot as for apple butter (Fig. 96).

Lemon Butter.—Select four medium-sized lemons, squeeze out the juice and grate the rind. To this add one-half pint of water, one pound of sugar, and three eggs which have been beaten together. Mix thoroughly and cook rapidly. After about five minutes add a tablespoonful of butter and continue the cooking until a consistency such as is required for apple butter is reached. Care must be taken to see that the product does not scorch. Pour into sterilized glasses, cover with paraffin, and set aside in a cool dark place.

Peanut Butter.—

2 quarts of Spanish peanuts
2 ounces of salt
4 quarts of Virginia peanuts

Roast the peanuts uniformly brown, grind, add the salt and grind twice again so as to have the salt well distributed throughout. Pack into small jars and sterilize twelve-ounce containers for one hour at 180° Fahrenheit (simmering) in a water-bath. If there is too much oil in the butter it will separate and the nuts will rise, leaving the oil in the bottom of the jars. The Spanish peanut contains a large amount of oil, therefore it is necessary to mix this variety with Virginia peanuts in the proportions given above.

CONSERVES

Rhubarb Conserve.—Wash the rhubarb, cut into small pieces, and allow for every three pounds of rhubarb three oranges, three pounds of sugar, three-quarter cupful of water, one pound of seeded raisins, and one-half pound of shelled pecans (if desired). Slice oranges, rind and all, wash raisins, and scald the nuts. Mix all together and boil over a low fire for about forty-five minutes. If a thermometer is used, cook to 104° Centigrade. Pour hot into jars and seal at once.

Medley Fruit Conserve.—

2 pounds of peaches	½ pound of apples
2 pounds of quinces	3 lemons
1½ pounds of pears	Sugar

Wash the fruit, peel or pare, core, and stone the fruit; pass it through a food chopper and weigh. To each pound of fruit allow three-quarters of a pound of sugar; put fruit and sugar in alternate layers in a bowl, and let stand over night. Next morning place in the preserving kettle with the pulp of lemons and one-half the rind sliced in thin strips. Boil until mixture becomes very thick. One cup of scalded chopped nuts may be added if desired, five minutes before removing from the fire. Pack hot into hot sterilized jars and seal at once.

Plum Conserve.—

3 pounds of Damson plums (after cutting)	1 pound of seeded raisins
	1 orange
1½ pounds of sugar	1 cup of shelled pecans
Juice of 1 lemon	

Slice plums, orange and lemon, add sugar and cook until thick and transparent. Put nuts into mixture five minutes before removing from the fire. If a thermometer is used cook the conserve to 103° Centigrade. Pack hot into sterilized jars and seal immediately. Process pint jars for thirty minutes at 180° Fahrenheit in a water-bath.

Fig Conserve.—

2 pounds of fresh figs or	1½ pounds of sugar
1 quart of plain canned figs	½ cupful of pecans (shelled)
1 orange	½ pound of raisins

Cut all, except nuts, into small pieces and cook until thick and transparent (about one hour). Add nuts five minutes before removing from stove. Pack and seal hot. Process as for plum conserve.

FRUIT PASTES

Fruit pastes are sometimes made for home use from the fruit pulp which is left after some of the clear juice has been extracted from the fruit for jelly making. A product of delightful flavor may be made by combining the pulp of different kinds of fruits. Press the pulp through a sieve, measure, and to each pound of cherry, plum, raspberry, strawberry, currant, or gooseberry pulp allow one pound of powdered sugar. Cook together over a low fire, carefully watching to prevent scorching, until it begins to thicken. Cooking the pulp in a double boiler for the last half hour of the cooking will aid in keeping the paste from burning. If the pulp is well boiled down it is more easily dried. Scalded and chopped nut kernels, crystallized orange peel, or preserved watermelon rind or citron can be cooked in the paste. Pour one-half inch layers of the rather solid mixture upon marble or glass slabs or platters which have been rubbed with salad oil. Place where a breeze or current of air will pass over it and allow to dry for two or three days.

Cut the paste into one-inch squares, roll in granulated sugar, and stand again in a draft for two or three days. Pack in tin boxes, glass jars, or paraffin-coated containers. If packed in layers, place a piece of parchment paper between the layers.

Apricot, peach, apple, and *quince pastes* are made in the same manner, except the proportion of sugar may be reduced for the apple and quince, three-quarters of a pound of sugar being a fair allowance for each pound of pulp. These cubes of fruit paste make attractive garnishes for custards, fruit cocktails, creams, cakes, etc. Different flavorings, such as vanilla or peppermint, may be used in these pastes, and sometimes harmless vegetable colors are stirred into the mass just as soon as it is removed from the fire.

A fancy pack of bands of color might be arranged as in jelly packing if several different fruit pastes are made at one time. When nearly dry (before cutting), put the different colors and flavors in alternate layers until four or five layers have been used. Press lightly and allow to stand for one hour in a draft. Cut into one-inch strips, cutting through all the layers, and dry again for one hour.

Store as for other pastes.

Fig Paste.—Treat the figs with a soda bath as for preserves, rinse and cook until tender in fresh, clear boiling water. Drain well and put the figs through a food chopper or rub pulp through a colander. Allow one pound of sugar for each quart of pulp. Mix and cook until it is a rather solid mass. Spread with an oiled spatula on the oiled surface of a flat dish, marble or glass slab, and finish drying in the sun. Three or four days will be required for drying. The trays should be brought into the house each night, and they should be protected from both flying and crawling insects. When thoroughly dry, roll, wrap, and pack as peach roll (p. 172).

Quince Cheese.—Wash the fruit, cut into quarters, remove core, stem, and flower. Cook the quinces until very tender in water, drain and rub through a sieve. Measure and allow three-quarter pound of sugar for each pound of pulp, and boil together until it is so thick that it will not quickly run together when a spoon or wooden paddle has passed through the mass. The pulp left from quince jelly can be pressed through a sieve and used as fresh pulp in making this paste or "cheese." Pour hot into hot sterilized glasses and seal like jelly. This "quince cheese," when turned out of the glass, will hold the shape of the mould and may be sliced.

Peach Roll.—Select ripe, soft peaches, remove the skins and stones, weigh the fruit and add one-fourth pound of sugar to each pound of fruit, place over the fire, and while cooking mash with a wooden spoon. When the fruit is very soft, rub it through a colander to insure that no hard lumps remain. Continue the cooking until a heavy consistency is reached.

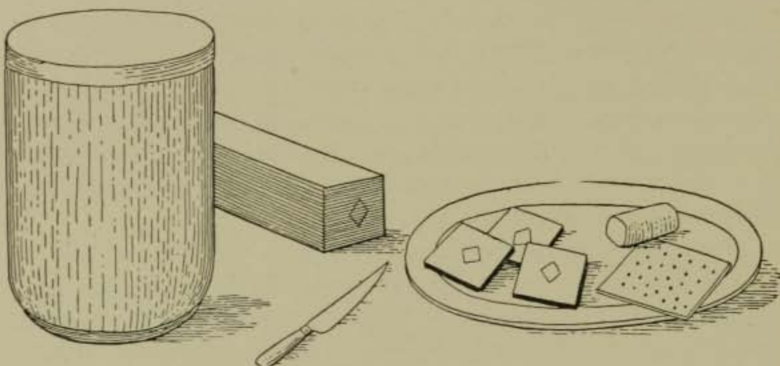

Fig. 96.—Guava paste, served with cheese and crackers.

Remove from the pan, spread on a smooth board which has been greased, place in the sun and cover with cheesecloth to keep off insects. When it is dry, sprinkle with granulated sugar, roll it up and wrap tightly in a cloth. It will keep for a long period of time

Green Tomato Mince Meat.—

1 peck of green tomatoes
2½ pounds of brown sugar
2 pounds of raisins
1 pound of beef suet
½ cupful of vinegar
2 tablespoonfuls of salt
2 tablespoonfuls of ground cinnamon
1 teaspoonful of ground cloves
2 teaspoonfuls of nutmeg
2 cupfuls of chopped apples (if desired)

Slice the tomatoes thinly, or put them through a food chopper, allow to drain, cover with cold water, place over the fire, and boil for five minutes. Drain well, add suet, vinegar, fruit, and seasoning, return to the fire and allow to simmer for from thirty to forty-five minutes.

QUESTIONS

1. State the general standard for marmalades and the care necessary to secure each characteristic.
2. Where is pectin found in the citrus fruits? How can it be extracted? How can the pieces in a citrus marmalade be prevented from rising?
3. From what are jams made? State the standard for jams and the care necessary to secure each characteristic.
4. Describe the care necessary while the jam is cooking. What caution is it wise to keep in mind while stirring jams? Describe carefully the method for testing marmalades and jams.
5. Under what conditions would you choose to make a conserve rather than a marmalade or jam?

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See Chapter XIII, page 188.

CHAPTER XIII

JELLY MAKING

Description.—Jellies are made by cooking together certain fruit juices and sugar in the proper proportions. A good glass of jelly is clear, sparkling, transparent, and of a beautiful color. When slipped out of the glass, it holds its form and will quiver. It can be cut with a clean, distinct cleavage, retaining the clear surface and angles made by the knife. Tenderness and firmness are unmistakable qualities. The aroma and delectable flavor of a good jelly recalls the beauty and fragrance of an orchard or a vineyard. There are two types of jelly—the fruit jelly, that is made from the natural fruit juices which contain sufficient pectin for making good jelly, and the pectin-base jelly, which is usually artificially colored and has the addition of some flavoring. Many advocate the natural-fruit jelly in preference to the pectin-base, tinted and flavored with rose, mint, and other such flavors, because they consider the pure natural-fruit jelly more artistic.

If the resulting mass is syrupy and sticky or tough and gummy, it fails to meet the requirements for a jelly.

Pectin, the Properties Necessary for Jelly Making.—Pectin is the essential jelly-making substance found in fruit juices. A combination in fruit juices of pectin, acid, and sugar in the proper proportions is essential in order to make good jelly. The best fruits for jelly making are those which contain both acid and pectin. The pectin, the fundamental jelly-making quality, does not exist in all fruits, and it is more abundant in slightly under-ripe fruit than in that which is fully ripe. As the fruit ripens, it becomes sweeter and it is believed that the pectin, which is a carbohydrate, is changed by the heat of the sun into a fruit sugar. Therefore, fruits which are not over-ripe are most satisfactory for jelly-making. Apples, currants, gooseberries, grapes, and oranges are fruits most commonly used for jelly making. Some fruits rich in pectin do not contain acid and will not make jelly unless an acid is added. The quince and guava are examples of this. Jellies may be made from such fruits as cherries, pineapples, rhubarb, strawberries, and peaches if the necessary pectin is added. Pectin can be extracted from the white part of the orange-peel and added to these juices. Therefore, a very satisfactory jelly can be made

FIG. 97.

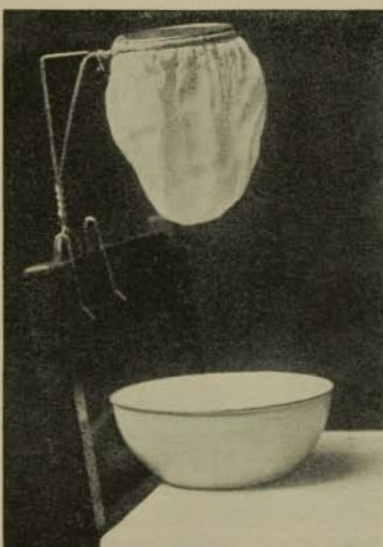

FIG. 98.

FIG. 97.—A commercial jelly strainer placed on a chair back.
FIG. 98.—A commercial jelly strainer placed on a table.

obtaining the flavor and color of fruits which do not contain sufficient pectin to make good jelly. If half the fruit selected is ripe fruit and the other half slightly under-ripe, the ripe fruit will furnish the fine flavor and color, while the under-ripe fruit will contain the jellying property and give a better consistency to the finished product.

Extracting the Juice.—This is easily done by applying heat. Fruit juice flows more readily when the fruit is heated than when the fruit is simply crushed. Heating is necessary also to develop the pectin in the fruit. Sometimes when no pectin is found in the raw pressed juice of certain fruits juices cooked out of the same fruit will show a large amount of it. Addition of acid before cooking will also help to bring out the pectin.

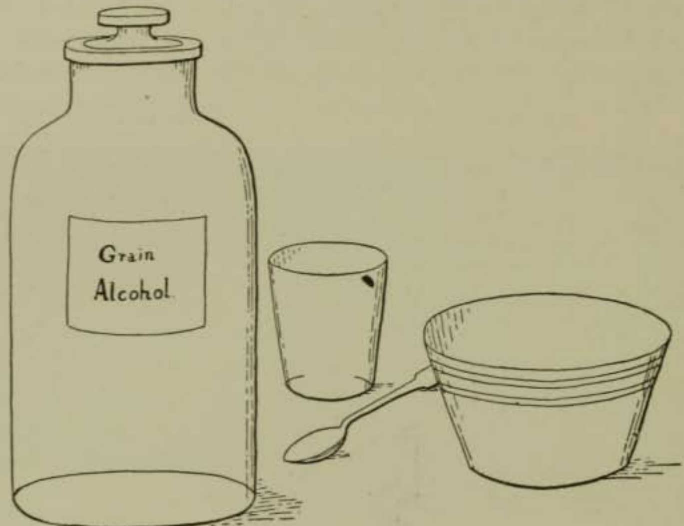

Fig. 99.—Alcohol test for pectin in fruit juices.

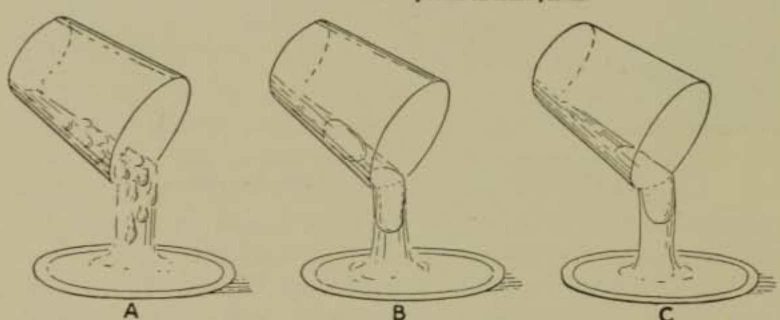

Fig. 100.—Testing fruit juice for pectin.

The quince is an example of fruit which often requires an acid to be added.

Juicy fruits should first be crushed and have only enough water added to allow the fruit to cook until tender. Less juicy fruit, of which the apple is a type, requires more water. For each pound of apples use two pints of water and cook until the pieces are very tender.

Squeeze the cooked fruit in a moistened double cheesecloth to extract the juice, and then strain the juice through a flannel or haircloth jelly-bag which has first been dipped into boiling water. By squeezing the pulp before letting the juice stand to drip through the jelly-bag more juice is obtained from the first dripping. Frequently the fruit juices may be extracted a second time by adding water to the pulp and recooking it. The second extraction is weaker in pectin and will require less sugar than the first extraction (Figs. 97 and 98).

Test the juice for pectin and find whether there is considerable pectin present. Pour into a glass one tablespoonful of the fruit juice and add to it the same amount of grain alcohol (95 per cent pure), mix by turning the glass gently, then pour carefully into another glass. If the pectin precipitates in a solid mass or clot, it is usually safe to add a cupful of sugar to each cup of juice in making jelly (Figs. 99 and 100).

If the pectin does not collect in this manner, the amount of sugar should be decreased. The most usual mistake made in jelly making is the addition of too much sugar, the result being a syrup instead of a jelly. This test for the presence of pectin in fruit juice is not an accurate quantitative test, but simply indicates whether little or much pectin

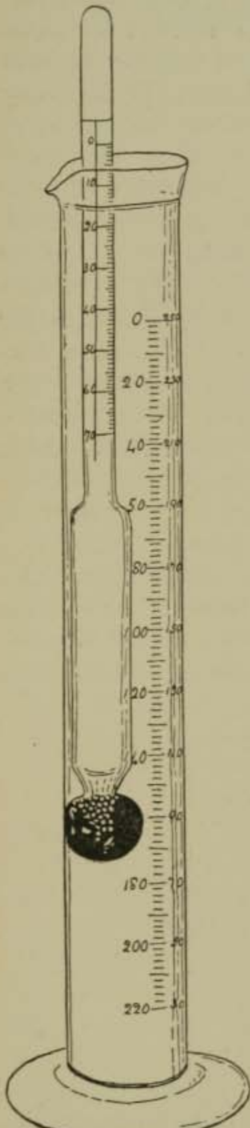

FIG. 101.—A saccharometer floating in a 250-c. c. cylinder.

is present. Different juices contain varying proportions of pectin, so one can readily see what a risk is taken when equal volumes of sugar and fruit juices are cooked together to make jelly, using the same rule for every sort of fruit. If the pectin test shows a small amount of pectin, only half the volume of sugar should be used to each volume of fruit juice. Sometimes a saccharometer is used to determine the percentage of fruit solids present in the fruit juice and to determine from the reading the amount of sugar necessary to combine with a given quantity of juice to make good jelly (Fig. 101). Consider apple juice first after the juice has been extracted from the fruit by crushing, heating, and straining; cool it to room temperature. Pour some of the juice into a slender cylinder which is deep enough to float the Brix or Balling spindle. Read the figure on the spindle which appears at the surface of the juice, and if, for example, the reading is 8 on the spindle, then thirteen ounces of sugar will be the proper proportion of sugar to combine with each quart of juice to make a good jelly.

The following table may be used when testing apple juice with a spindle to determine the amount of solids in the solution and the amount of sugar necessary to combine with it to make a jelly. Cool to room temperature before taking the reading:

Reading of Brix at 20° Centigrade	For each quart of juice add sugar	
	Pounds	Ounces
5.0	..	8
5.5	..	9
6.0	..	9.6
6.5	..	10.7
7.0	..	11.6
7.5	..	12.4
8.0	..	13.2
8.5	..	14.1
9.0	..	15.0
9.5	..	15.8
10.0	1	.7

This table is arranged for juices which have a temperature of 20° Centigrade or 68° Fahrenheit. The juices should never be tested immediately upon straining, unless they have cooled to room temperature.

As already stated, in making jellies more failures result from addition of too much sugar to the juice than for all other causes, and if the amount of sugar can be determined success is almost sure. Doctor Straughn has constructed tables like the above, which indicate the amount of sugar to be added to juices when their density is known, and this density can be determined by means of the Brix spindle or saccharometer. The use of the Brix spindle correctly necessitates the use of the table constructed for this purpose to transfer the Brix percentage density reading into the amount of sugar needed. This method has now been simplified by Doctor Straughn, who has devised an instrument, called a jellometer, with direct readings in ounces of sugar to be used for each quart of the juice, thus doing away with the tables (Fig. 102). To use the jellometer it is only necessary to float it in the fruit juice, which has been cooled to room temperature. The point at which it floats indicates the number of ounces of sugar to be added.

Quantity of Juice Cooked at One Time.—No difficulty should be found in handling eight or ten glasses at one time if everything for the complete process is conveniently arranged before cooking is begun. The capacity of the kettle should be four times as great as the quantity of juice cooked.

When to Add the Sugar.—The time for adding sugar is of importance even if the sugar has been properly proportioned to the juice in the beginning. There is no single trick to perform that will assure perfect results in jelly making, but a good, uniform product may easily be obtained by carefully following the general principles of jelly making which are outlined. The old method required that the sugar be added in the beginning of the process. The longer sugar is boiled with a weak acid, such as we have in fruit juice suitable for making jelly, the more the sugar is split or inverted into simple sugars, and the longer this goes on the less danger there will be in having the sugar crystallize out. Another method is that of cooking the juice and adding the sugar near the end of the process. The

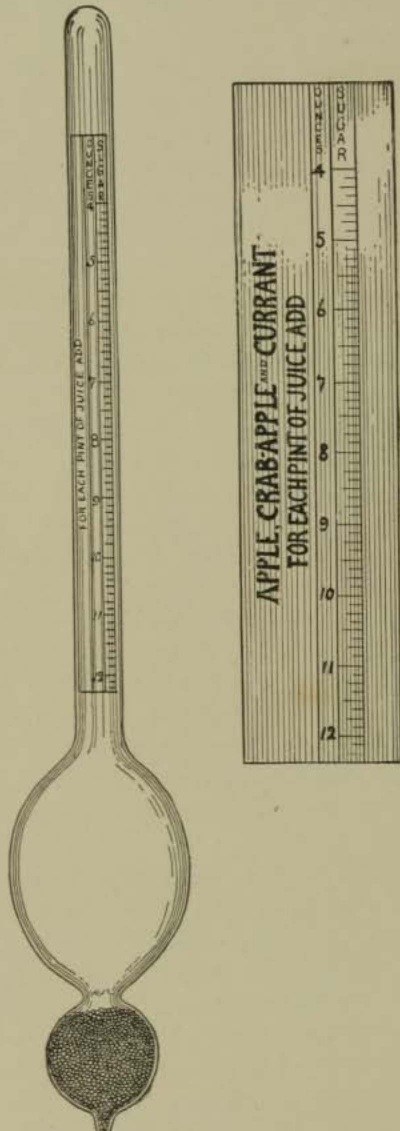

Fig. 102.—Jellometer for testing fruit juices in jelly making.

latter method, however, is not so good as the first, since, if the sugar does not all dissolve and mix thoroughly with the fruit juice, some of the sugar used is likely to crystallize out. After the jelly stands for a while these crystals may be seen throughout the jelly. Midway between these extremes we might choose a happy medium by adding the sugar just as soon as the juice boils. Although adding cold sugar to the hot juice stops the cooking by a partial cooling of the juice, there is no real virtue

FIG. 103.—Making strawberry and orange pectin jelly, Walton County, Florida. A. Grating yellow peel. B. Straining juice. C. Passing white part through food chopper. D. Testing for finished jelly. E. Pouring jelly into glasses.

in heating the sugar. The prolongation of the cooking, if there is any, is less trouble than heating the sugar when there is no appreciable gain.

Cooking the Jelly.—When the proper amount of sugar is determined, allow the juice to boil before adding it (Fig. 103). Clarify the juice by skimming it before the addition of sugar. Add the sugar gradually to the boiling juice, stirring until it is all dissolved. Cook very rapidly to keep the jelly a bright color and the product clear. Skimming the juice after the sugar is added is not a good practice from an economical standpoint.

A thermometer will aid greatly in jelly making. If placed in the cooking juice it will indicate the approach of the jelly stage, and the cooking juice will not need to be watched very closely until the temperature of 216° to 217° Fahrenheit or 102° to 103° Centigrade is reached. After this the juice cooks very rapidly and requires constant watching. The juice for jelly should not be allowed to simmer. All jellies should be made as quickly as possible when once the cooking has begun.

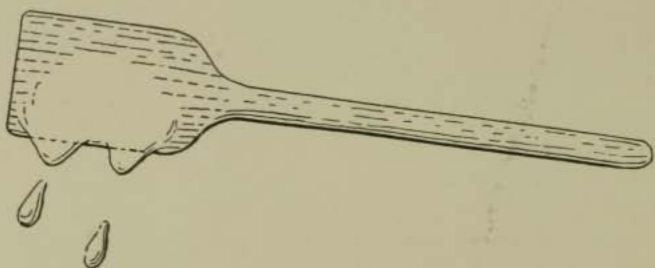

FIG. 104 A.—First test shows drops of syrup.

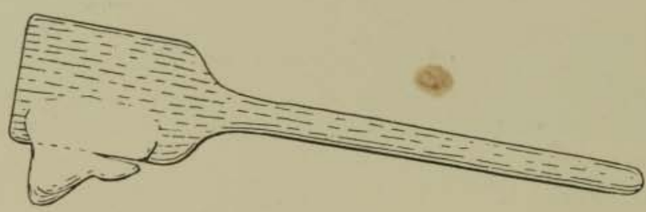

FIG. 104 B.—Finished test shows jelly flaking or sheeting from the paddle.

By long cooking, the acid affects the pectin in such a way as to cause it to lose some of its jelly-making power. Long cooking also has the tendency to make the finished product dull and darker than jelly which has been cooked rapidly over a hot fire.

Test the juice to determine when the jelly is finished. Take a small amount of juice in a spoon and cool it by gently moving it in the air for a few seconds and allow it to drop from the side of the spoon or wooden paddle. At first it will just run off as a syrup; then, as it cooks, the drops will become heavier, and when the drops run together and slide off in a flake or sheet from the side of the spoon, leaving the edge clean, the jelly is finished and should be removed from the fire at once. Skimming while cooking the juice is wasteful. Be careful not to break the scum while testing the juice for the jelly stage. After a good jelly test is obtained and the vessel is removed from the fire the scum may be removed all at one time before pouring the jelly into the containers. It is very necessary at this point to keep a cool head and work rapidly so that the jelly will not have time to cool in the pan (Figs. 104A and B).

Pouring the Jelly into the Glasses.—Jelly should be poured, while hot, into hot sterilized glasses. Fill the glasses full. Little bubbles collect on the surface, and these can be removed in a teaspoon by running it around the top of the jelly. If possible, allow the jelly to stand in the sun as it cools. When it is firm the jelly will have shrunken, leaving a space for melted paraffin. Pour a layer of melted paraffin over the top to seal it from the air (Fig. 105). The paraffin will run down along the edge and stick more securely if a small wooden stick is carefully run around the edge of the jelly after paraffin is poured on. If the paraffin runs down between the jelly and the glass for about one-fourth inch it will not be so easily slipped away from the jelly as it is when simply poured over the top in a thin layer. Another way to protect the jelly is sometimes used. A circle of paper is cut to fit into the glass, then dipped into grain alcohol or brandy and placed over the jelly. The alcohol or brandy serves, as does the hot paraffin, to kill any mold that might have dropped on top of the jelly as it stood to cool.

Covering the Glass.—Covering the glass is necessary after the paraffin or the dipped paper circle is placed on top of the jelly. Tie paper down tightly around the edge of the glass or put a tightly fitting cover over it.

Labelling.—Place small, neatly printed labels half way between the seams of the glass and near the lower edge. The label should be no larger than necessary to print the required information if the jelly is to be sold. Too much of the product is hidden when a large label is used. Generally it is not attractive to use brightly colored labels, because they detract from the color of the product.

Storing Jellies (Fig. 106).—A bright light will cause jellies to fade in color and also cause them to "weep"; that is, leak out and spoil the label. Keep them in a cool, dark, dry place.

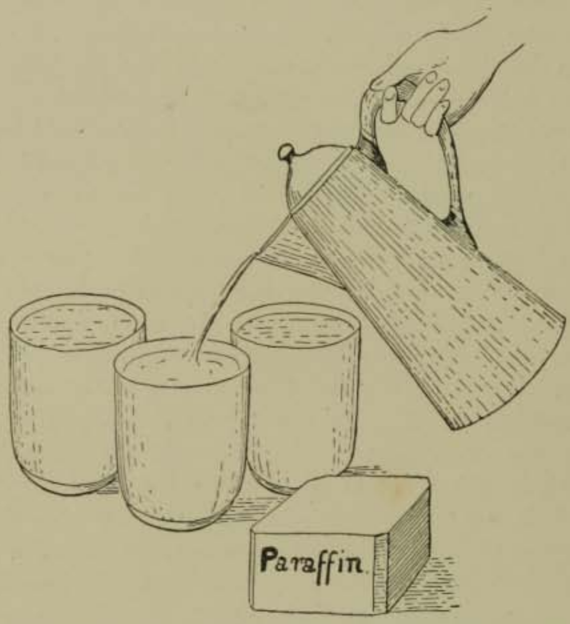

FIG. 105.—A coffee-pot is a convenient utensil for melting and pouring the paraffin.

If a tender jelly is handled or allowed to stand for several months in a jar which is not hermetically sealed, it is very apt to "weep." To prevent this weeping, commercial concerns hermetically seal their jelly jars. By using the crimped crown cap and the hand-sealing machine illustrated in the chapter on "Fruit Juices" (p. 102) jelly glasses may easily be sealed airtight. When the jelly is to be sealed in this manner it should first be allowed to cool and then have a thin layer of melted paraffin or a circle of paper which has been dipped into grain alcohol placed over the top before crimping on the cap.

Fancy Packs.—Fancy packs of jelly may be made by packing two or three jellies of different flavors and colors in one glass. It is necessary to allow the first layer to cool before adding the second, and so on. Apple juice or orange pectin may be used for a base and have the different flavors and colors added. For instance, jelly can be made of cherry, pineapple, strawberry,

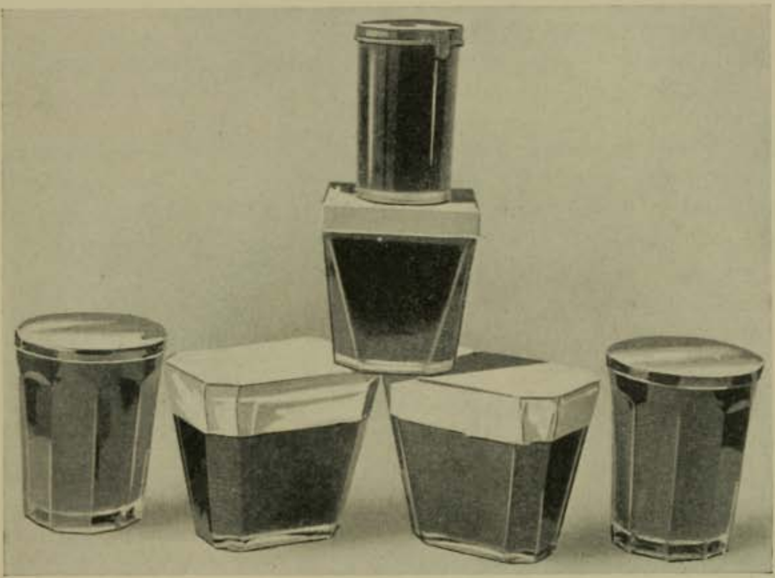

Fig. 106.—A few good glasses of jelly ready to store.

rhubarb, and other fruits by adding the necessary pectin in the form of apple juice or orange pectin. A mint jelly may be made by coloring either apple or orange pectin jelly green with a vegetable coloring matter and flavoring it with the fresh mint or a very few drops of spirits of peppermint.

Fancy Jellies.—Fancy jellies can be made from non-pectin fruits and other materials by using a pectin preparation made from the orange or apple and combining this with strawberry or other non-pectin fruits or with mint and other flavors. The non-pectin fruits, it will be recalled, include cherries, pineapples, rhubarb, and peaches. The use of one-half of the orange or apple pectin prepared as below, and one-half of a non-pectin fruit, will give satisfactory results, providing a jelly with the color and flavor of some desired fruit, although the latter will not of itself make jelly. The preparation of orange pectin is described and a couple of sample recipes for these fancy jellies are given (Fig. 107).

Preparation of Orange Pectin.—

½ pound of white portion orange-peel
3 tablespoonfuls of lemon juice
6 cupfuls of cold water

Scrape or grate the yellow from the peel of the orange. Remove the remaining white portion and pass it through a food chopper. Weigh, and for each half pound allow three cupfuls of cold water and one tablespoonful of lemon juice for each cup of water. Mix thoroughly, allow to stand for four or five hours, then boil for ten minutes, and cool. Add another three cupfuls of cold water. Bring to a boil and let stand over night. Next morning boil for five minutes, allow to cool, place in a flannel jelly-bag, squeeze it to remove all the juice, and then filter the juice through a clean flannel jelly-bag without pressing it.

This pectin may be used as a foundation in making jellies from fruit juices which do not contain a sufficient amount of pectin. If the pectin is to be kept for use later, pour it into sterilized jars while hot, process quart jars in a water-bath at simmering (180° Fahrenheit) for thirty minutes; seal and store in a dark place.

Strawberry and Orange Pectin Jelly.—

1 cupful of orange pectin
1 cupful of strawberry juice
1 cupful of sugar

Mix the pectin with the berry juice and bring it to boiling, add the sugar, and continue boiling until the jelly stage is reached. This finishing point is indicated by the flaking and sheeting from the spoon. Skim after removing jelly from the fire; pour immediately into hot sterilized jelly glasses. Cool and cover with melted paraffin.

Mint Jelly.—

1 pint of orange or apple pectin
1 pint of sugar
2 drops of oil of peppermint
2 drops of green vegetable coloring

Heat the pectin to boiling, add the sugar gradually, and continue boiling until the jelly will flake from the side of a spoon. At this point add carefully two drops of oil of peppermint, together with the two drops of green vegetable coloring

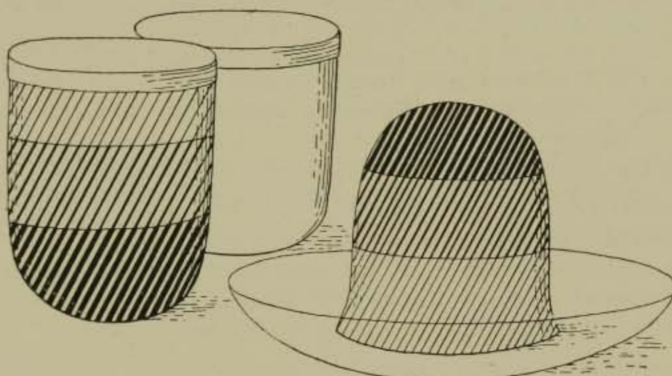

FIG. 107.—Fancy jellies.

matter. (This vegetable coloring may be obtained from a drug store.) Stir gently and pour while hot into sterilized glasses. After a few moments the scum which rises to the top may be easily removed from the jelly with a teaspoon. When cold, pour hot paraffin over it. Place sterilized lids over the jelly glasses or tie a circle of white paper over each.

Equal parts of pectin and non-pectin fruit juices combined, using the same amount of sugar as pectin, will usually be the proper proportion to use, when a flavor and color of non-pectin fruit are desired in jelly.

QUESTIONS

1. State in your own words the standard for jelly.
2. What do the best jelly-making fruits contain?
3. What is the character of pectin? What is the effect of the heat of the sun upon it? What effect has long cooking upon it?
4. Describe how to test a fruit juice for the approximate amount of pectin present.
5. What is the usual mistake in jelly making? How can this be avoided?
6. How should jellies be cooked? Why is this necessary?
7. Describe how to determine when the jelly has cooked sufficiently.
8. What is a satisfactory method of sealing jelly? In what kind of a place should it be stored?

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CHAPTER XIV

PICKLING

The preservation of food with salt or vinegar, either with or without the addition of spices or sugar, is commonly known as pickling. The predominating flavor determines the kind of pickle—sour pickle, sweet pickle, or spiced pickle. Green and slightly unripe fruits and vegetables are generally used for pickling. A great variety of vegetables and fruits may be kept by this method. Among the most common vegetables which are pickled are cucumbers, tomatoes, beets, onions, carrots, martynias, artichokes, cabbage, and chayotes.[1]

The method of grating horseradish or putting it through a food chopper and combining it with sufficient vinegar to moisten it is one of the simplest types of pickling. Some vegetables give better results if they are soaked in salt water over night or until thoroughly cured. This makes the tissue firmer and extracts water from it. Some fruits and vegetables require this special treatment, while others need only to be parboiled in salt water. By either of these methods the tissues are better prepared to absorb the flavored vinegar or syrup.

Utensils to Use in Pickle Making.—Only porcelain-lined or granite-wear kettles should be used when cooking pickles. Acid will attack metal utensils and they should not be used. A granite or wooden spoon should be used for stirring. A perforated agate ladle is a convenient utensil for lifting the pieces of pickle from the kettle. Finished pickles should be packed into sterilized jars or crocks.

Sweet Pickles.—Among the fruits especially good for sweet pickles are peaches, apples, plums, watermelon and cantaloupe rinds, cherries, grapes, gooseberries, figs, and pears.

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[1] The chayote (*Chayota edulis*) is rather a comparatively new vegetable. It is a climbing vine, resembling the cucumber in growth, although it is much more vigorous and prolific. The fruit is pear-shaped and somewhat corrugated, with a single flat seed.

Mixed Pickles.—Mixed pickles are made from various combinations of such vegetables as beans, cauliflower, onions, small ears of corn (two or three inches in length), cucumbers, and cabbage.

Relishes.—Pickles consisting of finely, evenly chopped vegetables are known as relishes; Chile sauce, chow-chow, and picalilli are often so classified.

Chutney.—Chutney is a hot sweet pickle originated in India. There are a number of other condiments made in many ways that belong to this class of pickle. Chutneys are of Oriental origin. They are served with curries, cold meats, sausage, and stews.

Mangoes.—The mango is a fruit believed to be a native of southern Asia, but it is now grown in nearly all sub-tropical countries. In addition to use as a fresh fruit, mango forms the basis of most chutneys of East India type and is also canned and other wise preserved. The mango melon is a small round melon with yellow skin and white flesh. It is cultivated chiefly for domestic mango pickling and preserving. Often small green melons, burr gherkins, and peppers are stuffed and pickled. The term "Mango" is popularly used for stuffed pickles.

Ketchup and Sauces.—When the materials to be pickled are finely chopped, cooked, and strained, and the resulting product is a more or less thick fluid, they are called ketchups or sauces. Many fruits and vegetables may be used for this purpose, but tomatoes are more generally used.

Dill Pickles.—In making dill pickles and sauer-kraut the acid is produced by fermentation and not by adding vinegar. The lactic acid bacteria convert the sugar present in these vegetables into lactic acid which acts as the preserving agent. The dill is added for the sake of its spicy flavor.

BRINING

Large quantities of vegetables may be taken care of during the harvesting season by brining them and allowing them to cure. They may be finished several months later in a less busy season, and when vinegar, sugar, and spices are likely to be cheaper.

This method of keeping vegetables has been practiced since primitive times. Our ancestors saved much of their surplus crop by storing it away in brine. Sometimes this material kept well; often it did not. The failure was attributed to bad luck, and the reasons for it were unknown. Tremendous losses in the spoilage of pickles in factories led to scientific investigation of this subject As a result valuable information has been contributed to the public. Otto Rahn's experiments at the University of Michigan are the source of much of this information.

The causes of spoilage will be discussed later. The different methods used in brining and pickling may be more satisfactorily explained by the use of a single product; for example, the cucumber.

PICKLING THE CUCUMBER

Preparation.—It is not necessary to wash the cucumbers before putting them into brine, since the bacteria on the outside of the vegetable aid in the process, and the brine pickles are washed, anyway, before being eaten. This does not apply in the case of dill pickles. These are eaten as they come from the crocks. German bacteriologists recommend that a little whey from sour milk be put into the pickle barrel to hasten the fermentation.

Brine.—Soft water should be used in making the brine. Water containing much iron or lime will discolor the pickles. Put the cucumbers into brine very soon after they are gathered. A good measure of salt is absolutely necessary to prevent spoilage, but salt alone is not enough. The strength of the brine used can easily be determined by using a salometer—a hydrometer or spindle which will show the density or strength of the brine by floating in the liquid (Fig. 108). The cucumbers may be put down in a 45 degree to a 60 degree brine. The salt draws out water from the vegetable tissues and toughens them somewhat. For this reason the weaker brine will give a better texture to the finished product. About one pound nine ounces of salt dissolved in one gallon of water will cause a salt hydrometer to float at about 45 on the scale, which will show that it is a 45 degree salt solution. The cucumbers should be weighted

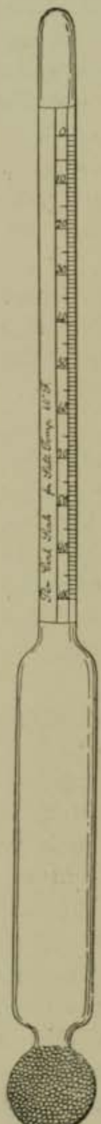

Fig. 108. Brine hydrometer.

down so this solution will completely cover them. A cheesecloth may be placed over the top to exclude the dust and at the same time admit air.

BRINES

Approximate, percentage of solution	Weight of salt	Quantity of water	Degrees, salometer
1	2 ounces	6 quarts	4
2	4 ounces	6 quarts	8
3	6 ounces	6 quarts	12
4	8 ounces	6 quarts	16
5	10 ounces	6 quarts	20
6	12¼ ounces	6 quarts	24
7	14½ ounces	6 quarts	28
8	16½ ounces	6 quarts	32
9	1 pound 3 ounces	6 quarts	36
10	1 pound 6 ounces	6 quarts	40
15	2⅛ pounds	6 quarts	60
20	3 pounds	6 quarts	80
25	4 pounds	6 quarts	100

From the above table it will be understood that the figures representing the percentage of salt in a solution is obtained by dividing the number of degrees which are read on a salometer by 4; for instance, to make a 68° salt solution we have to dissolve 68 divided by 4, or 17 parts of salt in 83 parts of water.

Grading.—Cucumbers should be graded according to size, as follows (Fig. 109):

Size 1—1 to 2 inches—Small gherkins.
Size 2—2 to 3 inches—Small pickles.
Size 3—3 to 4 inches—Medium pickles.
Size 4—4 inches and over—Large pickles.

Bacteria Necessary.—Many kinds of bacteria are present on the surface of the cucumbers, especially if a little dirt adheres to them. Among the other organisms there are a considerable number of lactic acid bacteria. The presence of salt and lack of air in the brine prevent most of the other bacteria from growing; the lactic acid organisms, however, not being restrained to as great a degree as the other types grow upon the substances given off by the shrinking of the

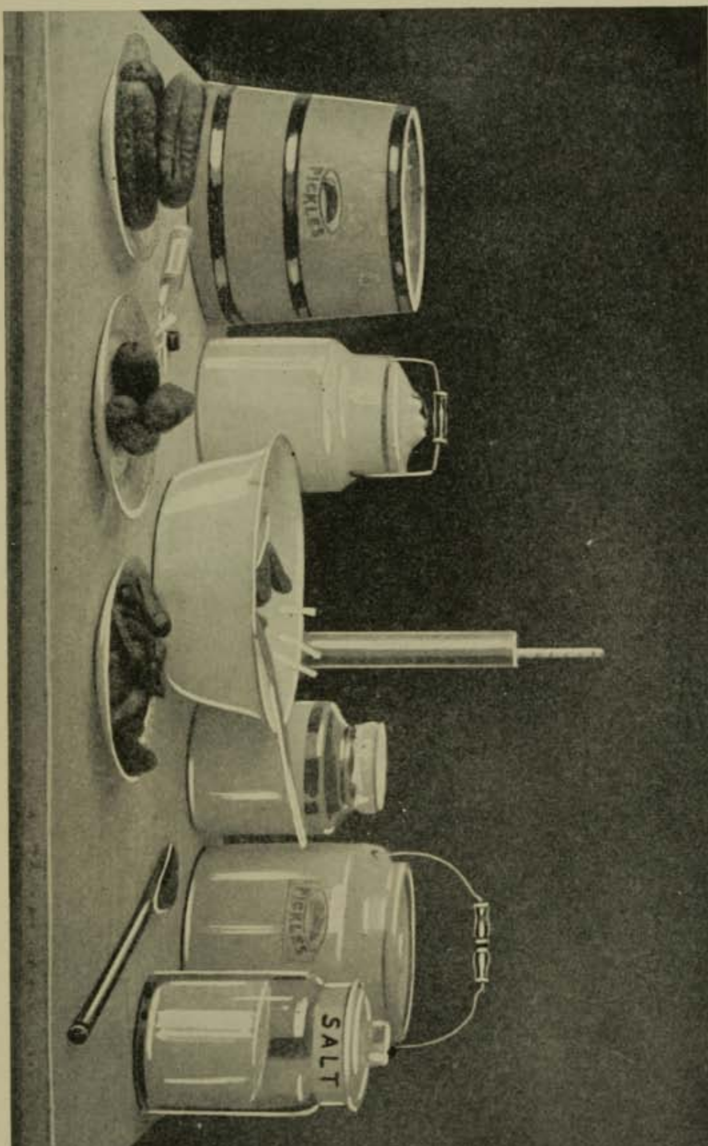

Fig. 109.—Brining equipment.

cucumbers in the salt solution and convert the sugar into lactic acid and gas.[2] The gas escapes and can be seen in little bubbles on the top of the brine. The bubbles indicate that fermentation is taking place. The acid turns the grass greenness of the vegetable to an olive green, which color is recognized as being the correct tint for pickles. When the frothing ceases the acid present in the brine is strong enough to kill most of the bacteria in the liquid, and from this time on the pickle brine should be covered, as explained below.

Spoilage Caused by Other Bacteria.—It is important, from the beginning of the process, to keep the vegetable being pickled weighted below the surface of the brine. If pieces protrude, the so-called potato bacillus will grow upon the exposed surfaces and cause spoilage. They grow rapidly and may do great damage in a very short time. The addition of a little vinegar will destroy these bacteria if they are discovered before much damage is done.

Test for Acid.—To determine when the brine reaches the acid stage, put a piece of blue litmus paper into it. If the litmus paper turns red, showing the presence of acid, all air should be excluded from the brine. This prevents the formation of yeast scum, which causes the spoiling of the pickles.

Preventing Scum Yeast.—This is not difficult. Simply skimming the yeast off is not sufficient, because it will grow again unless the container is sealed air-tight immediately after the brine tests acid. The very fact that yeast grows a scum proves that it must have air in order to live. It cannot endure hot sunlight, either. The bacteria which form the acid in the brine have just the opposite characteristics. They grow at the bottom of the crock or jar, where they avoid the air and where there is no light.

Excluding the Air.—It is necessary to exclude air, because air may carry in with it yeast, and the scum, which might form, would cause the pickles to soften and spoil. So soon as the acid test is obtained take care to weight the cucumbers down under the

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[2] Most of the gas is caused by the respiration or breathing of the living tissue cells of the cucumbers; a small amount, however, is produced by certain types of lactic acid bacteria.

brine, cover the brine with a piece of cheesecloth, and then pour on a thick layer of melted paraffin. Place the lids on the crocks or jars and wrap a strip of cheesecloth, dipped in hot melted paraffin, around where the lid and the top of the container meet, letting the paraffin harden and seal the opening. The paraffin is inexpensive and can be remelted and used year after year. Care should be taken not to pour it over the brine until fermentation has ceased, otherwise the gases arising from the brine will crack the paraffin and make remelting necessary. The containers should not be disturbed after they have been so sealed. One important characteristic of this scum is that it will not grow in the absence

FIG. 110.—Sealing a crock with a band of cheesecloth dipped into boiling paraffin.

of air, therefore the exclusion of air from the surface will entirely prevent the scum from forming (Fig. 110).

Brining in Barrels.—In treating large quantities, secure tight kegs or barrels. These may have to be charred and cleansed well. It is possible in brining vegetables to commence with a lighter brine, but they should probably be packed in a brine not lighter than 60 degrees. As soon as the brine tests acid, the barrels can be bunged up tightly to keep out all air. Since the brine is likely to settle and become strong at the bottom and weak at the top, it is best to turn the casks or barrels over every week for the first few weeks.

When these pickles are open they should be firm, good olive-green color and in fine condition. The great secret of pickle-making lies in bringing about acid fermentation quickly, and, after this is done, in preserving the acidity of the brine by covering tightly.

SPICED CUCUMBER PICKLE

Open the containers, weigh and freshen the cured cucumbers by allowing them to stand for an hour or two in clear, cold water. It is believed that the pickles are improved in texture (made crisp and firm) by dropping them into a lime bath (one ounce of lime to one gallon of water) for about two hours. The lime used is calcium oxide and can be obtained from drug stores. The color may be intensified by neutralizing the acid with a soda bath (one teaspoonful of soda to one gallon of water). If either of these baths is used it is necessary, immediately afterwards, to plunge the cucumbers into clear, cold water for one hour. Drain well and place in a granite kettle which has been lined with spinach or grape leaves, cover the cucumbers with the leaves, and pour over them boiling water, allow to stand in these leaves until thoroughly cold, drain well, and cover with a scalding vinegar solution (one pint of vinegar to three pints of water). Cool quickly and allow them to stand for three or four hours. By so treating with grape or spinach leaves a better green color may be obtained in the finished product. Place cucumbers in a fresh vinegar bath (two pints of vinegar to two pints of water). Allow them to stand until next morning.

Spiced Sour Pickle.—If a spiced pickle is desired, allow spices in the following proportion to each two-pound lot of cucumbers:

1 ounce of stick cinnamon
½ ounce of cloves
½ ounce of dried ginger root[3]
6 cupfuls of the last vinegar solution in which the cucumbers have been standing

Boil vinegar and spices together for five minutes, pour over

[3] Dried ginger root, or race ginger, can be obtained from the drug store. The white coating on the ginger is due to the lime water in which it has been dipped after drying to prevent insects from eating it. The coating is carbonate of lime. This race ginger should be dropped into boiling water and drained before adding it to the syrup.

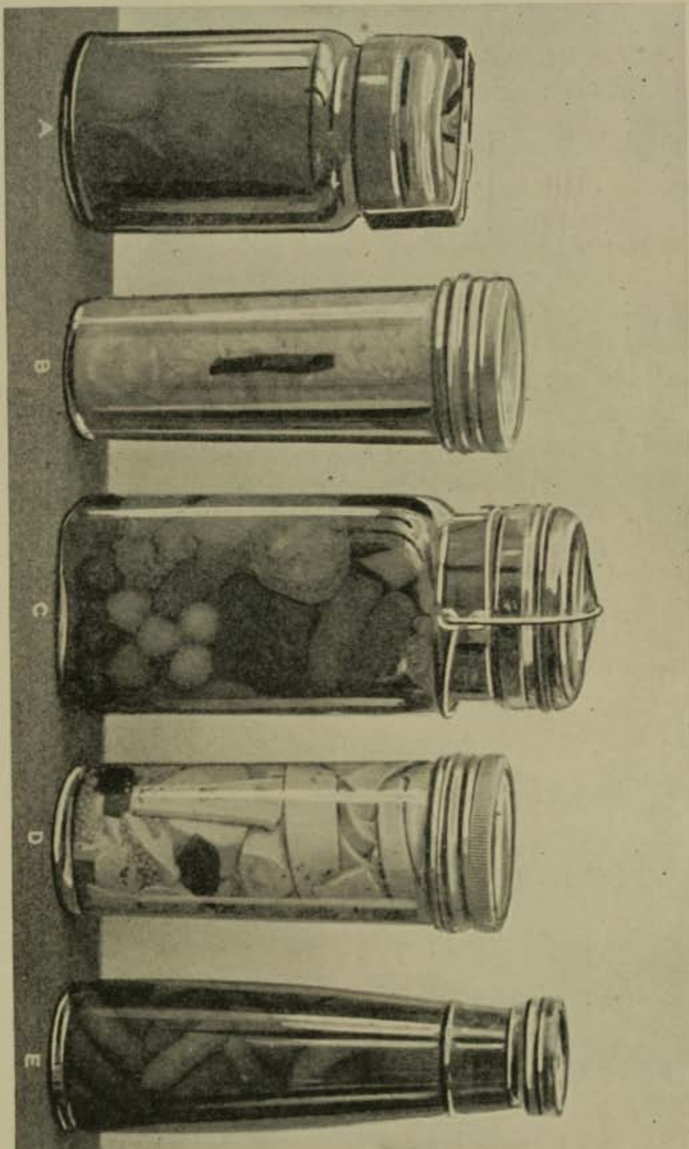

Fig. 111.—A few pickle packs: A. Cucumber sweetmeats. B. Plain cucumber slices. C. Mixed vegetable pickle. D. Palmetto cabbage pickle. E. Small cucumbers.

the drained cucumbers, allow to cool, and then pack into jars and pour the spiced vinegar over them.

Spiced Sweet Pickles.—If a sweet pickle is desired, make a syrup of the six cupfuls of vinegar solution and one and one-half pounds of sugar and cook together with spices for fifteen minutes, pour over the cucumbers, and allow to cool over night. Next morning drain the spiced syrup from the cucumbers, boil for ten minutes, and again pour over the cucumbers, stand for two hours, then boil together with the pickles until they become bright and clear (about ten minutes), cool quickly in a covered pan, and when cold arrange the cucumbers attractively in jars and pour over them the strained spiced syrup.

Cucumber Sweet Meats.—An attractive pack may be made by slicing the sweet pickled, medium-sized cucumbers before packing. Cut slices one-half inch thick, also cut a small circle from the center of each slice. Place a raisin or red cherry in the center for a garnish, arrange uniformly in the jars, strain the syrup in which the pickles have been plumping, and pour over the cucumbers in the jars, paddle to remove air bubbles, seal and process (Fig. 111).

Plain Cucumber Pickle.—After washing the brine from the cured cucumbers, allow them to stand in fresh, cold water for three hours. Drain and cover with a weak solution of vinegar and allow them to stand for two or three hours. Put in kettle:

1 quart of vinegar	1 pound of brown sugar
¼ cupful of whole black pepper	2 tablespoonfuls of cloves
1 or 2 pods of red pepper	1 tablespoonful of mace

Boil for five minutes and pour over the cucumbers which have been drained from the first vinegar. This amount is for one gallon of pickle. Pack into jars, cover with the spiced vinegar, and process to seal air-tight.

Cucumber Slices.—Select medium-sized cucumbers. Peel and slice thinly. To each gallon of slices sprinkle one cup of salt. Let stand for twelve hours; drain out the salt water; drop slices into glass jars, cover with pure, cold cider vinegar, seal and process in water-bath for fifteen minutes at 180° Fahrenheit (simmering).

Spiced Cucumber Salad.—

Vegetables	Spiced vinegar
5 pounds of sliced cucumbers (about 2 dozen)	1 quart of vinegar
½ cupful of chopped onion	½ cupful of sugar
2 cupfuls of sweet red pepper (chopped)	1 tablespoonful each of salt, powdered ginger, and mustard seed
1 cupful of sweet green pepper (chopped)	1 tablespoonful each of whole pepper, celery seed, cloves, cinnamon, and allspice

Mix the cucumber and onion and sprinkle alternate layers with salt, using three-quarter cupful for this lot. Let stand over night. Put peppers in brine (one cupful of salt to one gallon of water) over night. Next morning drain vegetables and freshen for one to two hours in clear, cold water.

Put all whole spices in cheesecloth bag, except the celery seed and mustard seed, which are put in loose. Add spices to the vinegar and boil for five minutes. Drain the vegetables well and pour the hot spiced vinegar over them. Let stand twenty-four hours. Pack, distributing the pepper well and flattening some of the cucumber slices against the face of each jar. Fill jars with same vinegar and paddle well to remove all bubbles. Garnish with strips of red pepper or pieces of spice. Process pint jars for fifteen minutes at 180° Fahrenheit (simmering).

Sweet Pickled Cucumbers and Red Peppers.—

12 sound cucumbers	1 teaspoonful of black pepper
8 sweet red peppers	1 teaspoonful of celery salt
1 cupful of brown sugar	1 teaspoonful of ground cloves
1 teaspoonful of salt	1 teaspoonful of allspice
1 pint of vinegar	

Cut the cucumbers in slices one inch thick. Remove the seed sacks from the peppers, and cut peppers lengthwise in strips one inch wide. Place alternate layers of each in a preserving kettle. Sprinkle one-half cupful of salt over them, cover with cold water, and let stand four hours. Strain and wash thoroughly in cold water to remove the brine; now put the cucumbers and peppers back into the preserving kettle, mix together the sugar and seasonings, add to pickle mixture with vinegar, and cover and cook until tender, stirring slowly and often. It will take twenty to thirty minutes. Pack into jars and process as for spiced cucumber salad.

Rummage Pickle.—

- 2 quarts of green tomatoes
- 1 quart of ripe tomatoes
- 2 bunches of celery
- 4 medium-sized onions
- 2 sweet green peppers
- 2 sweet red peppers
- 1 quart of small green cucumbers
- 4 tablespoonfuls of salt
- 1 quart of vinegar
- 1 pound of brown sugar
- 1 tablespoonful of mustard
- 1 tablespoonful of cinnamon
- 1 small hot red pepper

Put the vegetables through a food chopper, sprinkle with one-half cupful of salt, and allow to stand over night. Drain well the next morning and mix thoroughly with all ingredients. Allow to stand for from four to five hours. Pack into jars, process, and seal.

FIG. 112.—Preparation of vegetables for mixed pickles.

MIXED PICKLES

Mixed Pickles.—

- 3 large heads of cabbage
- 1 quart of vinegar
- 2 pounds of sugar
- ½ ounce each of cloves, cinnamon, allspice and mace
- 1 peck of green tomatoes
- 1 dozen medium-sized onions
- 2 dozen cucumbers
- 1 dozen green peppers

Chop them separately and very fine. Mix all together and put in alternate layers of the mixture and salt. Let stand over night. Then squeeze dry and cover with cold vinegar. Let it stand twenty-four hours and squeeze as before. Mix vinegar with spices, add sugar, boil for five minutes, and pour over the chopped vegetable. Allow to stand for several hours. Pack in jars, garnish with strips of red pepper, cover with the spiced vinegar, and process (Figs. 112 and 113).

Green Tomato Pickle.—

- 1 gallon of green tomatoes
- ½ dozen large onions
- 3 cupfuls of brown sugar
- ½ lemon
- 3 pods of red pepper
- 3 cupfuls of vinegar
- 1 tablespoonful of whole black pepper
- 1 tablespoonful of whole cloves
- 1 tablespoonful of allspice
- 1 tablespoonful of celery seed (crushed)
- 1 tablespoonful of mustard seed
- 1 tablespoonful of ground mustard

Slice the tomatoes and onions thin. Sprinkle over them one-half cupful of salt and let stand over night in a crock or enamel vessel. Tie the pepper, cloves, allspice, and celery seed in a cheese-cloth bag. Slice the lemon and chop two pepper pods very fine. Drain the tomato and onion well. Add all seasoning except one pepper pod to the vinegar, then add the tomato and onion. Cook for one-half hour, stirring gently at intervals to prevent burning. Remove spice-bag to prevent darkening product. Pack in pint jars and garnish with slender strips of the red pepper, placing them vertically on the opposite sides of each jar. Process for fifteen minutes.

Mustard Pickle.—

Vegetables

- 1 pint of whole small cucumbers
- 1 pint of sliced cucumbers
- 1 pint of small whole onions
- 1 cupful of string beans
- 3 sweet green peppers
- 3 sweet red peppers
- 1 pint of green fig tomatoes or
- 1 pint of cauliflower

Dressing

- 1 quart of vinegar
- 4 tablespoonfuls of flour
- 1 cupful of brown sugar
- 3 tablespoonfuls of powdered mustard
- ½ tablespoonful of turmeric
- 1 teaspoonful of celery seed (crushed)

Fig. 113.—A fancy pack of mixed pickles.

Cut all vegetables before measuring—tomatoes into halves, cucumbers into slices, string beans into one and one-half inch lengths, diagonally or on the bias, and chop peppers. All vegetables should be tender, and the whole cucumbers not longer than two and one-half inches.

Put all vegetables into brine over night, then freshen in clear

FIG. 114.—Packing pickles with paddles. (Heinz Company.)

water for two hours. Let these vegetables stand in liquor of one-half vinegar and one-half water for fifteen minutes, and then scald in same liquor.

To make mustard dressing, rub all the dry ingredients together until smooth, then add the hot vinegar slowly, stirring to make smooth paste. Cook over pan of water, stirring carefully, until the sauce thickens. Then drain the vegetables thoroughly and pour the mustard dressing over them while hot. Mix well and pack into jars. Process pint jars for twenty minutes at 180° Fahrenheit (simmering) (Fig. 114).

RELISHES

Dixie Relish.—

- 1 quart of chopped cabbage
- 1 pint of chopped white onion
- 1 pint of chopped sweet red pepper
- 1 pint of chopped sweet green pepper
- 5 tablespoonfuls of salt
- 4 tablespoonfuls of mustard seed
- 2 tablespoonfuls of celery seed (crushed)
- ¾ cupful of sugar
- 1 quart of cider vinegar

Soak the pepper in brine (one cupful of salt to one gallon of water) for twenty-four hours. Freshen in clear, cold water for one or two hours. Drain well, remove seeds and coarse white sec-

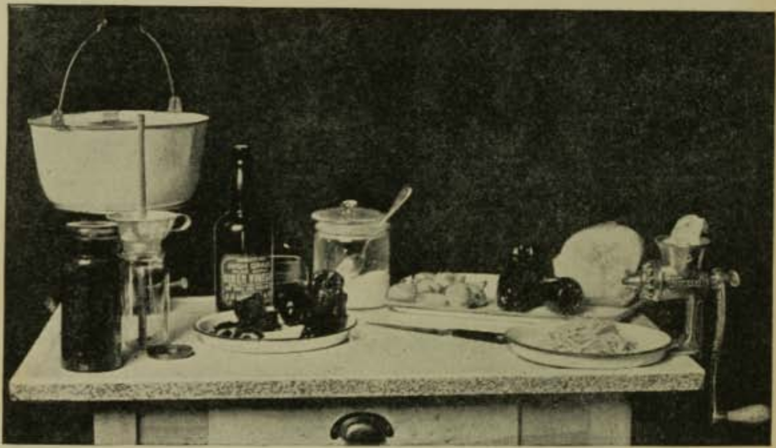

Fig. 115.—Making Dixie relish and stuffing pepper mangoes.

tions. Chop separately, and measure the chopped cabbage, peppers, and onions before mixing. Add spices, sugar, and vinegar. Let stand over night covered in a crock or enamelled vessel. Pack in small sterilized jars (Fig. 115).

When ready to pack, drain the vinegar off the relish in order

PLATE II

A B C D E

Attractive Pickle Packs

A. Dixie relish. B. B. S. Chutney. C. Sweet pickled chayote. D. Dixie relish. E. Vegetable macedoine.

that the jar may be well packed. Pack the relish in the jars, pressing it carefully; then pour over it the vinegar which was drained off. Paddle the jar thoroughly, to get every bubble out, and allow the vinegar to displace all air spaces. Garnish each jar with two slender strips of red pepper. Place these strips vertically on the seams in the jar on opposite sides. Cap, clamp, and process for fifteen minutes at 180° Fahrenheit (simmering).

Pepper Relish.—Take one dozen sweet green peppers and one dozen sweet red peppers, and add three large onions, chopped fine. Cover with boiling water and let stand ten minutes, drain, cover again, and let come to a boil. Then let stand again. Drain dry and add three tablespoonfuls of salt, two pints of vinegar, and two cups of granulated sugar. Cook fifteen minutes and pack in jars.

Corn Relish.—

1 dozen ears of corn
1 head of cabbage
3 sweet red peppers
3 sweet green peppers
1 quart of vinegar
1 cupful of sugar
2 tablespoonfuls of mustard
1 tablespoonful of salt
1 tablespoonful of celery salt

Blanch corn for two minutes and drop into a cold bath for a few seconds before cutting from cob. Cook all together for twenty minutes. Pack into sterilized jars, seal, and process.

Uncooked Tomato Relish.—

½ peck of ripe tomatoes
1 quart of cider vinegar
6 green peppers
6 sweet red peppers
4 medium-sized onions
½ cupful of chopped cabbage
2 teaspoonfuls of celery seed
½ teaspoonful of red pepper
1 teaspoonful of ground cloves
4 teaspoonfuls of mustard seed (yellow)
½ cupful of salt
1 cupful of sugar

Scald and peel tomatoes, chop all ingredients fine, add seasonings, and mix well. Add the vinegar and allow to stand over night. Next morning pack cold into small sterilized jars, seal, and process.

Sweet Pepper Chow-chow.—

3 pecks of sweet red peppers	½ peck of onions
1 cupful of grated horseradish	3 cupfuls of sugar
5 tablespoonfuls of salt	3 ounces of celery seed (crushed)
4 ounces of mustard seed	1 teaspoonful of cloves
½ tablespoonful of black pepper	1 teaspoonful of allspice
3 teaspoonfuls of cinnamon	2 teaspoonfuls of ground ginger
1 gallon of (60-grain) vinegar	

Sixty-grain vinegar is a commercial term for expressing the acidity of the vinegar. Its equivalent, expressed in percentage, would be 6 per cent acetic acid.

Chop peppers and onions, mix all ingredients, and cook over a slow fire for three hours. This quantity will fill fifteen pint jars. This relish can be improved by adding tabasco sauce to suit the taste.

CHUTNEYS

Hot Sweets to Serve with Curries, Cold Meats, Sausage, and Stews

B. S. Chutney.—This chutney is packed in red and yellow bands in the jars. These colors represent the banner of Spain, and for this reason it is called Banner Spain or B. S. Chutney.

Red part	Yellow part
2 pounds of sweet Spanish Pimiento or 2 No. 1 cans of Pimiento	1 pint of small yellow fig tomatoes (preserved) or
1 pound of sugar	1 pint of gingered watermelon rind or
Juice of 4 lemons	1 pint of gingered chayote sweet pickle
2 hot peppers	

Red Part.—Peel the peppers according to the instructions given for canning. Chop sweet and hot peppers together, add sugar and lemon juice, and let stand in an enamelled vessel or crock for twelve hours. Drain off the liquor and allow it to simmer for ten minutes. Pour it over the peppers again and let stand for four hours. Simmer the liquor again for fifteen minutes, allowing the peppers to remain in while simmering.

Yellow Part.—Use one pint of preserved yellow tomatoes, one pint of chopped gingered watermelon rind, or one pint of chayote sweet pickle. The preserved yellow tomatoes should be kept as nearly whole as possible. If the gingered watermelon rind or chayote is used it should be chopped or cut into small, uniform pieces that will pack easily.

A ten-ounce, vase-shaped hermetic jar is an attractive package for this product. In packing, place the heavier color—red—at the bottom in a one-inch layer; then place a one-inch layer of yellow. Continue in this manner until the jar is neatly filled. Combine the liquors and boil five minutes, strain, and pour it over the contents. Paddle to remove air bubbles. Cap, clamp, and process for ten minutes.

The small yellow fig tomato used in the chutney recipe is the variety which may be used for green tomato pickle and whole ripe-tomato preserves.

Apple Chutney.—

1 pound of green sour apples	2 ounces of race ginger root
1 pound of button onions	4 ounces of Chile peppers (or any hot peppers)
1 pound of raisins	8 ounces of salt
1 pound of soft brown sugar	1 tablespoonful of celery seed (crushed)
1 quart of cider vinegar	
1 clove of garlic	

Put the onions and salt and one cup of water in a bowl and cover. Renew this bath each morning for two days.

Pare, core, and slice the apples, soak with the other ingredients in a pint of cider vinegar for two days, add onions, and put through a food chopper. Combine with another pint of vinegar and boil until the apples are tender. Pack in small jars, seal, and process.

MANGOES

Stuffed Pepper Mango.—Mango peppers are mild, sweet, yellow, and waxy in appearance. They are highly esteemed for pickling. Soak sweet peppers in brine (one cupful of salt to one gallon of water) for twenty-four hours. When ready to stuff, take from brine, rinse in fresh water, carefully cut a circle off the top of each pepper, and save same, to be placed on peppers after stuffing. Remove the seeds and white sections. Soak in clear, cold water for one or two hours. Drain carefully. Stuff with

Dixie relish (p. 204), being careful not to press it in too tightly. Place top on the pepper and make secure by one or two stitches or by pinning cap in place with two or three wooden toothpicks. Pack as many stuffed peppers as can be placed in the jar without crushing. Then fill the jar to overflowing with a spiced vinegar. Process for fifteen minutes in quart jars.

Spiced Vinegar.—

- ½ gallon of vinegar
- ½ cupful of grated horseradish
- 1½ tablespoonfuls of celery seed (crushed)
- 1 cupful of sugar
- 1½ tablespoonfuls of mustard seed
- 1 tablespoonful of salt
- 1 tablespoonful of cinnamon

Cloves, nutmeg, and grated onion may be added if desired.

Green Mango Pickles.—Use tiny green nutmeg cantaloupes and cure in brine as for cucumbers. When cured, soak the mangoes in cold water for two days; then scald in kettle lined with spinach or grape leaves. Cool, drain, and boil for fifteen minutes in weak vinegar. Drain and cover them with the second spiced vinegar for a week. After that, take the seed from them and fill them with the following spices:

- 1 pound of ginger, soaked in brine a day or two, until soft enough to slice
- 1 ounce of ground black pepper
- 1 ounce of allspice
- ½ ounce of turmeric
- ¼ pound of garlic, soaked for a day or two in brine, then dried
- 1 ounce of celery seed (crushed)
- 1 ounce of mace
- ½ ounce of cloves
- 1 cupful of grated horseradish
- 4 ounces of white mustard seed
- 4 ounces of yellow mustard seed

A pint of chopped sweet pickles or preserved watermelon rind will improve the flavor and texture of this mixture for the filling.

Bruise all the spices and mix with one teacupful of salad oil. To each mango add one teaspoonful of brown sugar. This mixture will fill four dozen mangoes, having chopped up some of the broken ones to mix with the filling. Tie them or pin together with wooden toothpicks, pack in jars, and cover with sweet vinegar, allowing one pound of brown sugar for each pint of the spiced vinegar in which the melons soaked. Seal and process.

Spiced Cucumber Mango.—Select large cucumbers and prepare them as for spiced cucumbers, and allow them to stand for about a week. Slice a cap from the stem end and scoop out the center of the pickle, fill with Dixie relish (p. 204), replace the cap, and fasten with wooden toothpicks. Pack into jars, cover with spiced vinegar (p. 208), seal, and process.

Sweet Mango.—Large sweet pickles may be capped, scooped out, and filled with the following mixture:

1 cupful of preserved citron or watermelon rind
¼ cupful of candied cherries
¼ cupful of preserved orange and grapefruit peel
¼ cupful of conserved ginger

Fasten the cap in place, pack in jars, garnish with candied red cherries or orange-peel, cover with spiced syrup, seal, and process. This makes a delicious sweet mango.

KETCHUP

Tomato Ketchup.—Select red-ripe tomatoes. The extra juice, small and broken fruit, which will not do for canning, may be used, if they are sound red. Any green or yellowish parts of fruit will make a ketchup inferior in flavor and color, and not good for market. Use whole spices tied loosely in a bag while cooking, and remove before bottling to prevent darkening the product caused by ground spices. This does not apply to red pepper, which helps to give a bright-red color. The pulp of sweet Spanish pepper or the ground Hungarian paprika may also be used to give color and flavor. Remove seeds from sweet red pepper, chop, and add one cupful of this pepper and two medium-sized onions to one gallon of tomatoes before cooking.

Cook the tomatoes thoroughly, put through a colander or sieve, saving all pulp, and measure. For every gallon of pulp use the following:

2 tablespoonfuls of salt
4 tablespoonfuls of sugar
1 tablespoonful of mustard (powdered)
1 pint of good cider vinegar
1 level tablespoonful each of whole allspice, cloves, cinnamon, and pepper
2 small red peppers, sliced and seeds removed

After putting tomatoes through colander, add ground spices and spice-bag, and cook for one and one-half hours, or until nearly thick enough, then add vinegar and cook until thick. Rapid cooking (being careful not to scorch the ketchup) will give a better color than slow cooking. The finished product should have a fine, bright-red color.

Pour the ketchup at once into hot sterilized bottles. If any quantity is made for sale, set the hot bottles at once into a vessel of hot water, having a rack or false bottom in it to prevent breakage, put the cork stoppers in loosely, and process at boiling-point for thirty minutes. Drive the corks in tightly, and when cool dip mouth of bottle into melted paraffin, or cover stopper with sealing wax.

Recipe for making sealing wax was given on page 101.

English Mushroom Ketchup (Nice for Soups and Sauces).—

1 pint of vinegar
20 pounds of mushrooms
1 pound of salt
To each quart of liquor add 1 ounce of bruised or ground ginger
½ nutmeg
1 teaspoonful of horseradish
½ ounce of cloves
½ ounce of allspice
1 teaspoonful of whole pepper
1 sprig of mace
2 onions
1 clove of garlic

Run mushrooms through food chopper, mix salt through them, and let stand for twelve hours, then drain. To the liquor add all ingredients, boil slowly two hours, add vinegar, bottle, process, and seal.

Grape Ketchup.—

4 pounds of grapes
2 tablespoonfuls of cinnamon
1 tablespoon each of cloves and allspices
¼ teaspoonful of cayenne pepper, if desired
1 cupful of vinegar
1 teaspoonful of salt
1½ pounds of sugar

Wash and stem the grapes, and steam them over water until soft. Put through a colander. Add the spices, sugar, salt, and vinegar and let simmer for fifteen minutes. Bottle and seal. Use whole spices tied in a cloth while cooking and remove before bottling. This will give a better color than when ground spices are used.

Cranberry Ketchup.—

5 pounds of cranberries
1 pint of vinegar
2 pounds of brown sugar
½ tablespoonful of paprika
3 tablespoonfuls of cinnamon
½ tablespoonful of ground cloves
½ tablespoonful of salt

Cook the cranberries and vinegar until the berries burst, press through a sieve, add other ingredients, and let simmer until thick, process fifteen minutes at 180° Fahrenheit (simmering), cork, and seal.

Pimiento Ketchup.—

6 pounds of ripe, roasted, and peeled pimientos
2 tablespoonfuls of salt
2 pounds of sugar
2 tablespoonfuls of powdered ginger
2 tablespoonfuls of powdered cinnamon
1 quart of vinegar

Roast and peel the pimientos as for canning. Remove stem seeds, weigh, and pass through a food chopper. Rub spices together, add sugar, and mix well with the pepper pulp. Heat thoroughly and add the vinegar slowly. Cook all together until smooth and of the proper consistency. Pour hot into sterilized bottles, cork or cap, and seal. If the bottles of ketchup are to be shipped, sterilize them in a hot-water bath for thirty minutes at 180° Fahrenheit (simmering), and cork or seal immediately.

SAUCES

Chile Sauce.—

1 gallon of chopped ripe tomatoes
½ cupful of chopped white onions
½ cupful of chopped sweet green peppers
½ cupful of chopped sweet red peppers
½ cupful of brown sugar
2 tablespoonfuls of ginger
1 tablespoonful of cinnamon
1 tablespoonful of mustard
1 nutmeg (grated)
1 quart of vinegar
½ cupful of salt
½ teaspoonful of cayenne pepper

Peel the tomatoes and onions. Chop the onions and peppers fine. Boil all the ingredients except the vinegar together for two hours or until soft and broken. Add vinegar and simmer for one hour. Stir frequently. Bottle and seal while hot.

Pepper Sauce.—Wash small cherry or Chile red and green peppers, pack into bottles, cover with good cider vinegar and cork. It will be ready for use within a few days. As the sauce is used more vinegar may be added to the peppers from time to time.

Tabasco Sauce.—

4 dozen red tabasco or Chile peppers	½ cupful of spiced vinegar
	1 clove of garlic

Boil the finely chopped garlic and peppers until tender, drain, rub through a sieve, and add to the paste enough spiced vinegar to make it of a creamy consistency. Bottle and seal. Onion may be used in place of garlic if desired. Use spiced vinegar. Recipe given on page 208.

Tomato Paste.—

1 quart of thick tomato pulp	½ teaspoonful of salt
1 slice of onion (2 inches in diameter)	1 teaspoonful of paprika
	1 tablespoonful of mixed spices

Mix one tablespoonful of spices about as follows: One-half teaspoonful each of mustard seed, cloves, cinnamon, crushed celery seed, and bay leaf, one-quarter teaspoonful of whole black pepper, and one sprig of mace.

Tie spice in cheesecloth and cook with tomato pulp in a pan over water until thick enough to hold the shape of a spoon when a spoonful of it is dipped out. Pack hot into small sterilized jars or flat No. 1 cans, process fifteen minutes at boiling.

PRESERVING VEGETABLES BY FERMENTATION [4]

The preserving of food products by fermentation has been practiced for centuries. In Europe many fermented substances are common articles of food. In the United States, however, pickles and sauer-kraut are the only foods commonly prepared

[4] The recipe for preserving cucumbers, chayotes, beets, and string beans by fermentation was contributed by Dr. L. A. Round, Bureau of Chemistry, Department of Agriculture.

in this manner. A number of vegetables which are commonly preserved by canning can be fermented and kept indefinitely. Whenever it is difficult to obtain tin cans and glass jars, fermentation is the most feasible method of preserving many food products. The following procedure is recommended:

Cucumbers, Chayotes, Beets, and String Beans.[4]—Cucumbers and chayotes may be satisfactorily fermented by the following method: Wash the fruit, if necessary, and pack into a clean, water-tight barrel, keg, or crock. On the bottom of the barrel place a layer of dill and a handful of mixed spice. When half full add another layer of dill and another handful of spice. When the barrel is full, add more dill and spice. If a keg or crock is used, the amount of dill and spice can be reduced in proportion to the size of the receptacle. When nearly full, cover with cabbage or spinach leaves and a board cover weighted with stone. Make a brine by adding one pound of salt to ten quarts of water. To each fifteen quarts of brine so made add one quart of vinegar. Add sufficient brine to cover the material and allow to ferment. The strings should be removed from string beans before fermentation. In case of beets and string beans, also, if they are to be served like fresh string beans, the addition of spice is not necessary. Beets, of course, require careful washing to remove all dirt before brining. When the acid test with litmus paper is obtained, seal the brine air-tight.

Dill Pickles.—Dill pickles are made from fresh or salted cucumbers (the former are choicer, but the latter have better keeping qualities). Employ pickled dill seed or herb[5] and "dill spice," composed of allspice, black pepper, coriander seed, and bay leaves, in addition to the brine.

Soak 100 cucumbers in a 30-degree brine until the brine will give an acid test with litmus paper. Drain and arrange in layers in a crock, putting in a layer of cherry or grape leaves

[5] Dill is an herb of the parsley family, grown chiefly for its aromatic, pungent seeds, which are employed in the manufacture of sauces, pickles, etc.

first, then the cucumbers, then a few cloves, the dill, a few small pieces of red pepper, and then the leaves. Continue until the crock is full. Cover with the brine which was drained off and to which have been added one-half cupful of mustard seed, one-half cupful of horseradish and one-half cupful of salt. Cover with a light weight and seal air-tight for winter use.

Brining Cauliflower.—A surplus crop of cauliflower can be brined and used in mixed pickles later in the year when other vegetables mature.

The "Rice" heads of cauliflower are heavier than the smoother heads, and are not so fine for the market, but they are very good for pickling. Plain tight barrels or kegs may be used. "Second-hand" charred barrels are very satisfactory. Be sure barrels are clean before filling with the cauliflower.

All outer leaves should be removed, and the stump and heads should be put in whole, if possible. Pack cauliflower heads in barrels until two-thirds full, and fill barrel with brine which tests 40° with a salometer. Head the barrels and bore a small hole (one-half inch to three-quarters inch) in the top and fill the barrel to overflowing with brine through this hole. A little brine has to be added from time to time to take care of any leakage. Turn barrel at end of each week for six weeks. To do this, bung hole up tightly and turn barrels upside down so the salt which has settled at bottom will be equally distributed again. Watch for leakage and be sure to keep cauliflower well covered with brine.

After two months the cauliflower should be repacked. Skim the brine, using a skimming ladle. Dip out the cauliflower and repack fairly tight in a clean barrel which has been scalded. Cover with brine testing 40° with salometer. If an instrument is not at hand for testing the brine, use one pound of salt to each gallon of water (one pint of salt to eight pints of water). Bung up, fill top with water to take care of leakage, and allow to stand about five-months or until ready to use.

The Hollanders commence with a 30-degree brine and finish with a 35-degree brine. They cure in casks only, and their cauliflower has a better flavor than the domestic, because the brine is kept so low that they get a lactic acid cure. The same principle is followed in the cure of genuine dill pickle.

Sauer-kraut or "Crout."—Use one to three quarts of salt to twenty gallons of shredded slaw or cabbage, or three pounds of salt to each one hundred pounds of shredded cabbage will give a good flavor to the resulting kraut. Remove outside leaves and the hard core of cabbage. Shred the rest finely. Line the keg with the larger leaves on the bottom and sides as you fill it. Put in a three-inch layer of shredded cabbage and sprinkle with four or five tablespoonfuls of salt. Continue to repeat the process, lining barrel with the large leaves. Pound it all down well until the cask is full and covered with the brine. The salt soon extracts a considerable amount of juice from the cabbage, and this brine should rise above the slaw. Cover with the large leaves and a board cover to fit inside the cask. Weight this cover down with heavy weights so it will keep the cover level. Care should be taken not to use lime or sandstone for weights, for the acid produced by fermentation attacks the lime and destroys the keeping quality of the brine. It is necessary that the cabbage be entirely covered with brine at all times. Keep in a cool, dry cellar for three weeks to a month. Remove the scum and see that it is well covered with juice. When the weather is warm the kraut will cure in sixteen to eighteen days, when it is ready for use or for canning.

It may be packed in No. 3 cans and covered with boiling water. Cap, exhaust five minutes, tip, and process thirty minutes in a hot-water bath at 212° Fahrenheit.

Sauer-kraut is usually made in the fall for winter use. It may be eaten raw, fried, boiled with pork with onions added, or with wienerwurst sausage and browned in oven, or cooked with spare-ribs.

Brining Onions.—Onions may be cured by the first method given for brining cucumbers in a 45-degree brine (p. 192). When the liquid gives an acid test the jars or crocks should be sealed from the air. The onions will keep several months by this

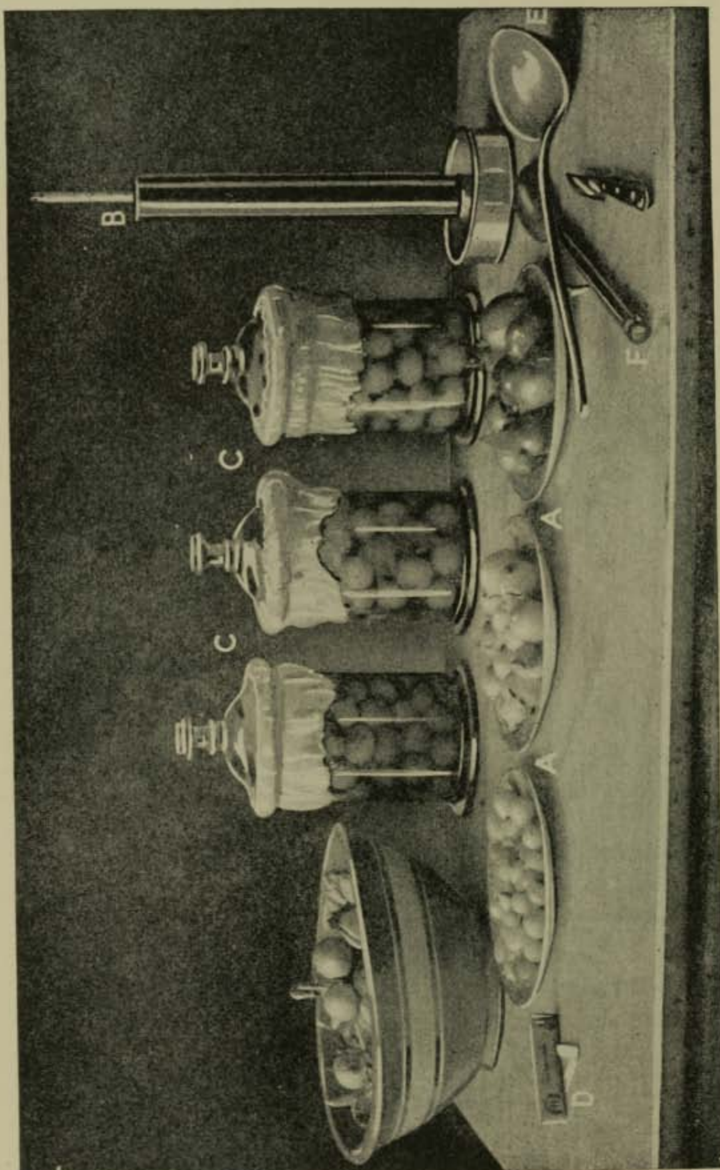

Fig. 116.—Brining onions: A. Grading according to size. B. Copper cup of brine with salometer floating in it. C. Sealed jars. D. Litmus paper. E. Ladle dipper. F. Wooden spoon.

method, and may be used in mixed pickles later, or spiced and put in vinegar (Fig. 116).

Pickled Onions.—Select small white onions and sort into two sizes, one-half inch diameter in one and three-fourths inch in other. Peel, cover with fresh water, and let stand for two days, changing the water on second day. Wash well and put into brine for four days, changing brine at end of second day. Take out of brine and put into boiling water. Let stand for ten minutes, then put into cold water for two hours. Drain, and pack into jars, putting in a few small red peppers, and garnishing with sprigs of mace. Fill jars to overflowing with spiced vinegar, made previously, as below, and allowed to stand for a few days with spice-bags left in it. Process as for pickles.

Spiced Vinegar for Pickled Onions.—

½ gallon of vinegar
1½ tablespoonfuls of celery seed
½ cupful of grated horseradish
1 cupful of sugar
1½ tablespoonfuls of mustard seed
1 tablespoonful of salt
1 tablespoonful of cinnamon

Cloves, nutmeg, and grated onion may be added if desired.

Pickling Olives.[6]—In California, Arizona, and other states where olives can be grown successfully many housewives are interested in pickling them by household methods for home use.

The two varieties which have given the best results in home pickling are the Mission and Manzanillo. The Mission holds its color well while being pickled, and with reasonable care in the extracting process yields a product which is firm and of good flavor. The Manzanillo is superior to the Mission in flavor, but the fruit is of a finer texture and is prone to soften during treatment; the color of the finished product is not so good as that of the Mission.

The finest pickled green olives come from the south of Spain. California and Arizona lead in the marketing of the pickled ripe olive. On the Pacific coast the green olive is no longer receiving attention.

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[6] NOTE.—Directions for pickling olives obtained from Farmers' Bulletin 296, 1907, U. S. Department of Agriculture, by W. W. Skinner.

Fruit for pickled green olives is gathered when it has attained full size, but before final ripening begins. It is sorted according to size and quality, then washed and placed in a solution of lime and potash to remove the bitter taste.

The olives, either green or ripe, should be picked into pails about one-third full of water, to prevent bruising, and sorted as to size and ripeness. The fruit is then placed in suitable vessels (preferably stone jars, though wooden kegs may be used if sterilized so that they are free from mold spores), the water poured off, and the fruit covered with a solution made of two ounces of soda lye, one ounce of lime, and one ounce of common salt to a gallon of water. The solution should be thoroughly mixed and allowed to stand an hour before using, and is best if made of boiled and cooled water. It should stand about two inches above the fruit, and if any of the olives float it is necessary to cover them with a board and weight.

The time of the lye treatment varies from three to seven days, according to the variety, size, and ripeness of the fruit. The solution should be examined daily, and should the sleek, soapy feeling peculiar to lye disappear it indicates that the solution is exhausted. The old solution should therefore be poured off and new solution added. It should also be changed at once should any scum or mold appear. The fruit should be frequently examined, always sampling the largest olives by cutting away a portion with a sharp knife. The progress of the lye toward the interior of the fruit is plainly marked by a distinct dark ring. When the ring has reached almost but not quite to the pit it is time to remove the lye and commence the washing.

The lye should now be poured off and water added and renewed morning and night. The wash-water should also be boiled as a preventative of mold, which is very likely to develop at this stage of the pickling process. The fruit should be kept in water, as before, with the board and weight, and throughout the extraction, washing, and salting the vessel should be closely covered. It will require from four to seven days to remove all traces of the alkali. Washing should be continued so long as the fruit has the peculiar hot taste due to the presence of lye, and it is well to test it with red litmus paper, which will turn blue if a trace of the lye remains. If the olives are still bitter after the washing has been completed, they should receive a second treatment with lye, followed by washing.

When free from lye the olives are ready for pickling. Some use brine only or salt and vinegar mixed, others add fennel and thyme or coriander and laurel leaves. The fruit is generally pickled whole, but when desired to give a stronger pickle savor it is marked with incisions to the stone.

If olives are to be brined, use two ounces of common salt to a gallon of water. The brine should be thoroughly boiled, cooled, and poured over the olives. The next day this solution should be poured off and a solution containing four ounces of salt should be used. If the stronger solution is used to begin with, the olives will shrivel. The fruit should next be treated with an eight-ounce brine, and, if intended to keep for some time, finally with a brine containing fourteen ounces of salt to tho gallon. A fourteen-ounce brine, however, makes the olives too salty to be used without a slight soaking.

The better method of keeping the finished product is to process the olives after adding the eight-ounce brine. Glass fruit jars filled with olives and brine, with the covers lightly screwed down over the rubbers, are heated to 180° Fahrenheit (simmering) for thirty minutes. They should then be removed and the covers quickly tightened. By this process the flavor of the olive is not injured, and if properly done the fruit will keep at least several months without deteriorating.

A perfect pickled green olive is yellowish green, very firm, with pinkish pit and agreeable flavor. Fruit of lesser quality is dark in color, with meat soft and mushy, or woody and tasteless, these defects being caused either by age or imperfect curing.

Pickled or salted ripe or black olives are purplish black in color, and dark and rather soft in pulp, with a bland flavor due to the oil developed in the ripening. They are processed in much the same manner as green fruit, as prior to pickling they retain the characteristic bitter flavor. Green olives are essentially a relish. Ripe olives are a wholesome and nutritious food.

Plain Mock Olives.—Mock olives may be made for home use from unripe plums. The plums, when just beginning to ripen, but still green, should be pickled in a 45-degree brine (one pound, nine ounces of salt and one gallon of water). The brine should be poured, hot, over the fruit and allowed to stand for thirty-six hours. It should then be poured off. Place the fruit in a new brine and boil for one minute. Drain the plums, pack into jars, cover with hot brine. Seal and process pint jars for thirty minutes at 212° Fahrenheit.

Spiced Mock Olives.—One gallon of green plums soaked for twenty-four hours in 45-degree brine (one pound, nine ounces of salt and one gallon of water). Drain, place into stone jars, and pour scalding vinegar over them. Next morning drain off this vinegar, add to it two tablespoonfuls of mustard seed, and boil for two minutes. Pour, hot, over the plums and allow to stand until cold. Pack in bottles, cover with hot strained liquor, seal, and process as for plain mock olives.

Pickled Mushrooms.—Steam whole mushrooms, place into jars, cover with vinegar, seal, and process as for mock olives.

FLAVORED VINEGARS

Tarragon Vinegar.—Bruise one cupful of Tarragon leaves, pour over them one quart of good apple vinegar, and allow to stand for from ten to twelve days. After this time strain carefully through a flannel cloth, bottle, and seal air-tight.

Celery Vinegar.—

1 quart of vinegar
1 tablespoonful of salt
1 tablespoonful of sugar
8 tablespoonfuls of celery seed (crushed) or 1 quart of chopped fresh celery

Heat the vinegar, add the seasoning, and pour while hot over the celery. Allow to cool, cover tightly, and set aside for from twelve to fifteen days. Strain, bottle, and seal.

Onion Vinegar.—

1 quart of good vinegar
½ cupful of chopped white onions
1 tablespoonful of salt
1 tablespoonful of sugar

Scald the vinegar and spices, pour over the onions, allow to stand for two weeks, strain, bottle, and seal.

Tarragon, celery, and onion vinegar are delicious when used in dressings and served with salads.

Artichoke Pickle.—Scrub and scrape young artichokes, plunge them into boiling brine (one-quarter cupful of salt to one quart of water) for five minutes. Then put into clear, cold water for a few minutes. Drain and cover with a spiced vinegar (p. 208). Let stand over night, and pack in sterilized jars. Cover with the spiced vinegar and process small jars in water-bath for fifteen minutes and quart jars twenty-five minutes at 180° Fahrenheit (simmering).

Pickled Beets.—Cook small beets until tender, slip the skins off, pack into jars, cover with spiced vinegar, seal and process for thirty minutes at simmering). Beets are better canned in water and made into pickle as desired.

Sweet Pickled Carrots.—Boil young, tender carrots until three-fourths done, scrape, cut in thin slices, and pour a boiling spiced syrup over them, made by boiling together one quart of vinegar, one quart of sugar, one tablespoonful of cinnamon, cloves, and one teaspoonful of mace and allspice. Allow to stand over night in this syrup. Next morning boil for five minutes, cool quickly, pack into jars, strain syrup over them, seal, and process as for all pickles.

Spiced Green Tomatoes.—

6 pounds of small whole green tomatoes
4 pounds of sugar
1 pint of vinegar
1 tablespoonful of cinnamon
½ tablespoonful of cloves
½ tablespoonful of allspice
½ tablespoonful of mace

Small green fig or plum tomatoes are suitable for this pickle. Scald and peel. Make a syrup of the sugar, vinegar, and spices. Drop in the whole fruit and boil until the tomatoes become clear, pour all into trays, cool quickly, pack cold into jars, strain syrup over them, seal and process.

Spiced Rhubarb.—Peel and slice one pound of rhubarb. Sprinkle over one cupful of sugar, and let stand over night. Next morning drain off the syrup, add one-half cupful of sugar, and put over the fire. Tie in spice-bag (six whole cloves, three whole allspice, a bit of mace, a six-inch stick of cinnamon, and a two-inch piece of ginger root), put into syrup and boil ten minutes, skim out spices, add rhubarb, and cook until clear. Seal in small jars.

SPICED FRUITS

Spiced Crab Apples.—Choose round crab apples uniform in size; do not pare them. Make a spiced syrup by boiling together one quart of vinegar, one quart of sugar, one tablespoonful of cinnamon, cloves, and one teaspoonful of mace and allspice, add crab apples, and heat gently, being careful not to burst the fruit. Let stand in syrup over night, pack cold, cover with syrup, seal, and process pint jars fifteen minutes at 180° Fahrenheit (simmering).

Pickled Watermelon Rind.—One pound of watermelon rind boiled in one quart of salt water (one-quarter cupful of salt to one quart of water) for fifteen minutes. Drain well and dip into a cold bath until the flavor of salt is gone. Drain carefully and stand in lime water over night (two ounces of lime to one gallon of water). Drain next morning and cook rapidly in a syrup made by boiling together one pound of sugar, one pint of water, one pint of vinegar, one teaspoonful each of cloves, cinnamon, allspice, and one-half teaspoonful of mace. Cook until rind becomes clear and transparent. Cool before packing, process as for other sweet pickles, and seal.

Cantaloupe Pickle (Sour).—Select under-ripe cantaloupe, peel, cut into sections. Place two pounds in stone jar and pour over a boiling mixture of one quart of vinegar, one pint of water, adding spices tied in spice-bag:

1½ teaspoonfuls of mace	6 teaspoonfuls of cloves
2 teaspoonfuls of cinnamon	1 pound of sugar

Next day pour vinegar off and bring to boil. Add sugar and drop in the spices and sections of fruit and boil until transparent. Pack fruit in jars and boil vinegar mixture for fifteen minutes longer to make a heavier syrup. Pour it over the fruit, cap jars, and process pints for fifteen minutes.

Cantaloupe Pickle (Sweet).—Soak one and one-half pounds of rind for three hours in lime water (two ounces of lime to one gallon of water). Drain and soak in fresh water for one hour.

Make a syrup by boiling together one quart of water and one pint of sugar, add well-drained rind, and cook rapidly for thirty minutes. Allow to stand over night. Next morning add one cupful of sugar, one cupful of vinegar, and spice-bag (one tablespoonful each of cinnamon, cloves, and allspice, and one-half tablespoonful of mace). Cook until rind is transparent (about one hour). Cool and pack in small jars. Cover with the strained syrup and process.

Sweet Pickled Chayote.—

2 pounds sliced chayotes
2 pounds of sugar
1 ounce of stick cinnamon
½ ounces of whole cloves
½ ounce of dried ginger root

Select half-grown chayotes, a green variety preferred, and slice thinly cross-wise. The slices from the smaller end of each fruit will make the most attractive pickle. The larger pieces may be chopped and used instead of cabbage in Dixie relish (p. 204).

The chayotes must first be cured in a 45-degree brine (about one pound, nine ounces of salt to one gallon of water). Place the sliced chayotes in a crock, cover them with the brine, and weight down with a plate. As soon as the brine around the chayotes will give an acid test with litmus paper (that is, will turn blue litmus paper pink) the chayotes are ready to be pickled. This will require three to five days.

If not made up into pickle at once it will be necessary to seal them air-tight. This can be done by sealing the jar with a layer of cheesecloth dipped in melted paraffin over which the lid is placed and sealed with strips of cloth which have been dipped in melted paraffin. The cured vegetable will keep as long as kept air-tight, but the color will not be as good as if finished at once.

Freshen the brined chayotes by standing in cold water for about two hours. Drain and let stand for two or three hours in a weak vinegar solution (one cupful of vinegar to three cupfuls of water). Place in stronger vinegar solution (one and one-half cupfuls of vinegar to one and one-half cupfuls of water) for a couple of hours. Then add the sugar and the spices, which are tied up in cheesecloth bags, to this solution. Cook the chayotes in this syrup until clear and transparent. Let stand until cold or over night in the syrup so that the slices will plump. Cut a tiny circle from the center of each slice of chayote and garnish with circles of sweet red pepper. Pack in jars, pour over the strained syrup, and process like other pickles.

Cucumber rings are sometimes garnished and packed in this manner.

Sweet Pickle Figs.—

5 quarts of figs	1 quart of sugar
1 quart of water	1 tablespoonful of cloves
1 pint of sugar	1 teaspoonful of allspice
1 pint of vinegar	1 teaspoonful of mace
1 tablespoonful of cinnamon	

First, cook five quarts of figs until tender in about a 30-degree syrup (one quart of water to one pint of sugar).

When figs become tender, add one quart of sugar, one pint of vinegar, one tablespoonful of cinnamon, one tablespoonful of cloves, one teaspoonful of allspice, and one teaspoonful of mace, and cook until figs are clear and transparent. Allow them to stand in this syrup over night. On the following morning pack the fruit into jars, cover with syrup. Sterilize pint jars in water-bath for fifteen minutes at boiling or thirty minutes at 180° Fahrenheit (simmering).

Spiced Currants and Gooseberries.—

7 pounds of fruit	3 tablespoonfuls of cinnamon
1 pint of vinegar	2 tablespoonfuls of cloves
5 pounds of sugar	

Make a syrup of the sugar, spices, and vinegar. Cool, add the fruit, and cook rapidly for from twenty to twenty-five minutes. Pack into jars while hot and seal at once.

Spiced Grapes.—Pick the grapes from the stem, wash and slip the pulp from the skins, steam the pulps over a vessel of hot water or in a double boiler until they can be rubbed through a coarse sieve to remove the seeds. Combine pulp with skins and weigh. To each seven pounds allow the same proportions of sugar and spices as for currants and gooseberries given above. Cook all together until very thick, pack while hot, and seal at once.

Damson Plums and Cherries.—These fruits may be spiced in the same manner as currants and gooseberries (p. 224). The addition of one teaspoonful of mace and two teaspoonfuls of allspice will improve the flavor. After they are cooked in the syrup until tender, lift them out and cook syrup fifteen minutes longer, then pour over the fruit and allow to stand until cold. Pack, seal, and process pint jars fifteen minutes at 180° Fahrenheit (simmering).

Sweet Pickled Peaches.—

6 pounds of fruit	4 ounces of stick cinnamon
3 pounds of sugar	2 ounces of whole cloves
1 pint of water	1 ounce of ginger
1 pint of vinegar	

Select firm clingstone peaches. It is better to have them under-ripe than over-ripe. Peel by either method given under canning peaches (p. 126), and drop at once into a syrup which is made by boiling together the sugar and water, and boil for fifteen minutes. Cool quickly and allow to stand for from two to three hours. Drain off the syrup, put vinegar and spices into it, boil for fifteen minutes, then add the peaches and cook together for half an hour. Let stand over night. Next morning drain off the syrup, boil for twenty minutes, add the peaches, and continue cooking for fifteen minutes longer. Cool again and let stand for two hours or over night, then boil all together until the peaches are clear and tender. Pack peaches cold into jars, garnish with snips of stick cinnamon, cover with strained syrup, seal, and process quart jars for twenty minutes at 180° Fahrenheit (simmering).

Spiced Pears.—

7 pounds of hard pears	½ lemon (rind)
3½ pounds of sugar	½ ounce of whole cloves
1 pint of vinegar	½ ounce of whole allspice
1 ounce of ginger root	2 ounces of stick cinnamon

Cut pears in half, remove the seeds, and pare. Make a syrup of vinegar and sugar, tie the spices in small pieces of cheesecloth and add them to the syrup. When this mixture begins to simmer, add the pears and lemon rind and bring to the boiling-point, cool quickly, and allow to stand over night. The next morning drain off the syrup from the pears into a porcelain-lined or agate kettle, bring the syrup to boiling-point and pour over the pears, allow to stand over night again. Next day drain and heat the syrup as before, repeating this for four or five consecutive days, then boil the syrup down until it is just enough to cover the fruit, add the fruit to the hot syrup and boil for thirty minutes, pack the fruit into jars, garnish with snips of cinnamon, cover with the syrup, seal, and process for thirty minutes at 180° Fahrenheit (simmering).

The pears may be finished in one day by boiling them in the syrup until the fruit is clear; remove the fruit and boil the syrup down to 221° Fahrenheit, add the fruit, reheat it, and finish as above. The fruit is less rich if done in this way.

QUESTIONS

1. What is meant by "pickling"?
2. What is the secret of pickle-making?
3. Why should some vegetables be soaked in salt water until cured and others parboiled in salt water before the flavored vinegar or syrup is added?
4. What strength brine would you use if you were preparing it for cucumber pickles? How approximate this if you have no hydrometer at hand?
5. While the pickle is in brine, why should the container be covered only with a cloth so as to admit air?
6. At what stage in the preparation of pickles are bacteria useful? Explain their action. How are these introduced into the brine?
7. What is the value of the presence of an acid in the brine? How can you test for it?
8. Why should the air be excluded as soon as the acid is formed in the brine?
9. Why is it well to turn the kegs or barrels containing pickles in brine?
10. Why is a lime bath sometimes used?
11. Why is a soda bath sometimes used?
12. If either bath is used, what must necessarily follow?
13. What is the standard for the finished product?
14. Give an outline of the preparation of olives.

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CHAPTER XV

DRYING FRUITS, VEGETABLES AND HERBS

GENERAL METHODS

The drying of foods has been practiced since the beginning of civilization.

Drying is one of Nature's own processes in the drying of grains, such as wheat, oats, corn, and many other seeds. Nature's methods have been improved by the application of artificial heat, which hastens the process. This is used to dry perishable products which under natural conditions could not be kept. Modern methods of evaporating products afford less opportunity for the accumulation of dirt and for fermentation.

Foods prepared in this way are less bulky and require less space for storage than in the natural condition. First-grade dried fruits and vegetables are about as expensive as the same product would be if canned, but they are lighter in weight, require less space in shipping, and can be packed in less expensive containers.

The first commercial products which were put on the market were inferior in quality because the packages were not only unsanitary but the products had often been injured by dust and insects. This led to a general depreciation in the value of dried foods.

Insufficient drying is one of the commonest causes of trouble. Some laws require that marketable dried fruits shall contain not more than 27½ per cent of water, and this limit practically eliminates that particular trouble to great advantage of the industry as a whole. If a larger proportion of water remains, the fruit tends to discolor, mold, or sour. A bushel of green apples, for example, weighs about fifty pounds, and should make seven or eight pounds of white stock, four pounds waste, five-sixths of the fruit being water. Apples when dried still contain 25 per cent of water.

The comparative merits of the open-air "drying" and the indoor "evaporating" processes hinge entirely upon the matter of climate. In California open-air drying is almost universally practiced, as the sections where fruit is dried are practically free from excessive moisture and rain during the entire drying season. In other parts of the United States the evaporating process has superseded open-air drying for commercial purposes. The results of the evaporating process are obtained in a shorter length of time, and the product has better keeping qualities and consequently commands a higher price than sun-dried fruits from the same localities.

The evaporating process industry in the United States began about 1868. It is said that in Wayne County, New York, alone, more than 2000 small evaporators are used right in the orchards. The dry kiln, which is most in favor now among the larger packers, consists of a drying bin with a slat floor built over a furnace. The fruit is spread on the floor and dried by the heat rising through and around it.

A type of homemade dry kiln used in some sections of the country can be made as follows: Walls of brick or stone are built up a foot or two above the ground, with the front end left open for a fire door. The size of this kiln depends upon the amount of material to be dried. Many farm kilns are four feet wide and eight to ten feet long. At the back end a flue is built, and this should extend four or five feet above the top of the kiln. Iron bars are placed across the top of the structure, and sheet iron or tin placed over these. A layer of clay mortar is spread over the whole surface to the depth of about two inches. After applying the mortar a fire should be started in the furnace to bake the clay. The firing should be done with a slow fire, and any cracks formed during the baking should be closed up with thin mortar. The material to be dried on this type of a kiln is placed on large metal trays to the depth of two or three inches. Only a few hours are required for the drying process. Most any fruit or vegetable can be dried on this type of drier, but those most commonly dried are apples, peaches, cherries, and sweet corn.

A description of the apple driers used for vegetable drying in

Western New York is given in Farmers' Bulletin No. 291, "Evaporation of Apples." Other interesting descriptive matter and illustrations may be found in Agricultural Experiment Station Bulletin No. 131, by J. S. Colwell, State College of Agriculture, Pullman, Wash. The chief use of the kiln evaporator in New York, Pennsylvania, Missouri, Virginia, Washington, and Arkansas is for the drying of apples, and many long-established plants had never dried anything else until 1915, during which time many evaporators in Monroe and Wayne counties, New York, ran full capacity in drying carrots, cabbage, onions, celery, and Irish potatoes for the French War Department. These crops when dried were mixed together under a certain formula and placed in fifteen-pound cans, which were sealed and shipped to the allied army, where they were used in making soup and stews for the soldiers.

This great demand for concentrated products has stimulated investigations and experimental work in drying foods. The Bureau of Chemistry in the United States Department of Agriculture has obtained some most interesting results by the use of an electric fan. It was found that products were dried rapidly and retained a good color by the use of the fan. This indicates the value of currents of air in drying. In any system of drying there needs to be considered the circulation of air as well as the application of heat.

Indoor Drying.—The indoor methods of drying have been found necessary in large parts of the United States now on account of the moisture present in the atmosphere. The following methods of indoor drying are sometimes used commercially:

1. The fruit is enclosed in a chamber where heated air is circulated over and through the fruit until 70 to 75 per cent of the water is extracted.

2. Vacuum driers are sometimes used. The evaporation is more rapid, but the color of the product is affected. If sulfurizing is applied a better color may be preserved.

3. Hydraulic pressure for certain products has been found to be a most effective method, but is not generally used in America.

French Methods of Vegetable Drying.—The following gives two French methods of drying green vegetables, which form the basis of a large industry in that country, some experiments with which are under way in the United States:

1. The greens are carefully selected, trimmed, and put into a hurdle of coarse linen cloth. This hurdle is set up in a chamber which is warmed by means of hot air. The heat circulates through pipes, running back and forth through the chamber of the evaporator, at a temperature of 95° to 113° Fahrenheit, or 35° to 45° Centigrade, being regulated according to the condition of the greens. The heat should be raised gradually to prevent a loss of flavor and color. The advocates of this process claim that the heat is more evenly distributed and the temperature more uniform, avoiding danger of scorching the fruit.

2. Another operation of drying green vegetables is carried on in France most successfully by a gradual pressing while drying the product. The volume of greens lessens four-fifths by the use of a powerful working hydraulic press. The greens are laid into two strong iron boxes which are placed at the end of the mounting beam of the press and a strong, close-fitting pounder presses them. By this process a cabbage head of very great size may be reduced to easily fit into a letter envelope; when again moistened and prepared it will almost fill a half-bushel measure. Many plants treated by this method will recover their original form and color when again soaked in water. Some vegetable mixtures are pressed into forms like cakes of chocolate and simply wrapped in a paper or put into tin pails. Dried spinach is packed in tin boxes, and a vegetable mixture for soups is sold in small cardboard boxes. If moisture is kept away from these products they will keep any length of time without losing their value. Potatoes, carrots, peas, and beans all may be preserved in the same way.

Sunlight Drying.—The simple method of exposure to sunlight was practiced universally until recently. In California and other sections, which are free from excessive moisture, open-air drying is still extensively employed. The fruit is cleaned, cut, then placed cut side up on wooden trays, about three by seven feet in size, sterilized with sulfur fumes, and placed in the sunlight for five days, or until sufficiently dry.

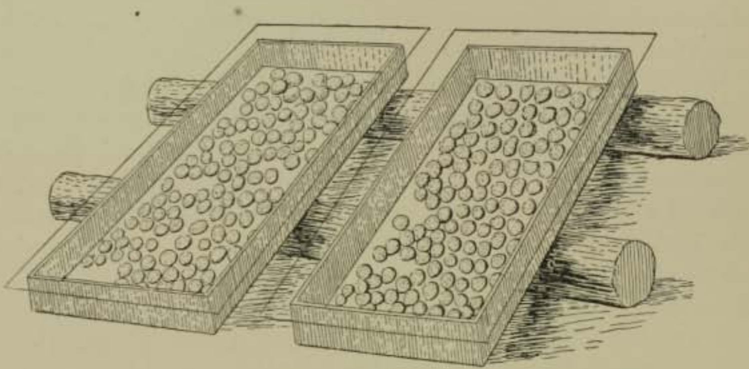

FIG. 117.—Drying raspberries.

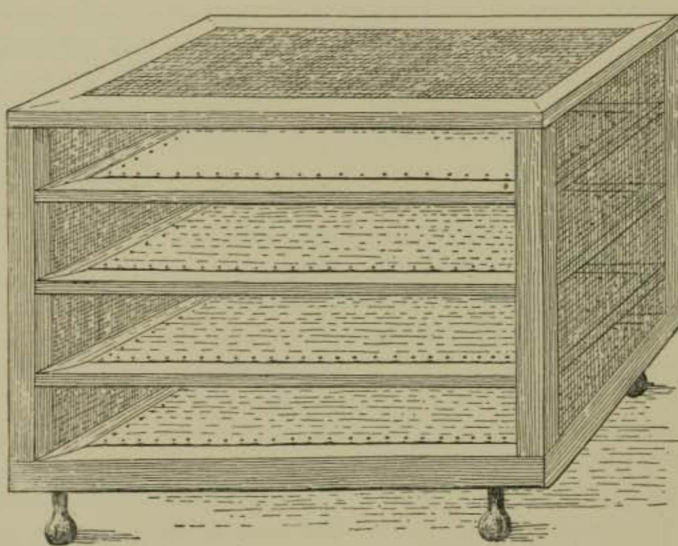

FIG. 118.—A homemade drier.

It is important to protect drying fruits from the rain, dew, dust, and insects.

Placing it in a screened rack or under glass or mosquito netting will protect it from flying insects, and crawling insects may be kept away by standing the racks or table legs in pans of water (Fig. 117). The drying can also be expedited by a proper arrangement of the fruit on the trays. It should always be placed in single layers, because piling it up prolongs the drying process. Evaporation of the water diminishes the bulk, so that later the contents of several trays may be put on one. This simplifies the amount of handling. During the first two days the pieces of fruit should be turned several times to aid in the process of drying. This is especially true of large fruits, such as peaches, pears, and apples. Simple devices for drying fruits can easily be made. Unless the weather conditions are ideal the product dried in the sun is liable to become discolored and moldy. This method of drying requires considerable labor.

DRIERS OR EVAPORATORS

Vegetables and fruits can be dried in an oven, in trays or racks over the kitchen stove, or in a specially constructed drier. There are small driers on the market which give satisfactory results. The small cook-stove driers or evaporators are small, oven-like structures, usually made of galvanized sheet iron, or of wood and galvanized iron. They are of such a size that they can be placed on the top of an ordinary wood or coal range or a kerosene stove. These driers hold a series of small trays on which fruits or vegetables are placed after being prepared for drying. Portable outdoor evaporators are especially convenient when it is desired to dry as much as ten bushels of fruit or vegetables per day. They are usually constructed of wood, except the parts in direct contact with the heater. The homemade dry kiln used in some sections of the country can be cheaply and easily made (p. 229).

A Homemade Drier (Fig. 118).—Make a frame about thirty-six inches long and eighteen inches wide, which will hold three movable shelves. The frame of the shelves or trays is made of two pieces of wood, one inch by eighteen inches, and two pieces, one inch by thirty-six inches, and is covered with white cheesecloth or pieces of flour sack which have been washed thoroughly. Place these trays about twelve inches apart in the framework of the drier. Stretch wire netting or white mosquito netting over the top and sides to keep away the flies and insects. Supports made of

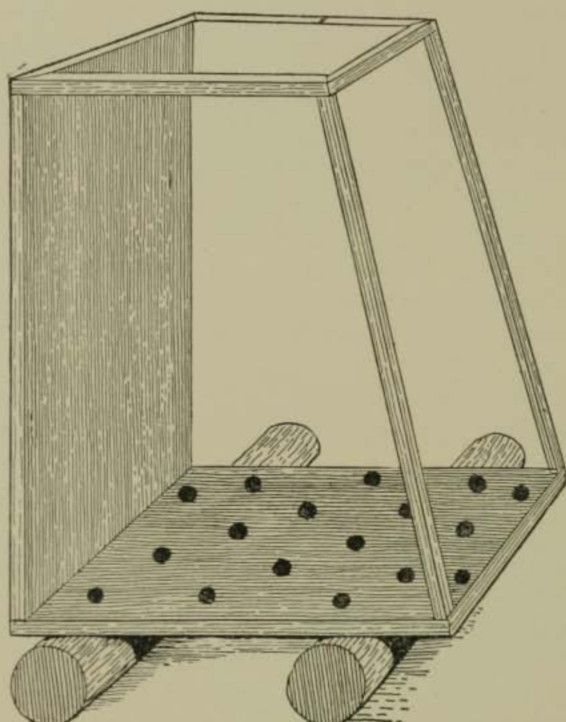

Fig. 119.—A reflector drier.

nails or pieces of metal and placed at the corners of the bottom of the frame will permit its being used on the back of the stove in damp, cloudy weather.

A Reflector Drier (Fig. 119).—Select a small, strong box and remove all sides but the bottom and back and replace these with pieces of glass. Paint the inside of the bottom and back of the box white. These white surfaces reflect the sunlight, which causes a rise of temperature on the inside. This shortens the process of drying the fruit. Leave small openings in the bottom of the box through which the air passes. Place the fruit or vegetable in the box, and do not remove until dried thoroughly.

Homemade Cook-stove Drier (Fig. 120).—A drier that can be used on a wood or coal range or a kerosene stove can be easily

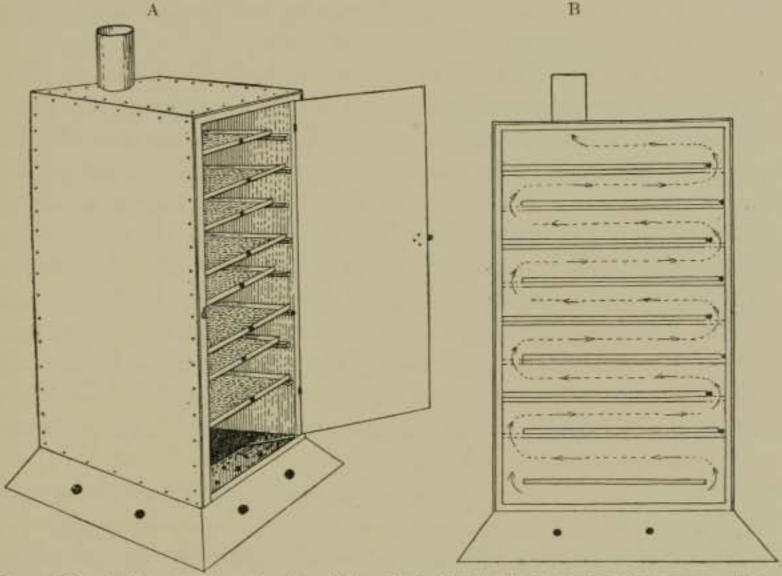

FIG. 120.—A. Homemade cook-stove drier. B. Sectional view showing the passage of the heated air.

and cheaply made. Dimensions: Base, 24 × 15 inches; height, 36 inches. A base six inches high is made of galvanized sheet iron. This base slightly flares toward the bottom and has two small openings for ventilation in each of the four sides. On the base rests a box-like frame made of one or one and one-half inch strips of wood. The two sides are braced with one and one-quarter inch strips which serve as cleats on which the trays in the drier rest. These are placed at intervals of three inches. The frame is covered with tin or galvanized sheet iron. This is tacked to the wooden strips of the frame. Thin strips of wood may be used instead of tin or sheet iron. The door is fitted on small hinges and fastened with a latch. It opens wide so that the trays can be easily removed. The bottom in the drier is made of a piece of perforated galvanized sheet iron. Two inches above the bottom is placed a solid sheet of galvanized iron which is three inches less in length and width than the bottom. This sheet rests on two wires fastened in the corners of the drier. This prevents the direct heat from coming in contact with the product and serves as a radiator to spread the heat more evenly.

The first tray is placed three inches above the radiator. The trays rest on the cleats three inches apart. A drier of the given dimensions will hold eight trays. The frame of the tray is made of one-inch strips, on which is tacked galvanized screen wire, which forms the bottom of the tray. The tray is 21 × 15 inches, making it three inches less in depth than the drier. The lowest tray, when placed in the drier, is even with the front, leaving the three-inch space in the back. The next tray is pushed to the back, leaving a three-inch space in the front. The other trays alternate in the same way. This permits the hot currents of heated air to pass around and over the trays. A ventilator opening is left in the top of the drier through which the moist air may pass away.

The principle of construction is that currents of heated air pass over the product as well as up through it, gathering the moisture and passing away. The movement of the current of air induces a more rapid and uniform drying. The upper trays can be shifted to the lower part of the drier and the lower trays to the upper part as drying proceeds, so as to dry the product uniformly throughout.

In order to secure the best results of evaporation it is necessary to run the temperature as high as possible without injury to the fruit, and to keep the air in rapid circulation throughout the chamber. It is under these conditions that the slight chemical changes in perfectly evaporated fruit take place. The albumin, instead of being slowly dried, is coagulated and greatly assists in the preservation of the fruit with the richness and flavor it possessed in its natural state.

It is important to know the temperature of the heat in the drier, and this cannot be determined very accurately except by using a thermometer. An inexpensive thermometer reading degrees from 100° Fahrenheit to 200° Fahrenheit, or thereabout, can be suspended in the drier. If a thermometer is not used the greatest care should be given to the regulation of the heat. The temperature in the drier rises rather quickly, and the product may scorch unless close attention is given.

DRYING FRUITS

The dried fruits are not only important foods for the household, but because they contain valuable food material in concentrated form they are convenient foodstuff for the traveller and explorer.

In very dry climates fruits are usually dried in the sun. Most fruits dried in the sun discolor unless especially treated. For drying fruits in small quantities for home use the drier is more satisfactory. On very hot, dry days fruit may be dried in the sun until surface begins to wrinkle, then finished in the drier. Only fresh ripe fruits should be used. Ripe fruits dry more quickly than unripe and retain a better color.

The ideal moisture content of dried fruits is about twenty-five per cent. The ability to judge accurately as to when the fruit has reached the proper condition for removal from drier can only be gained by experience. When sufficiently dried it should be so dry that it is impossible to press water out of the freshly cut ends of the pieces, and will not show any of the natural grain of the fruit on being broken and yet not so dry that it will snap or crackle. It should be leathery and pliable.

Before spreading fruit on the trays of the drier line the tray with wrapping paper or cheesecloth. There is a possibility of the acid of the fruit acting upon the zinc. After drying, cool quickly, as fruit when cooled slowly shrivels and looks unattractive.

Apples.—It is not advisable to dry early varieties of apples, because they lack firmness of texture. The fruit must be carefully pared and cored, with all blemishes removed. Sometimes, in commercial plants, after the apples are sliced they are subjected to the fumes of burning sulfur to bleach them and to prevent further discoloration. This practice is not advisable for home use.

Apples are often sliced in rings, one-quarter of an inch thick, or they are quartered. The rings dry more quickly than the quarters (Fig. 121). Arrange the slices in single layers on the trays. Place these in the sun or in an evaporator until the apples are dry. If sunlight drying is practiced the apples should be brought indoors every night and each morning returned to the sun until the apples are dry. Usually this process will require three or four days. In the evaporator only four to six hours are necessary to dry the fruit. Have the temperature at 110° Fahrenheit to begin with, and raise it gradually to 140° Fahrenheit. The fruit should be so dry that when a handful of slices is pressed together firmly into a ball the slices will be springy enough to separate at once upon being released from the hand. The texture of the fruit as it is handled should be soft, velvety, and leathery. Pack the slices neatly into pasteboard boxes which have been lined with paraffin paper, or tie in paper sacks and store in tin boxes in a dry place to protect from insects and dust.

Dried apple cores and skins are evaporated separately in the same way as the fruit. When properly cured they possess commercial value in home and foreign markets for the manufacture of jellies and vinegars.

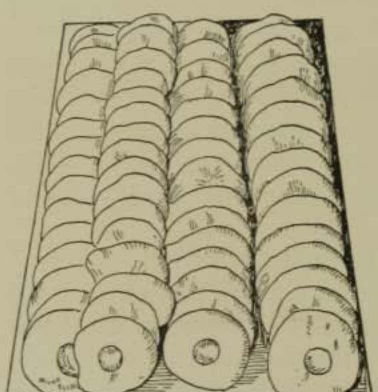

FIG. 121.—Sliced apples on a wooden tray.

Apricots.—It is necessary to start the drying of apricots with a higher temperature (130° Fahrenheit), because they contain a high percentage of water. After two or three hours turn the fruit and lower the heat. Continue the process as for peaches (p. 240).

Berries.—Heating the fruits carefully in a moderate oven for a short while before and after sunning insures a better product if sunlight drying is practiced.

Raspberries.—Black or purple raspberries are best for drying. Pick carefully in shallow trays to prevent bruising. Sort,

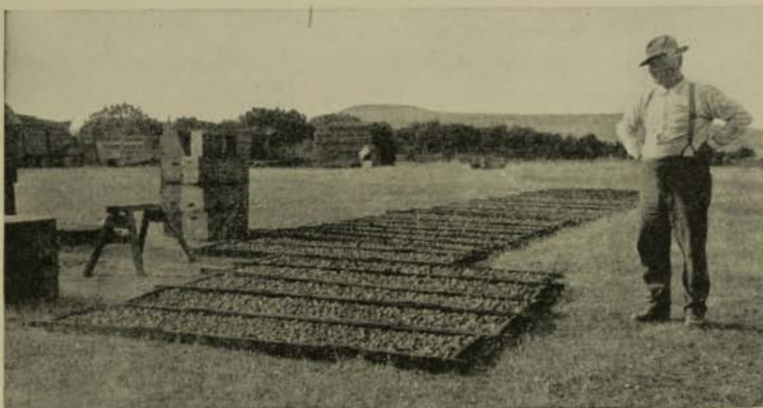

FIG. 122.—Drying figs in California.

FIG. 123.—Drying peaches in California. Trays stacked for finishing off.

selecting only sound berries, wash lightly, and place between tea towels or in the sun to dry off surface moisture. Spread them in thin layers on the trays or racks to dry. Raise the temperature gradually from 110° to 125° Fahrenheit in about two hours. Do not raise temperature higher than 130° Fahrenheit until a considerable portion of moisture has evaporated, as otherwise there will be expansion and loss of juice by dripping. This is accompanied by loss of flavor and color. Finish drying berries at 140° for two or three hours. It is necessary to dry berries from four to five hours.

Cherries.—Wash, dry off surface moisture before spreading unseeded cherries in thin layers on trays. If cherries are seeded there will be a loss of juice. Dry from three to four hours at a temperature of 110° to 150° Fahrenheit. Raise temperature gradually.

Figs (Fig. 122).—1. Select two quarts of perfect whole figs, allow them to stand in a gallon of lime water (one ounce of lime to one gallon of water) for one hour. Remove the figs from the lime water and stand in clear, cold water for half an hour. Drain the figs well and drop them into boiling syrup. Make syrup by boiling together one quart of sugar and one quart of water for ten minutes. Cook the figs rapidly in this syrup for forty or fifty minutes, remove the figs from the syrup, drain and place on trays or platters in the sun for several days, or place them in single layers on trays in the evaporator for three hours at a temperature from 130° to 150° Fahrenheit. If dried in the sun the figs should be turned each day and the tray should be brought indoors at night. It will be necessary to have the tray covered with glass or cheesecloth to protect the fruit from insects. During the time the figs are drying, if it should rain, keep them in an oven at a very low temperature.

2. Select three quarts of firm, sound figs and drop them into boiling lye solution (two tablespoonfuls of lye to two quarts of water) for one minute. Lift them out carefully and put through two cold baths, then drop into lime water, using one ounce of lime to a gallon of water; allow the figs to stand in this lime water for an hour, drain well, and rinse in clear water. Drop them into a syrup which you have made by using one quart of sugar and one quart of water, cook the figs in this syrup rapidly until they are clear, drain, and place them stems up on the platter in

the sun and allow them to remain in the sun or in a cool oven until they are thoroughly dried. Three to four hours in an evaporator at a temperature from 130° to 150° Fahrenheit will dry them sufficiently.

Peaches (Fig. 123).—Peaches are usually cut in halves, and may be evaporated with or without being peeled. Cut in halves, pit, lay in trays pit side up, and dry at a temperature of 110° Fahrenheit to 140° Fahrenheit for four to six hours. Sometimes they are dropped into a thin syrup before being dried. This gives a better flavor and color with some varieties of peaches.

Pears.—Pare, core, and cut fruit into eighths. As pears discolor quickly, do not let stand long before drying. To prevent discoloration, as the fruit is prepared it may be dipped for one minute into a cold salt bath, using one ounce of salt to one gallon of water. Dry off surface moisture and put into the evaporator, having the temperature 110° Fahrenheit, raising temperature gradually to 150° Fahrenheit. Dry for four to six hours, and longer if necessary. Pears may also be steamed ten minutes before drying.

Plums.—Select medium ripe plums, cover with boiling water, and cover the vessel and let stand twenty minutes. Small, thin-fleshed varieties are not suitable for drying. Drain, remove surface moisture, and dry for four to six hours, raising the temperature gradually from 110° to 150° Fahrenheit.

Storing Dried Fruits.—After trays are removed from the evaporator, such fruit as apples, peaches, etc., is put into bins, where it is stirred occasionally and allowed to remain until it passes through the sweating process. The fruit is again sorted according to appearance and quality before storing. The purpose in storing a dried product is to protect it from moisture, dust, and insects. Sometimes spoilage is caused by lack of proper storage. Any food which has been properly dried will keep in paper bags suspended from the ceiling of a fairly dry room indefinitely unless attacked by insects. The bags should be double-tied or sealed (see p. 247) to protect them from the dust. A safer way to store dried fruits would be to put these bags into tin buckets or boxes with tightly fitting covers.

Preparation of Dried Fruits for Use.—Failure to serve dried fruits in attractive ways is due usually to not soaking them long enough before cooking, and to adding sugar too early in their preparation. Dried fruits, like dried vegetables, require long soaking in plenty of water, and must be allowed to come slowly to a boil and then to boil gently until the fruit is plump and tender.

DRYING VEGETABLES

Equally as great care should be given to the selection and preparation of vegetables for drying as for canning. To secure a fine quality of dried products much depends upon having the vegetables absolutely fresh, young, tender, and perfectly clean. Wash all vegetables and clean well. If steel knives are used in paring and cutting, have them clean and bright, so as not to discolor the vegetable.

After vegetables are prepared properly they are then blanched. The blanch gives a more thorough cleaning, removes the strong odor and flavor from certain kinds of vegetables, and softens and loosens the fiber. This allows the moisture in the vegetable to evaporate more quickly and uniformly. It also quickly coagulates the albuminous matter in the vegetables which helps to hold in the natural flavors. Blanching consists of plunging the vegetable into boiling water for a short time. Use a wire basket or cheesecloth bag for this. After blanching the required number of minutes, drain well and remove surface moisture from vegetables by placing between two towels or by exposing to the sun and air for a short time.

The vegetable thus prepared is spread in a thin layer on the trays of the drier. The temperature for drying should be rather low to prevent scorching the product. For most vegetables, after surface moisture is removed, begin drying at a temperature of 110° Fahrenheit. Increase temperature gradually from 110° to 145° Fahrenheit. Complete drying for most vegetables in two or three hours. The time required for drying vegetables varies; however, it can easily be determined by a little experience. The material should be stirred or turned several times during the drying in order to secure a uniform product.

Green String Beans.—All varieties of string beans can be dried. Wash and string beans carefully. The very young and tender string bean can be dried whole. Those that are full grown should be cut in one-quarter to one-inch lengths with a vegetable slicer or a sharp knife. It is better to cut beans than snap them. They are then put in a bag of cheesecloth or in a wire basket and blanched in boiling water for six to ten minutes, depending on the maturity of the bean. One-half teaspoonful of soda may be added to each gallon of boiling water to help set the green color in the bean. Remove surface moisture according to directions given above. Begin drying at a temperature of 110° Fahrenheit and raise temperature gradually to 145° Fahrenheit. Wax beans are dried in the same manner as the green string beans.

Lima Beans.—Lima beans can be shelled from the pod and dried. If gathered before maturity, when young and tender, wash and blanch for five to ten minutes. Length of time for blanching depends upon size and maturity of bean. Remove surface moisture and dry for three to three and one-half hours at the temperature given for string beans.

Dry Shelled Beans.—Different kinds of beans, after maturing and drying on the vines, can be treated as follows: Shell, wash, and spread in thin layers on the trays of the drier and heat ten minutes, beginning at 160° Fahrenheit and gradually raising the temperature to 180° Fahrenheit. This high temperature will destroy all insect eggs that might be on the beans. Cowpeas or any field pea can be treated in the same way. Cool and store carefully. It might be added that the heating of the bean or pea destroys its vitality and thus treated cannot be used for seed purposes.

Garden Peas.—When drying the very young and tender sugar peas, use the pod also. Wash and cut in one-quarter inch pieces, blanch in boiling water six minutes, remove surface moisture, and dry the same length of time and at the same temperature as string beans. It is not necessary to use soda when blanching peas.

The garden pea, which has a non-edible pod, is shelled and blanched for three to five minutes. Remove surface moisture, spread in a single layer on trays, and dry for three to three and one-half hours. Begin drying at 110° Fahrenheit, raise temperature very slowly in about one and one-half hours to 145° Fahrenheit. Continue drying one and one-half or two hours at 145° Fahrenheit.

Sweet Corn.—Select very young and tender corn, and prepare at once after gathering. Boil or steam on the cob six to eight minutes to set the milk. To improve flavor a teaspoonful of salt to a gallon of water may be used. Drain well and cut corn from the cob, using a very sharp and flexible knife. Cut grains fine, only half way down to the cob, and scrape out the remainder of grain, being careful not to scrape off any of the chaff next to the cob. Dry from three to four hours at a temperature of 110° to 145° Fahrenheit. When field corn is used, good, plump roasting ear stage is the proper degree of ripeness. A pound of dried corn per dozen ears is an average yield. This method gives a delicious product which is easily kept.

Corn may be dried in the sun. Dry in oven for ten to fifteen minutes and finish drying in the sun. Sun drying is, of course, not satisfactory in damp weather, and the dried product will be darker in color and not as attractive in appearance. When dried in the sun it should be heated in the oven to kill insect eggs before storing.

Carrots and Parsnips.—Clean, scrape or pare, and slice in one-eighth inch slices. Blanch for six minutes, remove surface moisture, and dry for two and one-half to three hours. Begin drying at 110° Fahrenheit, and raise the temperature gradually to 150° Fahrenheit. Kohlrabi, celeriac, and salsify are dried by the same method.

Beets.—Boil the whole beets without peeling until a little more than three-fourths done. Dip in cold water, peel, and slice in one-eighth or one-quarter inch slices. Dry for two and one-half to three hours at a temperature of 110° to 150° Fahrenheit.

Okra.—Wash, blanch for three minutes in boiling soda water (one-half teaspoonful of soda to one gallon of water), and dry for two to three hours at a temperature of 110° to 140° Fahrenheit. Dry young and small tender pods whole. Older pods should be cut into one-quarter inch slices. Small, tender pods are sometimes strung on a string and hung over the stove to dry. If dried in this manner, heat in the oven before storing.

Onions and Leek.—Wash, peel, and slice onions in one-eighth to one-quarter inch slices. To avoid any unpleasantness, peel and slice holding under water. Blanch in boiling water for five minutes, remove surface moisture, dry for two and one-half to three hours, beginning at 110° Fahrenheit and raising temperature gradually to 140° Fahrenheit. Leek is cut in one-quarter inch strips and dried as onions.

Peppers.—Peppers may be dried by splitting on one side, removing seed, drying in the air, and finishing drying in the drier at 140° Fahrenheit. A more satisfactory method is to place peppers on a biscuit pan in a hot oven and heat until the skin blisters. Peel, split in half, take out seed, and dry at a temperature of 110° to 140° Fahrenheit. In drying thick-fleshed peppers like the pimiento, do not increase heat too quickly, but dry slowly and evenly. Small varieties of red peppers may be spread in the sun until wilted, and the drying finished in the drier, or they may be entirely dried in the sun.

Pumpkin and Summer Squash.—Pare and cut in about one-half inch strips and blanch for three minutes, remove surface moisture, and dry slowly for three to four hours, raising temperature from 110° to 140° Fahrenheit.

Vegetable Soup Mixtures.—Each vegetable used in the soup mixture is prepared and dried separately. They are put together in different proportions, the desired vegetable predominating. A combination of several vegetables makes a most desirable soup mixture. Those most often used are carrots, cabbage, onions, celery, and okra.

Cabbage.—Cabbage is shredded or cut into strips a few inches long. Blanch for ten minutes, drain, remove surface moisture, and dry for three hours at a temperature of 110° to 145° Fahrenheit.

Mushrooms.—Only dry mushrooms may be successfully cured. Use mature mushrooms for drying. After they have been peeled, place them in single layers, with caps down, on boards or drying racks, exposing them to the hot sun and air. Turn the mushrooms frequently. Bring the trays indoors each night, as the mushrooms absorb moisture rapidly. Finish them off by putting them in the oven or evaporator for one hour at 130° to 140° Fahrenheit. When they are brittle, run them through a spice or a coffee mill. Pack the mushroom powder at once into dry bottles and seal tightly. Dried mushroom powder keeps well, and this is a delicious flavoring to use in meat gravies made with milk. Whole mushrooms may be dried by the same method. After they are soaked they resemble the fresh ones, with the exception of being a little more tough.

Dried Celery and Parsley Leaves.—Celery and parsley leaves can be dried in the shade or for two hours in a cool oven (110° to 130° Fahrenheit). The temperature should be raised gradually. These leaves may be mixed in equal parts and powdered. Put the dried leaves through a spice mill, or use a rolling pin for pulverizing them. This combination makes a good seasoning for soups and stuffings. It should be stored in cans or jars air-tight, otherwise it will soften on standing.

Legumes.—Dried mature legumes are not only cheap, but they are rich in nourishment. Baked beans, for example, furnish more nutriment than beef costing two or three times as much.

Storing Dried Vegetables.—When vegetables are first taken from the drier, if completely dried they are very brittle. They are more easily handled and are in better condition for storing if allowed to stand one to three hours to absorb enough moisture to make them more pliable before putting them into bags or storing otherwise. If it is not convenient to store products immediately, and they are allowed to stand for several days, they should be heated to 160° Fahrenheit to destroy any insect eggs that might be on them. Care should be taken not to heat the vegetable higher than 160° Fahrenheit.

Dried vegetables should always be stored in moisture-proof containers and in a dry place, free from dust and dirt. The best container is a tin box, bucket, or can fitted with a tight cover. Perhaps the most convenient and cheapest container is the small paper bag. A small amount should be put into each bag, just enough for use in one or two meals. This will prevent the opening of any dried product that cannot be consumed in a short time. The upper part of the bag is twisted to form a neck. The neck is bent over and tied tight with a string. Dip a small brush into melted paraffin and paint the entire bag. This makes the bag practically moisture and insect-proof. To further protect from insect ravages, label and pack bags in a tin container with a tight-fitting cover. A large number of bags can be stored in an ordinary lard can. A glass jar with a tight seal is a good container for dried products. Paraffin-coated paper containers of various sizes can be found on the market. If such containers are used they should also be stored as the paper bags.

All dried products should be examined occasionally, and, upon the first appearance of insects, spread in thin layers in the sun until insects disappear; heat to a temperature of 160° Fahrenheit and restore carefully.

Preparation of Dried Vegetables for Use.—1. Soak for several hours in warm or cold water to absorb the moisture lost through evaporation.

2. Drain and boil such vegetables as peas, beans, and spinach in soda water, using about one-eighth teaspoonful of soda to one quart of water.

3. One tablespoonful of lemon juice added to dried beans after soaking them adds much improvement in flavor.

4. Add seasoning to the dried vegetables to make them more palatable—celery, mustard, onions, cheese, nutmeg, etc.

5. Dried vegetables are used in soup, and most deliciously flavored thick purée may be made of them. Four ounces of dried soup vegetables (sliced carrots, potatoes, cabbage, onions, etc.) will be sufficient to make three quarts to one gallon of vegetable soup.

DRYING HERBS

"Oh! who can tell the hidden power of Herbs,
And might of magic spell!"—*Spenser.*

The ancient housekeeper was far more interested than the modern one in gathering and drying her own herbs at the right season for culinary and medicinal uses. In the olden days herbs were relied upon to give variety to the daily menu and for tonic qualities, while to-day the flavor only is the dominant thought. A dash of prepared "kitchen bouquet" will answer all purposes.

French and Italian cooks excel in the skilful use of the variety of herbs in their cooking, while only three or four herbs—parsley, mint, sage, and thyme—are generally used by the American cooks.

The cultivation of herbs has been considered within the woman's domain because of the close relationship between herbs and cookery. In some cases it has been found profitable as a commercial enterprise. The Durham mustard which is now popular on the market was first prepared by a woman. Her ingenuity in making mustard flour and then preparing the Durham mustard has won for her a worldwide reputation. Most herbs are easily cultivated, since they are not disturbed by insects because of the essential oils found in them.

In many communities or neighborhoods herbs might be grown coöperatively, each kitchen garden to contain herbs agreed upon in advance.

Picking.—Herbs should be gathered in the morning after the dew has disappeared. The blossoms of catnip and like herbs are gathered. The belief that herbs should be gathered only when in blossom is probably an erroneous one. When only the leaves are desired to dry, they should be gathered while they are young and tender. If the leaves are picked when they are young and fresh a new growth continues to come, and these are as good as the first picking.

Drying.—Often the whole plant has to be dried in order not to shake off the seed pods. Stems and seeds may be spread out to dry on sheets of cotton cloth, or dried on trays of wire mesh or in a fruit evaporator, when one is available. Herbs which have been allowed to dry in the shade for one day can be quickly finished by subjecting them to a temperature of about 110° to 130° Fahrenheit in an oven or an evaporator. The length of time varies with the kind of herb being dried. The following herbs will dry sufficiently in the time given, if the temperature of 110° to 130° Fahrenheit is kept uniform:

Parsley	for about	1 hour	30 minutes
Sage	for about	1 hour	10 minutes
Mint	for about	1 hour	
Thyme	for about	1 hour	
Savory	for about	1 hour	
Marjoram	for about		45 minutes

Tarragon, basil, chives, and spearmint can also be dried.

Feli.—Young, tender sassafras leaves are gathered in the early spring, dried and powdered. The French use this in gumbo and for seasoning and thickening gravies and sauces.

Sweet Bay Leaves.—Sweet bay leaves are gathered while still young and tender and dried in the shade and bottled to use for seasoning.

Peppers.—Small hot peppers are strung on cord and hung up to dry slowly in the shade.

Storing Herbs.—An attractive way to pack herbs is to wrap them carefully in wax paper and place in small cans or packages. Dried leaves may be packed in glass jars, and powdered herbs are more often packed in narrow-necked bottles. The herbs are less liable to become moldy if they are kept dry and closed from the dust. When leaves and blossoms are to be packed they must be clean and free from stems. Herbs such as anise, coriander, caraway, fennel, lovage, and horehound are often used in confectionery. Angelica is valued for its stems, and it is sometimes candied. Iris root, dried lavender, sweet grass, clover blossoms, and rose petals have been used from time immemorial by housewives to perfume their linen closets.

Medicinal Herbs.—Since domestic medicinal remedies are no longer made, the growing of medicinal herbs is not common, but it might still be made a source of income in a limited way.

An article in the United States Yearbook of the Department of Agriculture for 1903 states: "As a result of such a study of the situation as has thus far been practicable, the Southern States seem to offer many advantages for the prospective drug grower. The long-growing season needed for many drug plants, the low price of labor, and the usual low price of land combine to make sections of the South seem promising in this connection."

Herbs which can sometimes be sold to local druggists are as follows:

Boneset	Tansy leaves and blossoms
Catnip	Yarrow leaves and blossoms
Mullein	Wintergreen leaves
Sage	Red raspberry leaves
Lobelia	Jimson-weed leaves
Motherwort	Red clover
Basswood flower	

Bark.—The bark is peel, so that none of the wood is left. Blackhaw, cherry, poplar, and Wahoo barks may be sold in small quantities and usually bring from three to eight cents a pound. In some cases the bark of the root is called for, such as the bark of the Wahoo and Blackhaw roots, and these bring from ten to twenty cents per pound.

Seeds.—Pumpkin, sunflower, lobelia, prickly ash berry, caraway, dill, burdock seed, and corn-silk are sometimes sold for three to fifteen cents per pound.

Roots.—Ginseng, burdock, bloodroot, yellow dock, mandrake, Indian turnip or spikenard root, Jack-in-the-pulpit, and sarsaparilla often sell for three to ten cents per pound.

HOME STORAGE OF VEGETABLES

To those persons fortunate enough to possess land for the growing of vegetables sufficient in quantity for the needs of the family, storage is an economic necessity. Likewise it is an economic necessity to grow vegetables to store. A half-acre garden should produce far more vegetables than the average family can consume during the maturing period of the crops. Only a small portion of the garden should be planted to those vegetables which must be used as soon as they reach maturity. The remainder should be devoted to crops that are to be canned, dried, or stored. It is comparatively easy to keep by storing such vegetables as potatoes, beets, carrots, parsnips, salsify, turnips, cabbage, celery, onions, sweet potatoes, dry beans, and dry lima beans. Some of the crops may be stored in the cellar under the dwelling, in pits or banks, or in caves or outdoor cellars. Others can be kept in any dry place, such as the pantry or attic.

The Storage Room in the Basement.—Many houses are heated by a furnace in the cellar. The pipes are, as a rule, carried under the joist, thus warming the cellar to some extent. For this reason it is best to partition off a small room in one corner of the cellar to serve as a storage-room for potatoes, beets, carrots, parsnips, salsify, and turnips. If possible, this room should have at least one window for the purpose of regulating the temperature. The floor should not be concreted, as the natural earth makes better conditions for the keeping of vegetables. Bins may be constructed for the various products, or they may be stored in boxes, baskets, or barrels. This room will also serve as a storage place for fresh fruits and canned goods. The vegetables to be stored should be harvested when the ground is dry, and allowed to lie on the surface long enough for the moisture to dry off before placing them in storage. The tops should be removed from beets, turnips, carrots, and salsify before placing them in storage.

Outdoor pits or banks are very generally used for keeping potatoes, beets, carrots, turnips, parsnips, cabbage, and salsify. Select a well-drained location and make an excavation. This is lined with straw, leaves, or similar material, and the vegetables placed in a conical pile on the material. The vegetables are then covered with straw or similar material, and finally with earth to a depth of several inches. The depth of the earth covering is determined by the severity of the winters in the particular locality. It is well to cover the pits with straw, corn fodder, or manure during severe weather. Such pits keep the above vegetables very well, but have the objection that it is hard to get the material out in cold weather, and where the pit is once opened it is desirable to remove the entire contents. For this reason several small pits rather than one large one should be constructed so that the entire contents may be removed at one time. Instead of storing each crop in a pit by itself, it is better to place several vegetables in the same pit, so that it will be necessary to open only one pit to get a supply of all of them. In storing several crops in the same pit it is a good plan to separate them with straw, leaves, or other material. The vegetables from the small pit may be placed in the basement storage-room, where they can be easily secured as needed for the table.

Cabbage may be stored in a special kind of bank or pit. The excavation is made long and narrow and about the same depth as for the other vegetables. The cabbages are pulled and placed in rows in the pit with the heads down and roots up. The whole is covered with dirt; no straw or litter need be used. These pits are made as long as desired, as it is possible to remove portions of the stored product without disturbing the remainder. Cabbage need not be covered as deeply as potatoes, as slight freezing does not injure the cabbage. The heads of cabbage are sometimes stored in banks or pits in a manner similar to potatoes, turnips, etc. This method is open to the same objection as when it is used for potatoes: it is hard to get at the material when it is needed. Another method of storing cabbage consists in setting the whole plant in trenches side by side with the roots down and as close together as they can be placed. Dirt is thrown over the roots and against the stalks to the depth of several inches. A low fence is built around the storage place, and rails, scantling, or other supports laid across the top. About two feet of straw or other material is then piled on top of the storage pit.

Celery may be stored in a modified type of outside pit, or in the row where it is grown. When stored in a pit or trench the plants are taken up and set side by side in a shallow pit as close together as it is feasible to pack them, and wide boards set up along the outside of the pit. Dirt is banked against these boards, and the top covered over with corn fodder or similar material. When celery is kept in the row where it is grown the earth is banked up around the plants as the weather gets cold. When freezing weather occurs the dirt should be brought to the tops of the plants and the ridge covered with coarse manure, straw or fodder, held in place by means of stakes or boards.

Outdoor Caves or Cellars.—Outdoor caves or cellars are superior to banks or pits in many respects. They require no more labor to store the vegetables than an indoor cellar, yet give a uniform and low temperature during the entire year. They possess practically all the advantages of the bank or pit, yet may be entered at any time during the winter for the removal of any portion of the stored product without endangering the keeping quality of the material that remains. These storage cellars are usually made partially under ground, although in the southern portion of the country they are usually entirely above ground. In sections where severe freezing occurs it is well to have the cellar partially under ground. In order to avoid steps down to the level of the floor, with the consequent extra labor in storing and removing the vegetables, a side-hill location is desirable for the cellar. An excavation is made into the hill of the approximate size of the cellar. The dirt from this excavation may be used for covering the roof and for banking against the sides of the structure. A frame should be erected by setting posts in rows in the bottom of the pit near the dirt walls, sawing these off at a uniform height, placing plates on top of the posts, and erecting rafters on these plates. The whole should be boarded up on the outside of the posts, with the exception of a space for a door in one end. The whole structure, except the door, is covered with dirt and sod. The thickness of the covering will be determined by the location; the colder the climate the thicker the covering. The dirt covering may be supplemented by a layer of manure, straw, corn fodder, etc., in winter time. Outdoor cellars are usually left with dirt floors, as a certain amount of moisture is desirable. These cellars may also be made of concrete, brick, stone, or other material. Such cellars are to be found in many sections of the country, and provide almost ideal storage facilities for potatoes, beets, turnips, carrots, parsnips, salsify, and celery.

Sweet potatoes should be thoroughly matured before harvesting, dug while the ground is dry, carefully handled, and thoroughly cured by holding them at a temperature of 80° to 85°

Fahrenheit for a week or ten days after harvesting. After this they should be stored in a place where the temperature remains in the neighborhood of 55° Fahrenheit. Such a location is usually near the furnace in the cellar, or near the furnace chimney on the second floor of the house. There is little merit in wrapping them in paper or burying them in sand. Sweet potatoes are stored in outdoor pits or banks, but this method is not to be recommended except where no other facilities are available. Sweet potatoes stored in pits are not as good in quality as those stored in houses.

Onions should be well matured before harvesting, and should be allowed to become thoroughly dry before being stored. They may be put up in baskets, crates, or bags, and placed in a cool, dry place. The attic is better than the cellar for storing onions. Temperatures slightly below the freezing-point do not injure them.

Beans, Peas, and Other Dried Products.—Such vegetables as may be kept in the dry state should be grown to as great an extent as possible. Various kinds of beans, including lima beans, should be allowed to dry on the vines. Lima beans should be gathered as they mature, and placed in a warm, dry place until dry enough to shell. Navy beans and kidney beans are usually harvested when a maximum number of pods are mature and the vines cured like hay, after which they are threshed or shelled. Peas are handled in the same way as navy beans. After the beans and peas are threshed or shelled and dried off they should be placed in bags and hung in some dry place, such as a closet or attic.

QUESTIONS

1. What advantages have dried vegetables and fruits over canned ones?
2. Is there any advantage in this means of preservation in the home?
3. State three essential steps in the drying of herbs, vegetables, or fruits.
4. What special care should be taken in the storage of dried products?
5. What are the principal causes of an unsatisfactorily dried product?
6. Why should the use of herbs be encouraged in this country?
7. Suggest as many ways as possible for the use of dried vegetables in the diet.
8. What special points should be considered in the preparation of them?
9. What mistakes are often made in the preparation of dried fruits for serving?

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CHAPTER XVI

PRESERVATION OF MEATS

SINCE the earliest ages people have preserved meats by various means, and some of the methods in use to-day have come down from a great antiquity. Most of the modern methods of meat preservation, which have wide commercial use, can also be used in the home, with the single exception of canning meats, which it is not wise for the home maker to attempt who is inexperienced in canning. Among the principal means used are drying, smoking, and curing with salt.

GENERAL METHODS

Drying.—This is not only the oldest method of preserving foods, but it is the simplest. While drying is better adapted to the curing of fruits and vegetables than it is to meats, yet meats are often shredded and dried in many parts of the world. Drying meats should only be practiced where there is little moisture in the atmosphere, or the meat will spoil before it becomes dry enough. It is never advisable to attempt to preserve meats by this method in cities where there is great danger of bacteria. Dried meat maintains all of its nutritive properties, but it is not easily digested on account of the toughened tissues. This product is not attractive in appearance, and this fact also works against its extensive use.

Smoking.—The custom of smoking meats is said to have originated from the habit of suspending meat near the fireplace in the dwelling. The meat became saturated with the creosote from the smoke, which gave it an agreeable taste and aided in its keeping qualities. The creosote was formed by the burning of the wood, and the smoke closed the pores to some extent, excluding the air and proving objectionable to insects. Before meats are smoked they usually undergo a treatment of salt and sugar, with sometimes a small amount of saltpetre added to modify the color, composition, and flavor, and to aid in the preservation of the meat. Saltpetre is considered injurious to health by some hygienists, and therefore many may object to its use. It is included in some of these recipes because its use had heretofore been customary.

Because the old method of smoking meats is long and expensive, a cheaper and quicker way has come into practice rather recently. Directions for this latter method state that brine is soaked into the meat, which is then treated with "smokine" or "liquid smoke." This solution may be purchased from a local druggist.

Liquid Smoke Method.—

200 pounds of meat	1 ounce of saltpetre
4 quarts of coarse salt	1 quart of warm water
1 pound of brown sugar	1/4 pound of ground pepper

Dissolve the saltpetre in the water, add salt and sugar, and mix well. Rub this mixture into the meat, and lay on a bench in a cold place for fourteen days. Then apply the liquid smoke with a brush, dry well, and in a few days paint the meat again with the liquid. Hang up, and when thoroughly dry wrap the meat in heavy brown paper and then in a clean flour sack.

Much time is saved by using the above recipe, but the meat which has been cured in the old-fashioned smoke-house is much finer in flavor and texture. Smoke-houses are still in use in many sections of the country. The meat should not be subjected to the smoke until it has been properly cured and drained.

Curing in Brine and Dry Salting.—Curing should begin as soon as the meat is cold and while it is still fresh. Frozen meats should not be salted, as the action of the frost will prevent proper penetration of the salt and uneven curing will result.

Pure water, salt, sugar, and saltpetre are all the ingredients needed for ordinary curing of meat. Meat may be packed in large earthen jars or in clean barrels, tight enough to prevent leakage. The barrel or jar may be used again and again unless meat has spoiled in it. These vessels should always be scalded thoroughly each time before packing fresh meat into them.

Brine-cured meats are best for farm use, for the reason that a

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suitable place for dry-curing is not usually obtainable. It is also less trouble to pack the meat in a barrel and pour on a brine than to go over it three or four times to rub in the salt. The brining method also gives better protection from insects and vermin. Trouble is sometimes experienced in keeping brine, but if pure water is used and directions are followed in making the brine there should be no difficulty in keeping it for a reasonable length of time. During warm weather brine should be closely watched. If it becomes "ropy" it should be boiled or more brine made. A cool, moist cellar is the best place for brine-curing. Dry-curing may be done successfully in a cellar also, though even more moisture is needed to effect a thorough cure. The cellar should be dark and tight enough to prevent flies and vermin from damaging the meat. When meats which have been cured in brine are boiled the shrinkage is greater than those which have been cured by dry-salting.

PRESERVING BEEF [1]

Corned Beef.—The pieces commonly used for corning are the plate, rump, cross-ribs, and brisket, or, in other words, the cheaper cuts of meat. The loin, ribs, and other fancy cuts are more often used fresh, and, since there is more or less waste of nutrients in corning, this is well. The pieces for corning should be cut into convenient-sized joints, say five or six inches square. It should be the aim to cut them all about the same thickness so that they will make an even layer in the barrel.

Meat from fat animals makes choicer corned beef than that from poor animals. When the meat is thoroughly cooled it should be corned as soon as possible, as any decay in the meat is likely to spoil the brine during the corning process. Under no circumstances should the meat be brined while it is frozen. Weigh out the meat and allow eight pounds of salt to each 100 pounds; sprinkle a layer of salt one-quarter of an inch in depth over the bottom of the barrel; pack in as closely as possible the

[1] Note.—This recipe and others which follow are quoted from Farmers' Bulletin No. 183, "Meat on the Farm: Butchering, Curing, and Keeping," by Andrew Boss, U. S. Department of Agriculture.

cuts of meat, making a layer five or six inches in thickness; then put on a layer of salt, following with another layer of meat; repeat until the meat and salt have all been packed in the barrel, care being used to reserve salt enough for a good layer over the top. After the pack has stood over night add, for every 100 pounds of meat, four pounds of sugar, two ounces of baking soda, and four ounces of saltpetre dissolved in a gallon of tepid water. Three gallons more of water should be sufficient to cover this quantity. In case more or less than 100 pounds of meat is to be corned, make the brine in the proportion given. A loose board cover weighted down with a heavy stone should be put on the meat to keep all of it under the brine. In case any should project, the meat would spoil and cause the brine to deteriorate.

It is not necessary to boil the brine except in warm weather. If the meat has been corned during the winter and must be kept into the summer season, it would be well to watch the brine closely during the spring, as it is more likely to spoil at that time than at any other season. If the brine appears to be ropy or does not drip freely from the finger when immersed and lifted, it should be drained off and new brine added, after carefully washing the meat. The sugar or molasses in the brine has a tendency to ferment, and, unless the brine is kept in a cool place, there is sometimes trouble from this source. The meat should be kept in the brine twenty-eight to forty days to secure thorough corning.

Dried Beef.—The round is commonly used for dried beef, the inside of the thigh being considered the choicest piece, as it is slightly more tender than the outside of the round. The round should be cut lengthwise of the grain of meat in preparing for dried beef, so that the muscle-fibers may be cut crosswise when the dried beef is sliced for table use. A tight jar or cask is necessary for curing. The process is as follows: To each 100 pounds of meat weigh out five pounds of salt, three pounds of granulated sugar, and two ounces of saltpetre; mix thoroughly together. Rub the meat on all surfaces with a third of the mixture and pack it in the jar as tightly as possible. Allow it to remain three days, when it should be removed and rubbed again with another third of the mixture. In repacking put at the bottom the pieces that were on top the first time. Let stand for three days, when they should be removed and rubbed with the remaining third of the mixture and allowed to stand for three days more. The liquid forming in the jars should not be removed, but the meat should be repacked in the liquid each time. The meat is ready to be taken from the pickle, and should be smoked and hung in a dry attic or near the kitchen fire where the water will evaporate from it. It may be used at any time after smoking, although the longer it hangs in the dry atmosphere the drier it will get. The drier the climate, in general, the more easily meats can be dried. In arid regions good dried meat can be made by exposing it fresh to the air, with protection from flies.

Pickling Meat.—Authorities differ in regard to the formula used in the pickling of meats. The following recipe is often used for tongue and small pieces of meat:

Cured Tongue.—

2 gallons of water	1 ounce of saltpetre
3 pounds of salt	½ cupful of sugar

Rub part of the salt into the meat, dissolving the remainder of the salt, the sugar, and the saltpetre in the water. Boil, skim, and strain to remove all impurities. Cool thoroughly before adding meat. Place a weight over the jar to keep the meat under the brine. Keep in a cold place and the tongue will be cured and ready to cook in four or five days.

PRESERVING PORK [2]

Plain Salt Pork.—Rub each piece of meat with fine common salt and pack closely in a barrel. Let stand over night. The next day weigh out ten pounds of salt and two ounces of saltpetre to each 100 pounds of meat and dissolve in four gallons of boiling water. Pour this brine over the meat when cold, cover, and weigh down to keep it under the brine.

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[2] NOTE.—These directions for handling pork were contributed by Major Lawrence Foot, Special Agent Marketing, U. S. Department of Agriculture, Little Rock, Ark.

How to Cure, Smoke, and Keep Hams, Shoulders, and Bacon.—Meat cannot be safely cured if it has any animal heat in it.

Cutting a Pork (Fig. 124).—Remove the head one inch behind the ears, the feet one inch above the knee-and-hock-joints.

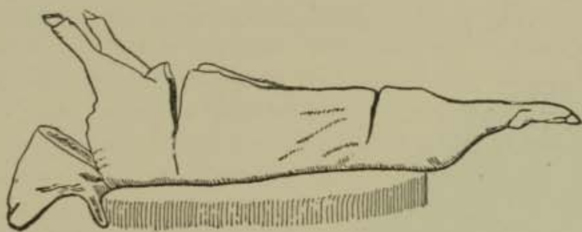

FIG. 124.—Cutting a pork.

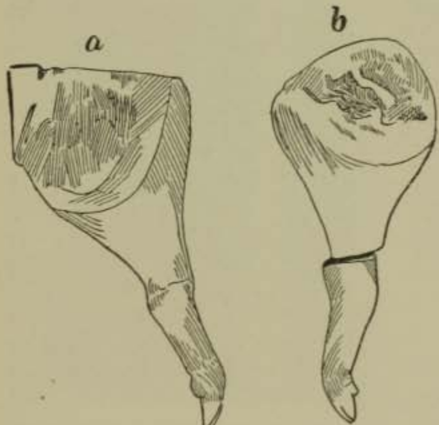

FIG. 125.—Trimming hams.

FIG. 126.—Picnic hams properly trimmed.

The hams should be trimmed neatly and round, making long hams; cut six inches below the stifle-joint (Fig. 125). The shoulders can be cut into picnic hams if desired (Fig. 126). Notice carefully the illustrations of hams, picnic hams, and bacon properly trimmed (Figs. 127 and 128). Remove the backbone

NOTE.—Drawings made from illustrations in Farmers' Bulletin No. 183.

by sawing off the ribs close to it. Remove the ribs, leaving as little meat on them as possible, as that meat will be needed in the sides to have bacon "with a streak of lean." Trim the sides neatly and with straight edges; leaf fat and the fat trimmings go into lard, the lean into sausage.

Salting.—No sugar and no saltpetre are used in this recipe. A hanging pew, box, or cask may be used for packing salted

Fig. 127.—A well-trimmed ham.

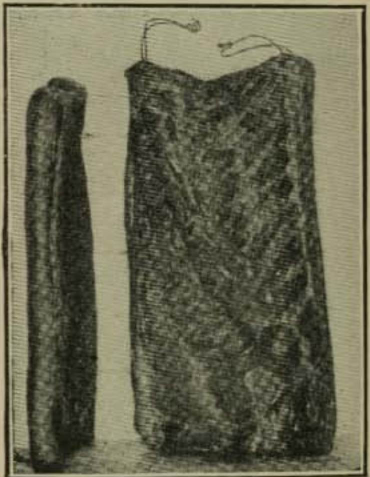

Fig. 128.—A well-trimmed breakfast bacon.

pork. First, place a layer of salt and pepper on the bottom of the pew or box, then the pieces of meat, skin down, salting the top heavily; then another layer, skin down, salting it, and so on, covering every particle of the meat, sides, ends, and top, with salt. When done the meat will look like a pile of salt. Hams, shoulders, and bacon are salted in this manner and allowed to stand three or four weeks, according to the weather. If it is very cold it takes a longer period. If the weather turns warm, shorten the period, but endeavor to cure the meat in a room that will average a temperature of 50°, if possible. If during curing the salt becomes crusted, overhaul the meat, rub the salt in thoroughly by hand, and pack it back in the same salt. When the meat has remained in the salt for the proper time, remove it, wash the meat thoroughly with tepid water, scrubbing it with a brush until all salt is removed from the outside, then hang "as the hog walks"—shanks down. The hams and shoulders should hang by wire from the thick ends. Drain the meat thoroughly for at least twenty-four hours, then put smoke to it.

Smoking.—The meat should hang at least fifteen feet above the fire. Start a slow fire with green hickory chips and smother the flame, if any, with corn-cobs. The meat should be warmed up gradually with a cool, dry smoke and smoked from ten to fifteen days, or until the meat has the proper color, a light chestnut. The house should never get hot (see p. 268).

Sugar-cured Breakfast Bacon.—For up-to-date "sugar-cured" breakfast bacon, take pieces one inch to one and one-half inches in thickness, six to eight inches wide, and fifteen to eighteen inches long, and treat with salt, sugar and saltpetre mixture for fifteen to twenty-two days, unless strips are heavier. To every 100 pounds of meat weigh out eight pounds of salt, two pounds of granulated white sugar, and two ounces of saltpetre, mix all thoroughly, dampen the top side (not skin side) lightly with water by using a whisk broom dipped in water, then rub the mixture into the top side, the edges, and the ends. Sprinkle bottom of box with the mixture, lay in the piece that is rubbed, skin down, and sprinkle with the salt mixture, giving a light coating on top, then another, and so on. Every seven days from the day packed, overhaul all, rub each piece again, and re-salt with the same mixture lightly. The bacon that is one inch thick should remain in mixture fifteen days. The bacon that is one and one-half inches thick should remain in mixture twenty-two days. Heavier bacon may require longer time. Then take out, wash thoroughly, hang in smoke-house twenty-four hours to drain, and smoke to a light-chestnut color. This recipe should not be used where the meat must be kept in a warm and dry place, as the preservatives will not penetrate easily and uniformly.

Pickled Hams and Bacon in Brine.—This recipe differs from the one given (p. 262), in that it calls for saltpetre and water. It has given satisfaction and is preferred by some. When the meat is cold, rub each piece with salt and allow it to drain over night. Then pack it in a barrel with the hams and shoulders in the bottom, using the strips of bacon to fill in between or to put on top. Weigh out for each 100 pounds of meat eight pounds of salt, two pounds of brown sugar, and two ounces of saltpetre. Dissolve all in four gallons of water, and cover the meat with the brine. For summer use it will be safest to boil the brine before using. In that case it should be thoroughly cooled before it is used. For winter curing it is not necessary to boil the brine. Bacon strips should remain in this brine four to six weeks; hams, six to eight weeks. Hams and bacon cured in the spring will keep right through the summer after they are smoked. The meat will be sweet and palatable if it is properly smoked, and the flavor will be good.

Head-cheese.—Cut a hog's head into four pieces. Remove the brain, ears, skin, snout, and eyes. Cut off the fattest parts for lard. Put the lean and bony parts to soak over night in cold water in order to extract the blood and dirt. When the meat is cleaned, put it over the fire to boil, using water enough to cover it. Boil until the meat separates readily from the bone. Then remove it from the fire and pick out all of the bones. Drain off the liquor, saving a part of it for future use. Chop the meat up finely with a chopping knife. Return it to the kettle and pour on enough of the liquor to cover the meat. Let it boil slowly for fifteen minutes to half hour. Season to taste with salt and pepper just before removing it from the fire. Turn into a shallow pan or dish. Cover with a piece of cheesecloth and put on a board with a weight to make it solid. When cold it should be sliced thinly and served without further cooking.

Scrapple.—The process for making this article of food is like that for head-cheese until the bones are removed and the meat chopped. When the liquor is added, return the pan to the stove to boil. Cornmeal is then stirred in until the contents are as thick as cornmeal mush. Stir it constantly for the first fifteen minutes. Then set it back on the stove to boil slowly for an hour. When it is done, pour it into a shallow dish to mould. Hot grease poured over the top after scrapple is put into moulds will help in keeping it. When cold it is sliced in thin pieces and fried.

Pickled Pigs' Feet.[3]—Pigs' feet should be thoroughly scalded, cleaned, washed and chilled, and cured in a clean, sterilized wooden vessel. Strength of pickle depends upon length of time it is to be carried, say an 80° pickle with five ounces of saltpetre per 100 pounds of meat for shipment in ten days; a 100° pickle for five days. Some curers use in addition one and one-half pounds of sugar per 100 pounds of feet. Pigs' feet cured by this method will be white and more attractive than when pickled with spices.

If spices are used it must be remembered that cloves tend to darken the feet. Curing should be effected in a clean wooden receptacle, using clean water for each batch.

Trying Out Lard.—Only the best of fat should be used for choice lard. Leaf fat is the best. Leaf lard is that which is made from the leaf fat which lies around the kidneys. The next best in quality is that from the back, and the poorest quality is that from around the intestines. The greater part of the lard marketed is obtained by melting together the whole fat except the leaf fat. The back strip of the side also makes nice lard, as do the ham, shoulder, and neck trimmings. Fat from around the intestines should never be mixed with the leaf and back fat. It makes a strong-smelling lard and should be kept separate. All scraps of lean meat should be cut out of the fat before trying out, as they are very likely to stick to the kettle and get scorched, giving an unpleasant flavor to the lard. When preparing the fat for trying, cut it into pieces from one to one and one-half inches square. The pieces should be nearly equal in size, so that they will try out in about the same time. Fill a clean kettle about three-fourths full, and put in a quart of water

[3]Quoted from "The National Provisioner."

or, if convenient, a quart of hot lard. One or the other is necessary to prevent the fat from burning before the heat is sufficient to bring out the grease. Keep the kettle over a moderate fire until the cracklings are brown and light enough to float. Frequent stirring will be necessary to prevent burning. When done, remove from the stove and allow to cool slightly, and then strain through a muslin cloth into a large jar. Stir it occasionally until it is cool enough to begin to solidify. If pails or smaller jars are to be filled, the lard should be dipped out while just warm enough to be liquid. Stirring while the lard is cooling tends to whiten it and makes it smoother. Lard should be stored in a dry, cool, dark place. Light, moisture, and high temperatures affect its quality unfavorably.

SAUSAGE

Sausage.—Pork sausage should be made only from clean, fresh pork. The shoulders, neck, and lean trimmings are usually used for sausage. Unless part of the fat is removed and used for lard the sausage is likely to be too fat. To each eighteen pounds of lean meat allow six pounds of fat. Mix the fat and lean meat together in chopping. Where a rotary cutter is used it is best to cut the meat twice (Fig. 129). After it is cut the first time, spread it out thinly and season. Eight ounces of pure, fine salt, four ounces of ground black pepper, four ounces of pure leaf sage, rubbed fine, and one teaspoonful of red pepper to each twenty-four pounds of meat will suit the taste of most persons. The seasoning should be sprinkled thinly over the cut meat and the meat again run through the cutter to mix the seasoning thoroughly. This method will give a more even mixing of the spices than can be obtained by working it with the hands. For immediate use the sausage may be packed away in stone jars or crocks, to be sliced for frying. Many people stuff it into casings made from the small intestines of the hog. When this is done the intestines must be turned inside out and carefully cleaned.

A good substitute for casings may be had in narrow muslin bags. These, when filled, should be two and one-half or three inches in diameter and eighteen to twenty-four inches long. Stuff the sausage in tightly by hand and hang in a cool place. If the sausage is to be kept for some time, melted lard should be rubbed over the outside of the bag. This excludes the air. Sausage may be kept for some time in a large jar if a thin coat of hot lard is poured over the top.

Mixed Sausage.—This may be made from a mixture of pork and beef in almost any proportion. It is the custom of many

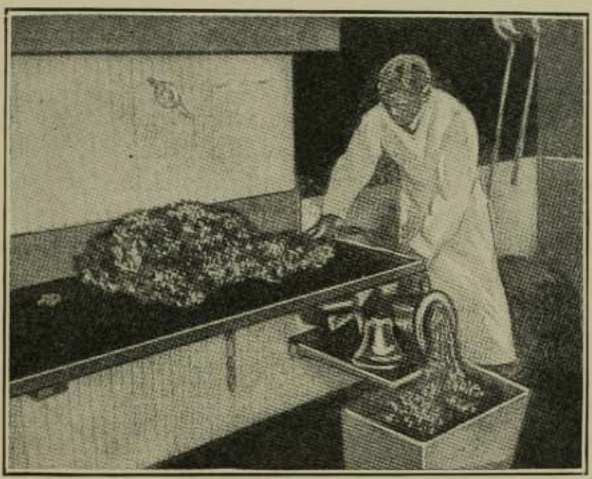

FIG. 129.—Grinding sausage meat the second time after seasoning is added.

farms to kill three or four hogs and a beef during the winter for the year's supply of meat. When this plan is followed a nice supply of sausage can be made from the trimmings. Sausage should not contain too much fat. A good proportion is two pounds of lean pork, one pound of fat pork, and one pound of lean beef. Chop together fine and season the same as for pork sausage. Pack in jars, muslin bags, or casings. Many people prefer this to clear pork sausage, as it is not so fat.

Bologna Sausage.—To each ten pounds of lean beef use one pound of fat pork, or bacon if preferred. Chop finely and season with one ounce of salt to each four pounds of meat, one ounce of the best black pepper (ground, pure) to each six pounds of meat, and a little ground coriander. Stuff into casings called beef "middles" or beef "rounds." If stuffed into middles, make the sausages ten or twelve inches long, and allow them to hang straight. If stuffed into rounds, make them twelve to fifteen inches long, and tie the ends together so as to form rings. Smoke for ten or twelve hours. Cook in boiling water until the sausages float. Dry on clean hay or straw in the sun, and hang away in a cool place until wanted.

Casings.—Sausage casings are the intestines of hogs, cattle, or sheep which have been emptied and cleaned. They are turned inside out and soaked in a solution of lye or lime water, thoroughly washed, and then salted down. When cleaned and put up by a reputable packer they are as good as when cleaned at home, and when they can be bought at a reasonable price (three cents a pound, perhaps) it hardly pays to clean them for home use. The casings from different animals are used for the various kinds of sausages. Beef casings are of three kinds—"rounds," made from the small intestines; "bungs," made from the large intestines, and "middles," made from that part of the entrails leading from the bung to the rectum. The "rounds" are used for bologna, the "bungs" for bologna, ham, and blood sausage, and the "middles" for bologna and summer sausage. Hog casings are made from the small intestines of the hog, and are used mainly for pork link sausage. Sheep casings are from the small intestines of sheep, and are commonly used for wienerwurst and other small sausages.

THE SMOKE-HOUSE

The **smoke-house** should be eight or ten feet high to give the best results, and of a size suited to the amount of meat likely to be smoked. One six by eight feet will be large enough for ordinary farm use. Ample ventilation should be provided to carry off the warm air in order to prevent overheating the meat. Small openings under the eaves or a chimney in the roof will be sufficient if arranged so as to be easily controlled. A fire-pot outside of the house proper, with a flue through which the smoke may be conducted to the meat chamber, gives the best conditions for smoking. When this cannot well be arranged, a fire may be built on the floor of the house and the meat shielded by a sheet of metal. Where the meat can be hung six or seven feet above the fire this precaution need not be taken. The construction should be such as to allow the smoke to pass up freely over the meat and out of the house, though rapid circulation is at the expense of fuel.

Brick or stone houses are best, though the first cost is greater than if they are built of lumber. Large dry-goods boxes and even barrels may be made to serve as smoke-houses where only small amounts of meat are to be smoked. The care of meat in such substitutes is so much more difficult and the results so much less satisfactory that a permanent place should be provided if possible.

The following specifications were furnished by Major Lawrence Foot, of Little Rock, Ark. From these figures one can get an idea of the approximate cost of a small smoke-house. In different localities the price of material and labor will vary somewhat. This bill of lumber and specifications are for a smoke-house ten feet by sixteen feet, roof one-third pitch, with dirt floor and brick foundation:

675 brick, $8 per 1000		$5.40
Three squares of composition roofing		6.00
Sills, 2 pieces, 4 × 6 inches, 16 feet long	64 feet	
Sills, 2 pieces, 4 × 6 inches, 10 feet long	40 feet	
Siding, 62 pieces, 1 × 12 inches, 12 feet long	620 feet	
Battens, 52 pieces, ½ × 3 inches, 10 feet long	154 feet	
Rafters, 11 pieces, 2 × 4 inches, 16 feet long	117 feet	
Joists, 7 pieces, 2 × 6 inches, 10 feet long	70 feet	
Plates, 2 pieces, 2 × 4 inches, 10 feet long	13 feet	
Plates, 2 pieces, 2 × 4 inches, 16 feet long	21 feet	
Sheeting	300 feet	
On sides of door, 2 pieces, 2 × 4 inches, 10 feet long	13 feet	
Door battens, 1 piece, 1 × 4 inches, 12 feet long	4 feet	
Total feet ($14 per 1000)	1416 feet	19.82
Total cost of above		$31.22

The above lumber will permit the roof to extend one foot over the gables and one foot over the sides. The sheeting is not worth as much as the other lumber; $8.78 additional will make the house cost about $40. This $8.78 should pay for the carpenter's work (two days should do it), bricklayer, mortar, hinges, padlock, and nails.

On the ridge of your roof you should have two ventilators, divided as follows: If house is sixteen feet long, one five feet from one end and the next five feet from the other ventilator; make same of galvanized sheet iron one foot long, in the shape of a pipe four inches in diameter; let six inches be above the ridge and six inches below, and so built on the ridge (the tinner can do that) as not to let the rain leak into your house. Use a loose wooden cover of sufficient weight to keep them (the covers) in place so as to fully open or partly close, but always keep them a little open in order to make a slight draught to let the smoke out slowly and give a cool smoke. A ventilator at the bottom of your door will help this slight draught, but the inside of same should be covered with close wire netting in order to keep out flies, and the same kind of netting tied tightly with wire should also be placed over and around your roof ventilators for the same purpose. The house should be absolutely dark, "light-proof." This will keep out flies, which breed skippers. Put your foundation in the ground below frost line.

Fuel.—The best fuel for smoking meats is green hickory or maple wood smothered with sawdust of the same material. Hard wood of any kind is preferable to soft wood. Resinous woods should never be used, as they are likely to impart bad flavors to the product. Corn-cobs are the best substitute for hard wood, and may be used if desired. Soft wood and corn-cobs give off large amounts of carbon in burning, and that is deposited on the meat, making it dark in color and rank flavored. Juniper berries, fragrant woods, and apple parings are sometimes added to the fire to flavor the meat.

Filling the House.—Meat that is to be smoked should be removed from the brine two or three days before being put in the smoke-house. If it has been cured in a strong brine, it will be best to soak the pieces in cold water over night to prevent a crust of salt from forming on the outside when drained. Washing the meat in tepid water and scrubbing clean with a brush is a good practice. The pieces should then be hung up to drain for a day or two. When drained, they may be hung in the house. All should be suspended from the joists and rafters below the ventilators, and should hang so that no two pieces come in contact, as this would prevent uniform smoking.

Keeping up the Fire.—A slow fire may then be started, warming up the meat gradually. During the winter months in cold climates it is best to keep the fire going continually until the smoking is complete, holding the temperature at about the same point. If the fire is allowed to die down, the meat becomes cold and the smoke does not penetrate readily. This results in heavy smoke on the outside and very little on the inner portions of the meat. During the spring months and in the summer a light fire may be started every second or third day for two weeks, the meat being allowed to hang in the smoke-house until sufficiently colored. When the fire is kept going steadily and an even temperature is maintained, twenty-four to thirty-six hours will be required to finish one lot of meat. Smoke will not penetrate frozen meat, and it will be necessary to extract all frost from it before filling the house. The house should be kept dark at all times to prevent flies entering. As soon as smoked sufficiently, the meat should be cooled by opening the ventilators or doors.

KEEPING SMOKED MEATS

When hard and firm the meat may be canvased or packed away for summer use. Smoked meat may also be left in the smoke-house for some time during moderate weather. The house should be kept perfectly dark and well enough ventilated to prevent dampness. A dry, cool cellar or an attic with free circulation will be a satisfactory place for smoked meats at all seasons if it is kept dark and flies are excluded. A fine way to keep the smoked meat is to place the meat, when smoking is finished, skin down, in a single layer on a hanging table in the smoke-house. The table should be hung with wires so the mice cannot reach the meat. They can easily do this when the tables are hung with cords. Sift wood ashes over these hanging tables, place on them only one layer of meat, skin down, and cover ends, sides, and top completely with sifted ashes at least two inches thick. Make ashes from such woods as poplar, ash, cottonwood, or such hard woods as hickory, maple, walnut, etc. The ashes should be sifted until as fine as flour, and the meat can remain untouched and only removed as needed for the table. Hams so treated will keep remarkably well for several years. It is generally conceded that a ham attains its full excellence when it is a year old.

This method seems to follow out the method used by the Westphalians in smoking their hams, except that they allow them to hang until wanted for use, and once in a while, especially in damp weather, give them a little smoke.

If to be kept only a short time, hams and bacon will need only to be hung out separately without covering. For longer keeping it will be necessary to wrap them first in heavy brown paper and then in burlap, canvas, or muslin and bury them in a grain bin or other suitable place, the object being to gain a uniform temperature and to keep away insects. A coat of ground pepper rubbed into the meat before wrapping will be distasteful to them. For absolute safe-keeping for an indefinite period of time it is essential that the meat be thoroughly cured. After it is smoked and has become dry on the surface it should be wrapped in parchment paper; or clean wrapping paper will do where parchment paper cannot be had. Then inclose in heavy muslin or canvas, and cover with yellow wash or ordinary lime whitewash, glue being added. Hang each piece out so that it does not come in contact with other pieces. Do not stack in piles.

Recipe for Yellow Wash for Meat Canvas.—For 100 pounds hams or bacon take:

3 pounds of barytes (barium sulfate)
1 ounce of chrome yellow (lead chromate)
1 ounce of glue
6 ounces of flour

Half fill a pail with water and mix in the flour, dissolving all lumps thoroughly. Dissolve the chrome in a quart of water in a separate vessel and add the solution and the glue to the flour; bring the whole to a boil and add the barytes slowly, stirring constantly. Make the wash the day before it is required. Stir it frequently when using, and apply with a brush.

Cooking Ham.—Hams cured without sugar in the salt to sweeten them will perhaps be better if boiled by the following recipe. The sugar placed in the kettle will in a great measure add to the sweetness of the ham, and if the ham has taken too much salt the sugar will help that fault also to some extent.

A Combination Virginia and Louisiana Recipe.—Immerse and soak the ham or shoulder in water the night before cooking (if one year old or over, soak twenty-four hours), then wash thoroughly in tepid water. The ham is then placed, skin down, in a boiler full of boiling water. After putting in the water, add a teacupful each of sugar and vinegar. The temperature should then be allowed to lower slightly and the water just kept gently simmering several hours, with the top on the kettle. As the water boils out, add fresh boiling water, and always keep the boiler full. By putting it in boiling water the albumin is coagulated at once on the surface of the ham and much of the juices and flavors kept in until cooked. When the ham is done it will turn over, skin up, and the meat will leave the bone in the leg for an inch. After the ham is cooked, take kettle and all off the stove, skim off the impurities, and let it cool off in the water in which it has cooked, as it will reabsorb part of the nutriment and juices which have been drawn out during cooking, and the shrinkage is much less than if taken out immediately.

Baking Ham.—The following day remove outside skin, stick with cloves one-half inch apart, and cover the ham well with brown sugar and bake, basting it frequently with cider. When it is well baked, take it out of the oven and baste another ten to twenty minutes in the pan on top of the stove. The sugar crust should be quite brown and crisp when done.

QUESTIONS

1. What methods have been used for centuries in the preservation of meat?
2. Why should meat be cured as soon as possible after the animal heat has been lost?
3. Why can you not depend upon the result if frozen meat be cured or smoked?
4. Why is brine-cured meat more practical than dry-cured when the meat is cured at home?
5. For what must the brine be watched closely, especially during warm weather? What are the causes of the brine spoiling? What care must be given it and the meat in it if a brine is found to be spoiled?
6. Why must the meat be weighted so that every portion is kept under the brine?
7. What cut of beef is usually selected as the nicer portion to dry? How should it be cut?
8. Describe the process of curing and the time taken to accomplish it. When is the beef ready for use?
9. What is meant by sugar-cured hams and bacon?

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CHAPTER XVII

USE OF FRUITS AND VEGETABLES IN THE DIET

Fruits and vegetables would be welcome on our tables if it were only for their beauty of form and color, and for the pleasing variety of flavors which they give to our meals. Considering, however, that besides being attractive to the eye and the taste they are absolutely necessary for health and for physical well-being, it seems worth while to make every effort to use them as freely as we can afford to. It is the part of wisdom, also, to preserve them in times of plenty for use in times of scarcity and high prices.

These foods should not be undervalued because they cannot supply all that is needed in the diet. They cannot take the place of meat or milk, to be sure, or of bread or butter, but they are as important in their places as these other more substantial foods are in theirs.

The healthful diet, as a whole, should supply a large number of substances, which, for convenience, may be here grouped under four heads:

First, fuel. This is needed by the body much as the locomotive needs coal as a source of energy or of power to do work. The greater part of the fuel of the body is provided by fats, sugar, and starch.

Second, protein. This, like fat, sugar, and starch, is a fuel, but, unlike them, it supplies many of the materials needed by the body of the child for making new tissues, and by the bodies of the grown persons for making good the losses in the bodily machinery that are constantly taking place as the result of the wear and tear of work.

Third, non-burnable or mineral-building materials. These substances, like protein, are needed by the young for growth and by all as a means of keeping the body in good repair.

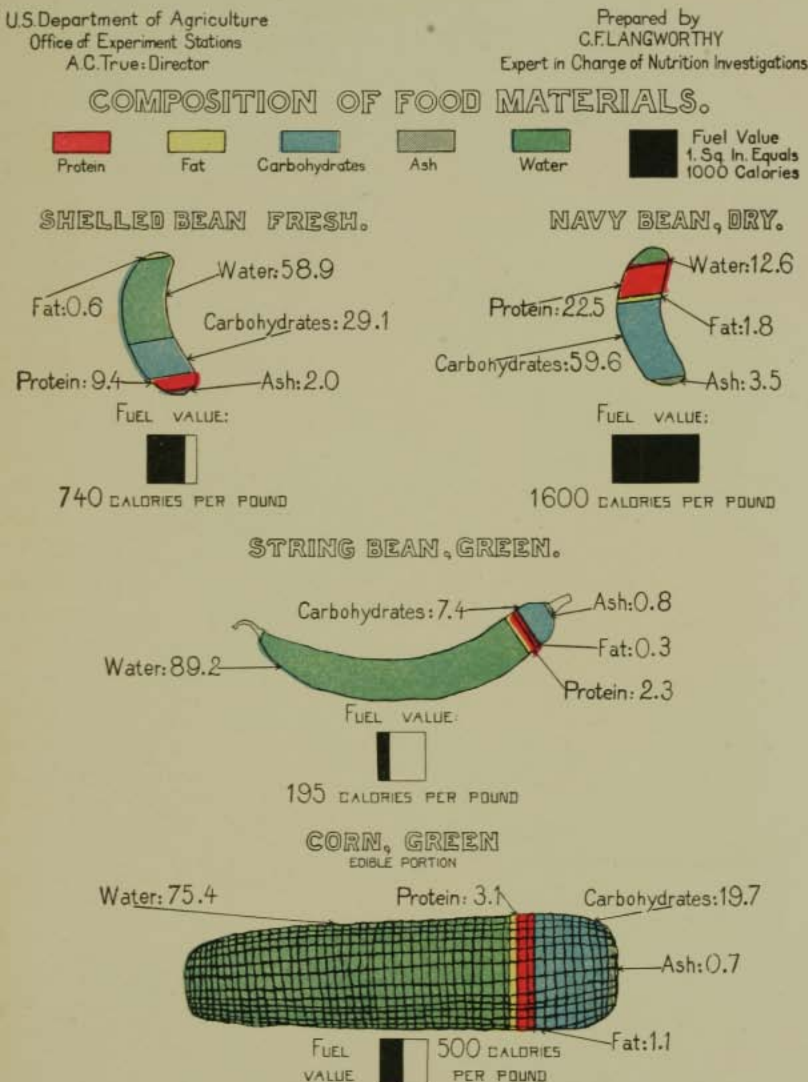
Fourth, certain newly discovered substances which are believed to be growth-promoting and body-regulating, and therefore needed to keep the human machine in good running order. These substances correspond with the cleaning materials and the lubricating oils used on the locomotive. They neither serve as fuel nor enter into the structure of the body, but have an important part to play in its operation.

In considering the necessary nutrients of the body in the order in which they are listed above, we come first to those which cannot be supplied in any very large measure by fresh fruits and vegetables. Apples, oranges, turnips, asparagus, and, in fact, all the fruits and vegetables contain large amounts of water, usually eight parts out of ten by weight. In some cases, particularly those of the succulent vegetables like lettuce, cucumbers, and tomatoes, water constitutes over 90 per cent of the weight. They have the same relation to butter, oil, and other fats as fuels for the body as soft wood or paper has to coal when considered as fuels for a locomotive. Even those who eat fruits and vegetables very freely seldom get from them, in the course of a day, more than a tenth of the energy they need for their work.

Nor can fruits and vegetables be used as the chief source of protein. This is best supplied by milk in the case of the child, and by milk, meat, eggs, and cheese in the case of grown persons. Among the foods usually classed as vegetables, only the dried legumes—navy beans, peanuts, soy beans, and others—provide much protein. Taken as a whole, the vegetables seldom provide more than five per cent of all the protein needed in the course of a day (Plate III).

The statement of the uses to which fruits and vegetables cannot be put clears the ground for an understanding of their very great usefulness in other particulars. As sources of mineral-building substances, particularly iron, they are invaluable. This should not be taken to mean that without fruits and vegetables the diet would be entirely lacking in iron, for it is present in large amounts in lean meats, egg yolks, cereals, and other common foods. In these last-mentioned substances, however, iron

PLATE III



(Courtesy, Office of Home Economics, U.S. Department of Agriculture.)

FOOD CHART

is combined with a large amount of fuel in the form, sometimes of protein, sometimes of starch, sugar, or fat. If, therefore, meats, eggs, cereals, etc., are eaten in large enough amounts to supply iron, they provide too much fuel for the body, and this, if not burned out to supply energy, is likely to be deposited in the form of fat. Unless fruits and vegetables are freely eaten, therefore, one of two unfortunate conditions is likely to exist: Either the diet will be deficient in iron, or it will be too "hearty." It is because of their very wateriness that fruits and vegetables can be freely used as a source of iron and other mineral supplies without overloading the body with other substances.

In the diet of children fruits and vegetables are particularly useful. Milk, which is an indispensable part of their food, contains plenty of lime and some iron. The iron, however, is insufficient for health. Soups and other dishes made out of milk and spinach or other vegetables are therefore important items in the diet of children.

Of the many other ways in which fruits and vegetables help to keep the body in order it will be sufficient to speak here only of two or three. First, they give bulk to the diet, and for this reason are believed to have an important part to play in the digestion of other foods. Their delicate, fibrous framework consists of a substance called cellulose, which is not digested. The cellulose, therefore, remains unchanged as it passes through the digestive organs and serves to prevent other foods from settling down into compact masses. Whether this is the whole explanation of the laxative effect of these foods or not is still uncertain. It is probable that the mild acids and mineral substances which all of them contain contribute toward the same end. However that may be, they serve in some way to keep the food from accumulating in the intestines until it undergoes undesirable decomposition.

There is also a theory that fruits and vegetables have an important part to play in offsetting certain substances that are produced in the digestion of meat, poultry, fish, eggs, etc. A certain amount of these last-mentioned foods is needed for body-building purposes. Without fruits and vegetables, however, they would, according to the theory, be left in the unfortunate position of having performed a great service to the body and then of being obliged to injure it. Accompanied by fruits and vegetables, they do their beneficent work and then are transformed into harmless substances in preparation for being eliminated from the body.

It is now generally believed that the more meat and eggs a person eats the more fruits and vegetables he needs. To think, therefore, that because one has eaten a large amount of meat he needs no vegetables or fruit is a mistake, for under these circumstances he needs vegetables and fruits more than if a small amount of

FIG. 130.—Roast with vegetable macedoine garnish.

meat only had been eaten (Fig. 130). In a heavy meal of meat, therefore, allowance should be made for fruits and vegetables. If necessary, this should be done by the cutting down of fats and sweets. A meat or vegetable salad or fruit for dessert follows more logically after a heavy meat course than such desserts as suet puddings or pie (Fig. 131).

It should be remembered, also, that while such foods as boiled rice, macaroni, and hominy are often eaten with meat or combined with it in the making of extremely attractive dishes, they are not substitutes for potatoes in the diet. When one of them is served with meat the housekeeper should think of it not as a substitute for vegetables, but rather as taking the place of part of the bread usually eaten at the meal, for rice, macaroni, or hominy has exactly the same uses in the diet that bread has. She should, therefore, take particular pains to supply some other vegetable in the form of a salad or of fruit for dessert in meals which contain meat but no potatoes.

Finally, fruits and vegetables are an important source of certain recently discovered substances, sometimes called vitamines, which are thought to promote growth in children and to have an important part to play in keeping all people, old as well as young, in good physical condition.

FIG. 131.

FIG. 132.

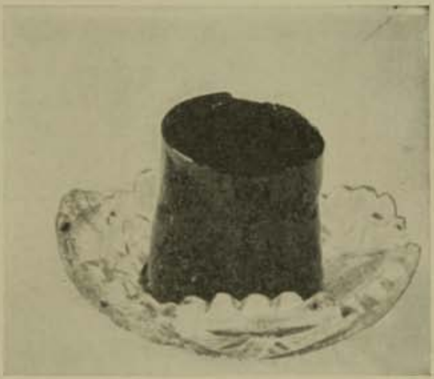


FIG. 131.—Fruit macedoine.
FIG. 132.—A glass of currant jelly.

What has been said so far about the nutritive value of fruits and vegetables applies to them when they are fresh and undried. After they have been dried they are no longer watery foods, but contain a very large percentage of nourishing material. Beans and peas, when dried, contain more protein than meat does, and even after they have been soaked in water and cooked they are considered good substitutes for meat and eggs. It is well, therefore, for the housekeeper, when she plans meals, to class the dried legumes with the meats.

The well-ordered meal contains good bread, or a cereal food served in some other attractive way; a little food from the meat or meat substitutes, enough to insure sufficient protein; a little butter or other fat to give richness; a little sugar or other sweet to furnish flavor, and, last but not least, a vegetable or a fruit (Fig. 132). These five kinds of food should all be represented in the diet at all times. The varied diet which contains all of these five kinds of food is needed to make a perfect ration. If one is lacking, the diet will be deficient in some thing needed for health or palatability. The time was when the winter diet was

Fig. 133.—Canned asparagus and pepper salad.

Fig. 134.—Log-cabin salad made from canned beans.

always one-sided because of the absence of fruit and vegetables. That time is now past, or should be, for with our present knowledge and skill in canning and preserving fruits and vegetables we may easily have a complete ration all the year round (Figs. 133 and 134).

QUESTIONS

1. Name the substances that should be included in a healthful diet—stating the use of each in the body.
2. Why are fruits and vegetables absolutely necessary for health and physical well-being?
3. What constitutes a balanced meal when a large portion of meat is served?
4. Name some substitutes for bread and outline two combinations for a meal which contains these substitutes.
5. What newly discovered substance has been found in fruits and vegetables? What is the function of these substances?
6. What dried vegetables can be substituted for meat?
7. What is contained in a well-ordered meal?
8. How can you plan to have this complete ration all the year?

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CHAPTER XVIII

CANNING CLUB ORGANIZATION

Canning Club and Home Demonstration Work is conducted under the coöperative agreement between the several state colleges of agriculture and the United States Department of Agriculture. In the South all this work is directed by the organization of state and county agents. In the North and West this work is part of the Boys' and Girls' Club Work and is supervised by state leaders, assistant leaders, district workers, and, in some places, county agents. In the 419 counties organized in the South in 1916 there were about 60,000 girls enrolled to carry on canning and poultry club work, together with related activities in sewing, cooking, and gardening.

Aim.—One of the objects of the work is to develop a skill that shall increase the economic earnings of girls and women in the country. Their home has many functions not performed by the city home. It is a producing as well as a consuming center. Its contribution to the income of the farm, especially in saving the waste and expense of conducting farming operations, often measures the difference between profitable farming and unprofitable farming. The skill and business ability of farm housewives and children are a notable contribution to the economic resources of the farm. In many cases incomes must be increased before standards of living can be raised or progressive community enterprises fostered. Proceeding upon this basis, the work in the South has added materially to the wealth, health, and happiness of country people.

Financing the Work.—In the beginning, generous financial help from the General Education Board—the corporate trustees of a fund of more than \$50,000,000 given by John D. Rockefeller for educational purposes—made possible the free development of this work. This was soon followed by state and county appropriations. In 1914 Congress made appropriations to take the place of those being made by the General Education Board, and the Smith-Lever Extension Act of 1914 brought its first Federal appropriations in 1915, thus giving permanent support to demonstration work in agriculture and home economics. In 1917 there was in the 15 Southern an organization of about 500 counties supervised by 13 state, 21 assistant state, 15 district, and 494 county agents, making a total of 543.

During 1914–1915 in forty states slightly over $320,000 was spent in home economics demonstrations, while in 1916–1917 in forty-eight states $750,000 was allotted, an increase of over 130 per cent in two years. This money was derived from the United States Department of Agriculture, the state colleges of agriculture, Federal anl state coöperative extension act funds, and county and other local sources. In 1916 the allotment of funds for extension work for farm women was derived from the following sources: $107,000 from funds appropriated directly to the United States Department of Agriculture, $260,000 from Federal extension act funds, $120,000 from state extension act funds, $32,000 from direct state appropriations in addition to the amount appropriated by the state to offset the Federal coöperative extension funds, $178,000 from county appropriations, and about $80,000 from other miscellaneous sources.[1]

Initial Work.—Following the development of United States Farm Demonstration Work as a means of instructing farm men and subsequently of boys' corn clubs, because boys also insisted upon being enrolled as "demonstrators," there was a very insistent demand for activities for girls which should give them opportunity to carry on skilful work in their homes and enter into friendly contest with one another. The opportunity to influence and instruct adults through the interests of their children was recognized from the first.

Activities which have fundamental connection with every country home, and which involve the need for accurate information and skill in doing, were selected. During 1910 some girls' tomato clubs were organized in South Carolina and Virginia, with

[1] NOTE.—Statement, also table showing total amount of funds available for extension work among farm women, is quoted from the "Weekly News Letter" of the U. S. Department of Agriculture.

Women County Agents and Funds Available for Extension Work Among Farm Women

State	1914–'15		1915–'16			1916–'17	
	Number of counties with women agents, July 1, 1914	Funds for home economics work	Number of counties with women agents, July 1, 1915	Total number of women extension workers	Funds for home economics work	Number of counties with women agents, July 1, 1916	Funds for home economics work
Alabama	18	$16,156	19	39	$19,510	27	$28,870
Arizona	...	....	...	1	1,558	...	1,100
Arkansas	15	11,262	20	37	20,767	34	44,628
California	...	....	...	[2]	2,626	...	5,000
Colorado	...	3,752	...	3	3,250	2	3,334
Connecticut	...	....	...	1	....	...	2,600
Delaware	...	643	...	1	1,899	...	2,100
Florida	24	22,211	27	33	32,135	30	40,373
Georgia	29	14,222	48	54	28,321	54	53,500
Idaho	...	3,044	...	5	3,450	...	4,200
Illinois	...	2,978	...	3	15,450	1	16,200
Indiana	...	4,780	...	7	4,000	...	4,700
Iowa	...	19,052	...	9	28,800	...	31,930
Kansas	...	6,897	...	8	9,236	...	12,351
Kentucky	9	15,732	19	35	19,056	35	26,250
Louisiana	13	9,058	13	22	13,640	16	22,805
Maine	...	....	...	1	1,425	...	2,966
Maryland	5	4,102	6	13	11,230	7	12,880
Massachusetts	...	4,636	...	4	4,667	1	4,888
Michigan	...	1,518	...	5	4,474	1	7,000
Minnesota	...	4,756	...	[2]	7,715	...	8,390
Mississippi	33	18,553	33	38	25,964	38	34,288
Missouri	...	....	...	3	....	...	8,500
Montana	...	1,804	...	2	5,700	...	5,600
Nebraska	...	5,057	...	5	4,950	1	7,600
Nevada	...	1,844	...	1	1,050	...	914
New Hampshire	...	978	...	4	2,150	1	5,600
New Jersey	...	1,774	...	...	4,099	...	4,800
New Mexico	...	1,474	...	3	2,300	...	2,400
New York	...	5,050	...	4	6,250	1	15,075
North Carolina	27	25,719	34	38	43,265	48	53,623
North Dakota	...	....	...	4	5,300	...	7,990
Ohio	...	12,760	...	9	16,400	1	19,495
Oklahoma	19	11,123	24	29	24,095	30	30,076
Oregon	...	4,016	...	12	3,150	...	3,835
Pennsylvania	...	1,767	...	2	6,060	1	7,300
Rhode Island	...	1,667	...	1	1,925	...	1,600
South Carolina	21	20,565	24	38	41,390	32	54,887
South Dakota	...	2,112	...	[2]	....	...	1,685
Tennessee	18	12,231	24	40	25,554	34	43,092
Texas	26	17,040	27	37	24,288	39	36,920
Utah	...	2,191	...	6	5,287	2	5,825
Vermont	...	....	...	1	2,500	...	2,700
Virginia	17	15,438	22	25	24,337	28	33,357
Washington	...	2,429	...	3	3,092	...	4,300
West Virginia	5	7,630	10	12	13,946	14	17,413
Wisconsin	...	....	...	4	9,000	...	8,160
Wyoming	...	2,958	...	...	2,800	...	2,950
Total	279	$320,979	350	602	$538,061	478	$755,990

[2] Figures not available.

the aid of teachers and other school officials. These girls cultivated tenth-acre plots of tomatoes, following some simple instructions furnished by the Office of Farm Demonstration Work, and canning their vegetables under the instruction of one of its representatives. The results of this experiment were made the basis during the next year for the organization of from two to four counties each in the states of South Carolina, Virginia, and Mississippi, under the leadership of women who were appointed to take charge of each state and with the aid of a few county workers whose services were secured for brief periods in the canning season. In 1912 eleven states had workers in charge with 160 counties organized, and in 1917 every Southern state was organized, and similar plans are rapidly developing in the North and West.

The State Agent.—In the beginning of the girls' canning club work a state agent or organizer was appointed. To help her in each county organized, a capable woman was secured for about two months in the year to hold the canning demonstrations in the summer and give what volunteer help she could in spring and fall. The clubs were organized and the first instruction was given through the schools where the girls could be met in groups. Correspondence and an occasional visit from the county agent had to suffice as instruction and supervision until the canning season opened, when regular field meetings, in way of canning demonstrations for groups of members, were held at central points in the county. Again in autumn, the collecting of results and the holding of an exhibit of canned products were largely volunteer work of the county agent. The results which these workers obtained were so notable that in a short time this general plan was adopted permanently, the period of employment for the county agent increasing rapidly to nine or twelve months.

The girls' canning clubs, with a tenth-acre garden as the basis of each individual's work, have made possible a gradually evolved four years' program of work which thousands of girls have eagerly entered upon. Each year finds a larger percentage of these girls continuing the program and finishing the season's activities. As in all real demonstration work, the girl becomes a "demonstrator." She agrees to follow instructions and use approved methods; her work and its results being accomplished with more skill, greater efficiency, and showing finer quality than that which has heretofore been known, become an object lesson for others and the center of influence in the home and community. Each season brings its characteristic activity of natural work, accompanied by the stimulus of individual ownership and group contests in skill and definite accomplishment.

Fig. 135.—"The home women of the country, if they will give their minds fully to this vital subject of food conservation and train themselves in household thrift, can make of the housewife's apron a uniform of national significance."—D. F. Houston, *Secretary of Agriculture.*

Four-year Program of Work.—Since the mastery of some definite phase of work is essential for each year, a systematic program has been worked out. During the first year the girls select tomatoes as their main crop, learning a great deal about the cultivation of this vegetable and how to market both fresh and canned products. They acquire considerable horticultural skill in managing their gardens. The financial records they keep give a good business training. For the public demonstrations which they give for the benefit of their communities, these girls find it necessary to make attractive uniforms, aprons, caps, towels, holders, etc. This gives sewing a very definite place in their work, and it is done for a special purpose rather than for the sake of a lesson.

An instance of the use of such uniforms is given in the report of a county agent, as follows:

"The meeting at Pheba was especially interesting. Sixteen canning club girls in white uniform, cap, and apron gave a program with club songs and yells. Afterwards they served a two-course luncheon to the mothers and teachers. The latter were especially interested and announced their intention of going back to their schools and have their club members make caps and aprons and learn the club songs."

FIG. 136.—A comfortable garden uniform.

The use of these uniforms has a tendency to make popular suitable working clothes for girls and women. Advanced girls continue their sewing by making uniform dresses of appropriate design and material. In a number of the states they have chosen pink or blue chambray for their dress material, each member having the privilege of choosing either color she prefers. With this combination of attractive pink and blue dresses, with white uniform aprons and caps, a group of these girls, with their county agents in all-white, resemble a huge bunch of sweet peas. Tan or gray linen crash makes very neat uniforms when worn with the white aprons. In some sections near the coast where colored material quickly fades, white uniforms are more satisfactory for

FIG. 137.—Another style of garden uniform.

canning work. Of course, the uniform dress worn for this work should be light weight, and of such material as can be often and easily washed. In 1916, in 419 organized counties in the 15 Southern States, 21,172 girls reported the making of 23,767 aprons, caps, holders, and towels, and 3875 uniform dresses to be worn for public demonstrations (Fig. 135).

The white dresses are not appropriate for the garden work among vines and dirt, as they soil easily and are likely to become stained. The gardening uniform which has been adopted in some sections is the bloomer and middy blouse combination. The regular gymnasium bloomers are suitable for this purpose. Women working in agriculture because of war conditions abroad adopted the bloomers for reason of comfort, convenience, and economy. The bloomer overalls for women are on the market in America, and have been adopted in several factories (Figs. 136, 137, and 138).

An attractive gardening set consisting of an apron for tools and a kneeling pad might be made of matting, burlap, denim,

FIG. 138.—Garden uniform.

oilcloth, or heavy canvas. Matting lined with brown denim and bound with red tape makes an attractive color combination and is very suitable material, because the color does not show soil easily.

This equipment is easily made and will be found most useful in the garden, especially during the transplanting seasons. The making of the garden kneeling pad and apron gives opportunity for teaching something about sewing and will arouse more interest in garden work. The garden pad is used to kneel upon when planting seeds and transplanting plants. This work can be done

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with more ease and comfort, and the use of the pad and apron will protect the clothing a great deal when working in the garden. The pocket arrangement in the pad is convenient for carrying the small plants which are to be transplanted. The apron is a companion piece and is used for carrying tools—planting stick, pruning shears, trowel, and garden line. A small pocket for seeds might be stitched on the front of the middle pocket to make the apron a little more complete (Fig. 163, p. 341).

During the second year two vegetable crops are cultivated, these being chosen with definite regard to home needs and marketing conditions. In addition to the canned vegetables, many clubs market soup mixtures, sauces, and special products which have been originated for them, like Dixie relish and B. S. Chutney. Sewing is continued in the making of uniform dresses of attractive and appropriate design and material.

During the next two years perennial gardens are started and either small fruits or perennial vegetables, suited to the locality or especially attractive for market, are planted. Many girls who have proceeded thus far are ready to make a reputation for special products from Southern fruits, such as the fig, scuppernong, May haw, and guava, or to succeed admirably with the Spanish pepper, for which a great demand exists. The preparation of their vegetable products for the table and contests in bread making are given considerable place. In many instances winter gardening is carried on extensively.

With the increased supply of wholesome food, by means of the fall garden, canning and poultry club products, the agent has a wonderful opportunity in the fall and winter to get into the kitchens and teach the preparation and combination of these products for serving.

SUGGESTED PROGRAM FOR LOCAL GIRLS' CLUB MEETINGS [2]

February

Call meeting to order. Organize.

Distribute daily record books, explain same and urge the importance of attending all club meetings, local, spring and fall rallies, institutes, and fairs.

Discuss soil best suited to tomatoes, Bordeaux mixture, construction of hotbed and cold frame (show model, if possible), and choice of seed.

[2] By Miss Minnie L. Garrison, County Agent, Edgemoor, S. C.

March

Call meeting to order. Roll-call. Minutes (review of last lesson). Reports of work done since last meeting.

Measurement of one-tenth acre plot and preparation.

Transplanting to cold frames, etc.

Bookbinding for cook books, histories, etc.

Game or club yell.

April

Call meeting to order. Roll-call. Minutes.

Vary with bread and poultry program.

Bread.—Judging bread.

Distribute helpful bulletins.

Refreshments—eggs in nest or goldenrod.

Poultry.—Talks on poultry, breeds, hatching, etc.

Demonstrate candling or testing eggs.

Decorate Easter eggs or have egg hunt. Remind girls of true meaning of Easter.

Kodak pictures.

May

Call meeting to order. Roll-call. Minutes.

Plain sewing, based on uniform cap and apron. Apron party.

Distribute copies of club songs and yells. Practice same for spring meeting.

Other instructions concerning special meeting.

June

Call meeting to order. Roll-call. Minutes. Reports on benefits derived from having attended spring meetings.

Study cultural instructions.

Visit plot and give comments.

Demonstrations. Pruning and staking, repeat Bordeaux spray, etc.

Discuss cook books, recipes, and drawings for same.

Serve salads, utilizing vegetables.

Kodak pictures, music.

July

Fireless cooker. Canning demonstration.

Call meeting to order. Roll-call. Minutes.

List of canning supplies, literature prepared in advance.

Canning demonstration, using fruit and vegetables.

Emphasize grading, sterilization, full pack, attractive pack and quality.

Dinner.

Get together, talk over morning's work. Demonstrate jelly making.

Suggest "Canning Christmas Presents."

Distribute literature before leaving.

Songs and yells.

August

Call meeting to order. Roll-call. Minutes.

Practice canning special products.

Basket making.

September

Literary program. Short business meeting.

Roll-call—answer with current events, etc. Magazine article or report on interesting library book.

Read sketch of Doctor Knapp's life.

Word building, using letters composing club motto.

Puzzle—dissected labels.

Show pictures of good exhibits with projector if possible.

October

Call meeting to order. Roll-call. Minutes.

Go over records again. Sum up.

Demonstrate labelling, packing, etc., for fairs.

Judging canned goods.

Assign work for girls during fair.

Coöperation Between School and Home.—It can be easily seen that all of these activities are carried on in the home and form an integral part of the life of the girls themselves, but everywhere the schools are taking a very active part in promoting this work. The coöperation of the teacher is always essential.

In each community organized the girls are selected and enrolled through the school early enough to undertake gardening After the club members have been enrolled and they have selected plots for their one-tenth acre gardens the teacher can render valuable assistance. With her aid the girls study the instructions for the purpose of securing information as to how to carry on the work at home. The teacher giving the best coöperation correlates the work with regular lessons in reading, arithmetic, language, drawing, and really makes it a part of the school life. She often organizes the members into clubs and holds the first meeting at the school. Here they are taught the construction of a hotbed or cold frame, and sometimes one is built on the south side of the school building; plants are raised in it for the home gardens, and a number of lessons are based on the planting and care of these beds. When these plants have grown large and strong enough to transplant, a meeting is planned at the home of some club member, where they learn the principles of transplanting.

Club work furnishes constant opportunity to enliven schoolroom routine with vital interests and fine motives for study. Many instances of the helpful reaction which these clubs have upon the schools have been reported. In a similar way they give the schools a better opportunity to bring influences to bear directly upon the homes.

Community Activities.—By the time school closes the work has reached an interesting stage and the club members continue to work together. At this season the county agent meets with the clubs on the one-tenth acre plot, gives cultural instructions, and makes preparation for the canning work. Midsummer brings the canning season, and here again at the home of the club member having the first ripe tomatoes the girls of the community meet to work together, with the county agent demonstrating how to take each step in the canning, and the girls doing the actual work under her supervision. After one or two such demonstrations the girls acquire sufficient experience to give a public demonstration in canning, at which the neighbors are taught what the girls are already skilled in doing.

Coöperation for community development or benefit to the group is now beginning among farm people. Club members often undertake it more readily than their parents.

Instances of neighborly coöperation are not rare. One county agent reported that upon visiting one little girl, named Gladys, she found that she had been ill for two weeks and unable to set out her tomato plants, which were fast becoming too large to be transplanted easily. Upon the agent's visit to the next home she reported the instance, and a member of the same club immediately suggested that they get together and do the transplanting. In a short time six girls met at Gladys's home. The little sick girl was able to be carried out in a chair and sit in the shade to watch the others happy at work transplanting the tomatoes for her. Words failed and tears came instead when she tried to thank her friends for this kindness.

A county agent reported that the home of one of her club members was destroyed by fire. Before she had opportunity to visit this community, the president of the club had called a meeting and its members had arranged to give a "shower" of canned products to the club member to whose family this loss had occurred.

Not only is individual initiative aroused, but elements of leadership are developed in country communities where they are most needed. As a means of developing leadership, many state schools give short courses for prize-winning club members from the various counties. These girls have proved their efficiency by successful work and already possess qualities of leadership. Upon being given definite instruction in even a few lines of work they can be inspired to return to their communities and extend to others the same aid. These girls frequently become the officers of their clubs and the local representatives through whom the county agent works in developing many community enterprises.

During one short course each prize winner gave the story of her year's work and told how she spent the money earned from her tenth-acre garden. One girl had for two successive years paid her expenses at the county high school out of her earnings; another was helping her brother through college; another purchased a fine cow, and still another enabled her father to hold his cotton until spring by making her funds available for certain family expenses. In every instance the business experience was one which reflected dignity and judgment.

The County Agent.—It can be readily seen that the centers of influence in demonstration work are the farms and homes where individuals, perhaps a modest little girl or quiet, home-loving woman, make the demonstrations which teach a lesson to an entire community. This lesson carries greater weight and is more convincing than if made by a skilled specialist from a distant institution, but it can be accomplished successfully only when there exists an organization whose leaders have won permanent place in the confidence and affection of the people with whom they work. In the organization of home demonstration work in the South the county agent holds this important place. A state agent with headquarters at the State College of Agriculture directs the work, and frequently technical help is given by specialists who come from the same institution. The state agent is, in an important way, the connecting link between the county agent and the force of extension workers whose headquarters are at the state colleges and in the United States Department of Agriculture.

The county agent becomes the personal medium through which information is furnished and by whom skilful demonstrations are directed. The efficient county agent must be a leader and an organizer. She must possess fine sympathy and good judgment. Her knowledge of people and conditions in her county must be wide and accurate. To all this there must be added good training in home economics and a constantly increasing knowledge of the lighter branches of agriculture, such as horticulture, dairying, and poultry raising.

Demonstration work for women has made most rapid progress where preceded by at least a year of work among girls. Definite results are more quickly obtained among young people who have high enthusiasm and who, fortunately, lack experiences which suggest failure and who are without a sense of caution which previous failures suggest to the mature mind when new enterprises or new methods are proposed. Then, too, the mother's gratitude for training given to her daughter paves the way for active acceptance on her part of instruction and help.

Demonstrations Among Women.—Improvement in management of rural homes has not kept pace with that of the farm itself, nor can it be compared to the management of the city home from which has been taken every creative industry. For these reasons, one line of demonstration which has been eagerly undertaken by hundreds of women is the making and use of labor-saving devices and securing more labor-saving equipment from the outside. The economic needs of women on farms demand greater skill in the constructive activities which are, fortunately, theirs to manage and from which the opportunity for financial income and the satisfaction of creative work of high order rightfully come. Therefore, demonstrations in poultry raising, home dairying, etc., are among the first to be undertaken.

A form of organization which has been found very successful is that for the coöperative marketing of products which results from certain demonstrations. Of these, some of the most successful have been organized for the purpose of disposing of poultry products. In one county nine egg circles sold 4370 dozen eggs in a few months. The products were so carefully graded that better prices were secured for them than had been received by individuals before carrying on the work coöperatively.

Demonstrations involving the preparation of food for the table, and sanitary measures, are also popular. While the reports do not show the extent of the work, it is interesting, however, to note that during the year 1916 the county women agents enrolled and instructed 37,255 girls in canning clubs, 8911 girls in poultry clubs, 21,083 women as home demonstrators, and 2211 women in poultry clubs. The number of clubs organized for women during this year was 963; a total of 27,260 meetings was held, with an attendance of 476,366. The number of girls reporting results from canning work was 21,605. Of this number, 7058 made demonstrations in cooking club products and 11,384 made bread demonstrations. There were reported 350 scholarships won as prizes by the club girls. The total number of containers of fruit and vegetables packed by the women and girls under demonstration methods was 3,318,481, with a total value of $669,839.56. The total number of winter garden demonstrations by the girls and women was 7649. A total number of 37 egg circles was organized by the women and girls, and the total value of poultry products was $53,952.76.

The following improvements or devices were made or installed under the leadership of the women agents: 3058 homemade fireless cookers have come into common use, accompanied in many instances by the purchase of kerosene stoves. There have been reported over 2000 demonstrations made in the use of a homemade iceless refrigerator by which the problems of the sanitary handling of milk and improvement in butter making are largely solved. A good beginning has been made in installing 264 home water systems, 57 inexpensive homemade shower-baths, and a number of improved sewage disposals.

In a number of counties demonstrations along sanitary lines were begun with campaigns against flies which involved the making of 4505 fly-traps in a short time, followed by other active measures against this pest. One thousand two hundred and seventy houses have been screened as a result of these "fly campaigns."

The making of a few practical devices has been a great stimulus to a large number of people who have contributed clever ideas and useful models for many kinds of work. County agents rapidly receive demands for advice in arranging kitchens and adding built-in conveniences. To meet these demands, extension specialists in farm mechanics are devoting considerable time to assisting the county agents with specifications and plans.

Many labor-saving devices have been made or installed in more conveniently arranged kitchens. The following were also made in 1916 under the supervision of the women county agents:

Kitchen cabinets	180
Floor mops	119
Number of wheel trays	225
Number of ironing boards	243

Some valuable work has been done in home butter making for the market. In addition to the iceless refrigerators, the following improved home dairy equipment has been made or purchased under the guidance of county agents:

Butter paddles	635
Butter moulds	624
Thermometers	241
Shotgun cans (for handling milk)	214
Barrel churns	180
Number of hand butter-workers	79
Number of pounds of butter made under demonstration methods	76,513

In any demonstrations undertaken, whether in the making and use of labor-saving devices, in better utilization of farm products for the table, management of sanitary or hygienic problems, etc., it must be recognized that in addition to technical information brought from the outside there exist in any community many excellent practices and much valuable information which are not in common use. To find such practices and arouse individuals to a sense of their obligation in extending them to their less fortunate neighbors is often a valuable part of the work of the county agent. As soon as this is undertaken, or whenever a few individual women successfully carry out definite demonstrations in their homes, active demand arises for community organization which shall bring together those having a common interest in some line of work and in addition give opportunity for social life and recreation. Organizations thus developed assume a permanent place in their communities.

With the initial work that has been accomplished, the fine support and coöperation given by many existing organizations and institutions, with Federal, state, and county appropriations rapidly being made, and a demand for the organization of counties far exceeding each year's possibilities, it is safe to assume that this phase of extension work is permanently established. It has met the need of the most progressive, as well as the least developed, homes and communities.

The county agent now has an avenue of approach into every activity of the home. With increased opportunity for training, which institutions are giving by adapting their courses for her need, and with the opportunity for permanent service in her county, the work of the county woman agent will continue to be a most potent influence for progressive and happy country homes.

The activities described are typical of the home demonstration work now being conducted in the 15 Southern States, and are fairly comparable with that more recently started in the 33 Northern and Western States.

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CHAPTER XIX

THE BUSINESS SIDE OF CANNING

As Outlined by the North Carolina State Agent in Home Demonstration Work

THAT there is an excellent market for home-canned products of standard grade has been amply proved by the Girls' Canning Clubs of the South. Just as soon as it was established in the minds of the public that their products were to be depended upon for an extra number of whole fruit of uniform color and a weight running up to the maximum in a can, there was no trouble in getting these cans on the pantry shelves of the housewife, and, later, in increasing numbers on the shelves of the grocer.

Five years ago, when the canning clubs first began to can in tin for the market, they started with girls eager to earn money for themselves but absolutely untrained in the art of putting vegetables and fruits into cans and sterilizing them sufficiently well to insure their keeping qualities. Fortunately, these girls were young and impressionable, and they went in whole-heartedly to carry out instructions in the new methods of canning which the state supervisors were bringing to them.

Marketing.—In North Carolina it was back in 1912 that the problem of getting the products before the consumer began, although the girls had only 33,000 cans and these all filled with tomatoes. This was our first year in the organization, and both supervisors and girls were inexperienced in the commercial world. I can remember my consternation when the 33,000 cans were dumped upon me to sell, and every little club girl was asking that they be sold immediately, as she needed her money.

Here we were with a large number of cans to be disposed of and with no reputation in the business world—worse than none, in fact, for we had to shoulder the reputation made by the usual carelessly packed product which the farmwife brought to the grocer! Thinking it would be a good plan to sell in bulk, I sent samples of our tomatoes to a large grocery house in New York.

The products were examined and pronounced excellent, but in one of the cans there was found a very light-colored tomato, and, quite properly, the firm refused to take any product that could not be relied upon as uniform throughout.

Standardizing.—This criticism at the very outset of our marketing career probably did us more good than anything that could have happened. I felt that there might be a light-colored tomato secreted in every one of those 33,000 cans, and, calling into headquarters the fourteen supervising county agents, we had a heart-to-heart conference regarding a standard pack, and agreed that we must not seek an outside market until we had proved at home that we could put up an article that could be relied upon. These women went back to their territories to dispose of what the club girls had produced among their own community housewives. If any can was found not to be what it should be commercially it was replaced by the club member or money was refunded. Strict rules and regulations regarding standards were enforced, and if a girl infringed the rules, ignorantly or carelessly, she was not allowed to use the label.

The Girls' Own Responsibility.—In a surprisingly short time these little business women learned the necessity of uniform packs, and the agents set to work inaugurating market campaigns and inspiring the girls to assume the responsibility of the disposal of their own products. This they did by loading wagons with cans and bringing them into the towns and villages, selling in this manner every can they had filled. In many county papers advertisements were run, saying that beans, peaches, tomatoes, berries, and so on, would be brought into town on Saturday by the canning club girls and orders might be left with the county agent, whose address was given.

Sawmills became a great source of revenue, many girls reporting that they had sold out to the "hands" before they could put the labels on the cans. The first dealings we had with merchants were sales made to the small country grocer here and there who found his supply low at times and thought he might try a few cans of this "homemade stuff." As our output began to grow, in the larger towns where the housewives had eaten of

CO-OPERATIVE EXTENSION WORK

IN AGRICULTURE AND HOME ECONOMICS IN NORTH CAROLINA

NORTH CAROLINA A. & M. COLLEGE

North Carolina State Department of Agriculture. Division of Home Demonstration Work.
United States Department of Agriculture, Co-operating. Division of Markets.

Town of..

Date ....

Name of Merchant ....

Deliver to...
SIGNATURE OF PURCHASER

Street No..

NORTH CAROLINA GIRLS' CANNING CLUB

....	Doz. Cans Tomatoes	@.........	Per Doz.	....	......
....	" " String Beans	@.........	" "	....	......
....	" " Blackberries	@.........	" "	....	......
....	" " Peaches	@.........	" "	....	......
....	" " Soup Mixture	@.........	" "	....	......
....	....	@.........	" "	....	......
....	....	@.........	" "	....	......
....	....	@.........	" "	....	......
			Total $		

Approved...191
SIGNATURE OF MERCHANT

FURTHER ORDERS FOR CANNED GOODS MAY BE PLACED WITH COUNTY AGENT

....
SIGNATURE OF COUNTY AGENT

Town...

our products and found them good, we decided to make house-to-house canvasses to secure orders through grocers.

Sales Demonstration.—Certain club members with initiative were given order books, with which they secured quite enough orders from the housewives to make the 4-H brand products well worth while to the grocer. Beautiful exhibits in glass were put in his window with "What you see in the glass you will find in the tin"; and, if he desired it, the county supervisor, with one or two of her girls, would go into the store and demonstrate the different ways in which 4-H Brand[1] products might be used. These little business women in their white caps and aprons served string-bean salad, tomato bisque, tomato jelly, or demonstrated what might be done with berries, peaches, corn, or kraut.

Convincing the Retailer.—In one county the grocers were quite hard to convince that anything made at home could possibly be as good as what was shipped from the factories, and the county supervisor was forced to call in the Chamber of Commerce to assist her in convincing them. It was decided that a committee of grocerymen should be asked to come to the Chamber and pass judgment on the standard brands of tomatoes sold in the town and on the Girls' Canning Club product. Two disinterested persons selected cans—four different brands—and from a pile of several hundred 4-H Brand cans they selected two. The contents of these cans were poured into six glass bowls, each bowl being numbered. When they were set before the grocers for judgment the bowls receiving the best grade held Canning Club products, the others grading third, fourth, fifth, and sixth. This was enough to arouse interest in the grocers and was, with a house-to-house canvass for orders, sufficient to bring us a trade that carried every one of our county cans to the retail merchant.

Selling Direct.—One of the best and most satisfactory selling arrangements is to be made with institutions, colleges, and hotels, and our advanced girls are working up quite a trade in No. 10 or gallon cans. If these institutions can rely upon you for a steady and uniform output they are glad to be in touch with a

[1] The 4-H in the brand is a Canning Club slogan, signifying the development of the head, heart, hand, and health.

producer who can deliver products they know to be well flavored, clean, and high in the percentage of pulp to the can.

Bettie Van Tapscott and her mother, of Alamance County, did some excellent work in this line. Bettie says: "We filled last year an order of beans and pears for Swain Hall, at the University of North Carolina, and when that was delivered I sent Mr. Tischler, the man who buys, a sample of my tomatoes.

FIG. 139.—A North Carolina canning club at work.

He immediately ordered 100 dozen. I had only 1003 cans, so I divided the order with a neighbor club member. Mr. Tischler told me if what I sent him proved satisfactory he would give me another order for this year. I guess it did, for he gave me an order for just as many as I would accept. I filled it and sent it to him yesterday, and he wants another fifty dozen already. You see, it is no trouble to find a market if you go at it right. I correctly mark, label, and crate all products I send off."

Club members undertake coöperative work more readily than will their parents. One enterprising girl informed her county agent that she had already booked orders for canned products to the value of $168. When asked if she could fill them all, she said, "Oh, no; I expect to have a good many more orders than this when all my letters are answered, but there are eight of us in our club and we will do it together." (Fig. 139.)

Two sisters of Mecklenburg County, Margaret and May Belle Brown, who have been club members since the work first started in the fall of 1912, have sent into state headquarters reports of each year's work. They have kept a strict account of the yield and of the expense of planting, cultivating, and marketing, and in five years' time they have recorded a total profit of $889.37. This does well indeed when the first year they cleared only $45, and they suffered from the terrible floods of July, 1916, that laid waste so many fields and gardens of the South.

Profits Made by Five Girls in 1916.—Here are five girls whose 1916 marketing records are good:

	Profit
Miss Elsie Yarborough, Wake County	$155.86
Miss Bettie Van Tapscott, Alamance County	137.20
Miss Ella Maie Kelly, Richmond County	110.58
Miss Emma Reid, Mecklenburg County	109.71
Miss Hessie Steele, Richmond County	101.45

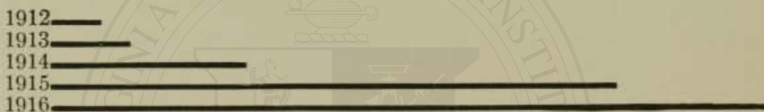
One Family Record.—The family record of Mr. and Mrs. Watts and their two daughters, Mary and Clyde, of Wake County, is interesting. They canned in the summer of 1916:

2000	cans tomatoes	$200.00
3000	cans sweet potatoes	300.00
500	cans string beans	75.00
200	cans corn	30.00
300	cans butterbeans	60.00
300	glasses apple jelly	45.00
8	quarts fig pickle	3.20
12	quarts fig preserves	9.60
8	quarts scuppernong preserves	6.00
8	quarts tomato pickle	4.00
200	glasses blackberry jam	40.00
6536	total containers. Estimated value,	$772.80
	Estimated cost,	193.20
	Profit,	$579.60

A Summary Showing Increase of Work Done by Years Since 1912.—This is a summary of Canning Club work in North Carolina for a period of five years, 1912–1916:

Year	Number counties organized	Number girls reporting	Number cans and jars	Value of products	Total cost	Total profits
1912.........	14	229	33,019	$3,301	$825	$2,476
1913.........	14	235	70,000	7,000	1,750	5,250
1914.........	32	814	259,019	35,361	9,425	25,935
1915.........	37	2,386	633,447	104,241	28,985	75,256
1916.........	44	3,453	680,551	117,816	29,432	88,383
Totals...	....	....	1,676,036	$267,719	$70,417	$197,300

Diagram Showing Growth of Profits for Five Years



STANDARDS

That a can may be accepted by the trade and that a home canner may stand on an equal footing with the commercial canner, standards of excellence must be the same. First, it would be well to select a standard variety of fruit or vegetable to can. White peaches in one can and yellow in another, under the same brand, will not be tolerated by the trade unless marked white peach or yellow peach. This will apply to the shrivel pea and the marrowfat—each good of its kind, but each needing a definite distinguishing name, even if they both appear under the same brand.

The brand may be considered the family name which the packer adopts for his products, and each variety he puts out will have a given name which will distinguish it from the rest of the family. If a canner decides to put string beans upon the market he should select a variety which has practically no strings and which is round and meaty and green in color. These qualities are demanded by the trade and can be had in the "Green Pod

Stringless Bean." This bean, even when grown to medium size, is still juicy, tender, and stringless, and has proved a much better canner than the old Valentine.

Grading.—*Beans* are graded as to size, the first grading being given to the very small bean. This grade is called in commercial parlance "Rat-tail." The next grade is medium, and the third the broken bean. Each of these is excellent in its way, as even the broken bean is gathered while it is tender and before well-formed beans are to be found in the pod.

Tomatoes should be red-ripe, and to grade as extra standard the can should be packed full of either whole tomatoes or very large pieces. Sometimes the whole fruit is too large to put in the can opening and must be cut. One green or light-colored tomato will ruin your grade.

Peaches should be graded according to the number of halves that can be packed in a can, and the contents of a can should be absolutely uniform in size and color. Some of the California peaches are so large that only eight halves can be packed in a No. 3 can. These, of course, would have an extra fine grading. We cannot hope in the East to equal the size of the California fruit, but our flavor seems to catch the trade, and many of the Eastern peaches grade extremely well on that account.

Berries will be graded as to size, only ripe fruit being used.

Soup mixture, chow-chow, and ketchup must each be of a uniform consistency, as must jams and preserves.

The cans, jars, and bottles should be selected carefully and the number of ounces that they contain carefully noted on the label. Directions as to weights of cans and quantity of contents will be found elsewhere in this book.

The Label.—The label for a can should be carefully chosen and must not be changed except under unusual circumstances. This label becomes the sign-patent of what is in the can, and any reputation which the contents of the can may make is recorded under its particular label in the purchaser's mind. To change often would be disastrous, as the public has begun to look for what it desires under a particular cover, and is a little suspicious that it is not getting quite as good if a change is made (Fig. 140).

FIG. 140.—Properly labelled jars.

FIG. 141.—Standard packs in tin.

I was much amused at an old grocer who had been buying from the Canning Clubs when all of the labels bore pictures of the fruit or vegetable in the can. The new labels were very neat and attractive, but were without pictures, simply the name of the vegetable being printed on them. "I can't buy these," he said. "I would have to take out my spectacles and read the name on those cans every time I wanted peaches or tomatoes for a customer for the whole lot of them."

Consult your grocers and see which style they prefer. Make your selection and stick to it. Every label should bear the name and address of the canner, and should have printed thereon the weight of contents of can (Fig. 141).

When striving for an extra trade a well-advertised cleanliness of methods does much to bring a high-class patronage. To publish that all canning is done under a wire-screened shed or in a fly-proof room, that the workers wear immaculate uniforms and close-fitting caps, and that conditions around the canner are sanitary in every respect is a great incentive to the hospital or hotel buyer.

MARKETING POLICY

During the fall and winter of 1916, for example, prices of canned products ran riot, and all preconceived ideas of what was a good marketing policy were scattered to the winds. A county agent who had heretofore found it wise and expedient to visit the town merchant in the spring and secure his order at a certain price for future delivery discovered that she had brought trouble upon herself unless she had designated some special girls to fill those orders at the time the contract was made.

Prices commenced to climb even in August, and by October tomatoes were selling at \$1.10–\$1.25 a dozen to the retailer. When the agent thought it time to fill the contracts taken at \$1 she found many of her girls had sold at \$1.25 and many more were holding for the advanced price that was certain to come. She had not put the matter before the girls in the spring to find if they would take the contract, believing that any of them would be glad of the chance to sell tomatoes in quantity at one dollar, as had been the case in previous years. It was therefore a distinct shock to find so many already sold out or arranging for higher prices. It was at the last the club spirit that saved her, for the girls clubbed together and agreed each one to furnish a part of the orders taken, that the loss might not fall heavily on any one of them and that the business honor of the clubs might be saved.

Business plans which have been evolved from that experience seem to be sound. The county supervisor will always more or less act as a go-between from club girl to merchant, because the merchant finds it very convenient to telephone her an order or to see her about the coming output when she is in town; but after the agent finds what the grocer needs she is wisely selecting certain girls to go to him, make their own bargains, and sign any contracts which may be eventually agreed upon. This puts the responsibility on the proper person—the producer—and leaves the county agent free to advise, to keep her eyes open for possible chances, to see that standards are maintained, and to look to the carrying out of the state's marketing policy; namely, not selling to the merchant and also to the consumer in any town. By this policy we avoid selling to the grocer and also to his customers, and so keep the good-will of both (Fig. 142).

It was a little difficult to instill this into the girl at first. She could not see why it was not proper to sell all the products possible to the housewives at certain advanced prices, and what she could not sell in this way later to sell to the merchant at a less price.

Good business principles, however, are part of her training, and she sees the wisdom of the position when she and her fellow-club members are producing in such quantities that it is upon the grocer that they must rely to take the whole output. He pays promptly a satisfactory price—even if less than the consumer—and the difference is almost made up when the delivery of all products can be made at one time instead of in small lots.

Prices.—Prices are governed by supply and demand. In 1915 from 85 cents to \$1 per dozen was a good price to receive for No. 3 tomatoes. In 1916–1917 tomatoes in No. 3 cans sold as high as \$1.80 to \$2 per dozen to the retailer. Nineteen hundred and fifteen was a good garden year, and a large number of cans were put upon the market. Nineteen hundred and sixteen was one of the worst trucking years the country had ever known. Not only did the long drought of April and May damage the early plants until we could expect only half a crop, but in the South the July floods almost wiped out what remained. The supply of canned products was therefore very short all over the country, and the reserve supply of the jobbers and grocers had been called upon to such an extent that even a bumper crop in 1917 would scarcely meet the demand of ordinary circumstances. As it was, war conditions made an extra supply necessary and put upon the home the responsibility of filling every available glass jar for home use and every tin can for market.

While empty tin cans were high, the price of full cans was correspondingly high, and there appeared to be no chance of a canner losing out in the market if his pack were of standard grade.

In North Carolina the club girls have found it at times not unprofitable to sell to the jobber. Indeed, there are circumstances under which this is advisable. If a supervisor finds herself with a large output in a county, the market not very brisk, and the young canners quite impatient to sell, as is sometimes the case in a new county, a jobber who will agree to take the whole output or as much of it as the girls will agree to let go may prove himself a friend in need. The price is not much below the retail man's, and the short length of time it takes for the girls to reimburse themselves gives them courage and determination to keep on at the work another year. In some cases drop orders for these jobbers may be accepted; that is, a jobber will buy several thousand cans from a county, asking that one thousand be sent to John Doe, of Wilmington, and so many more to a firm in Charlotte, and so on. This saves the jobber the extra expense of receiving the whole shipment himself and reshipping to his customers.

Principal Money Crops.—The club girls' principal money crops are tomatoes, string beans, and soup mixture, though the demand for sweet potatoes, corn, kraut, peas, berries, peaches, preserves, jams, and pickles is constantly growing.

Five years ago the girl found it difficult to get her products upon the market without much hard work. To-day, because of her fidelity to standards and her willingness to make good any losses to the merchant, he is seeking her out and in many counties is taking every 4-H Brand can that is put upon the market. In 1916 the canning clubs of the South could have sold many times their output, and they are now looking forward to a more than doubled output, feeling that they have an assured market for all they can produce, and a great duty to perform in producing everything that their energy and determination can wrest from the ground.

Shipping.—The best marketing policy is to build up a trade in your own community. Certainly, unless your canning output is large enough to number in carload lots, it would not be profitable to ship to any great distance. Freight rates in small lots are high and rather unsatisfactory as to length of time in delivery. In North Carolina we frequently ship from one county to another when a territory has produced a large number of cans and feels that its market might not be sufficiently well established to dispose of them readily. But we are careful to ship to the nearest county having a market for more than it produced, and we make certain that the shipment goes over one line only.

For the most part, cans should be shipped in cases containing two dozen. Look at the regulation tomato box in any grocery store and observe the size. These boxes should be marked on both ends by a label. Just the same label which you paste on your can will answer and should be placed in the middle of the end spaces. This will enable the grocer to determine easily the contents of the case.

Last year I found some grocers and many institutions willing to have their products in tin shipped to them in barrels. The freight rate is cheaper on barrels, and if excelsior is used in the packing to prevent scratching of labels, six dozen No. 3 cans can be sent very well in this receptacle.

Shipment of products in glass can be made in barrels well packed with excelsior and arrive with practically no breakage. Pasteboard cartons are good for small packages of glass. Glass is best sent by express, though short-distance freight is quite safe for glass in barrels. The parcels post may be used to advantage for small packages, but they must be put in either a heavy pasteboard carton or a light wooden one and be well packed.

The Invoice.—When an order is shipped, an invoice or list of what is included in the shipment should be sent to the purchaser and a copy filed for the shipper's information. Never

Fig. 142.—North Carolina county agents attending canning school and conference, 1915.

neglect this, as much confusion results otherwise. A copy of the bill of lading should also be sent, but an express receipt should be kept by the shipper.

The Payment.—Some merchants ask that shipment be made sight draft with bill of lading attached. This means that the purchaser pays before taking the shipment from the station. Any banker will explain this shipment. Other merchants prefer the bill sent and a certain length of time in which to pay it. Any

PRODUCTS SOLD

Date	Kinds	Tin				Glass							No. lbs. sold fresh	No. lbs. home use	Value fresh vegetables
		No. 1	No. 2	No. 3	No. 10	Kinds	1-2 gal.	qt.	pt.	12 oz. jar	Glasses	Bottles			
Total															

grocer whose rating is good should be able to arrange satisfactory means of payment with the shipper. In five years of doing business with the merchant the North Carolina Canning Clubs have never to my knowledge lost a penny through nonpayment of bills.

In trading with the housewife cash payments are preferable, as too much time is consumed in a second visit to collect for small orders.

Records and Accounts.—Every canner should keep an account of just what she spends in her yearly venture. A complicated system of bookkeeping is not necessary; but to determine just what is cleared during the season and to be able to know whether the business pays, a strict record of what is paid out in money and time must be kept. The following things should be listed: cost of ploughing, fertilizer, seed, plants, time consumed in planting, cultivating, harvesting and canning, and the cost of sugar, cans, jars, labels, crates, etc. The cost of marketing must also be included.

A record should also be kept of what is sold, the prices received, and when delivered.

QUESTIONS

1. Describe briefly your idea of business integrity.
2. What plan of marketing do you believe would be the most feasible in your community? Why?
3. A fundamental demand of a commercial product is uniformity: give a brief explanation of each way in which packs should be uniform.
4. In what ways may the label influence ease of marketing?
5. Explain how prices are governed.

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CHAPTER XX

TEACHING CANNING AND RELATED ACTIVITIES

THE material contained in this volume may be used as a textbook in the hands of students in a course of canning and preserving given for high school, normal school, and college students. Here and there such courses are being given, and in many other institutions the subjects of canning and preserving are given attention. This book will also prove useful as a reference volume in connection with extension and other special courses, and in summer school courses for study as to utilizing fruits and vegetables cultivated on the city vacant lots, high school training farms, and school gardens.

Many schools and colleges are adding this line of practical work, in raising and canning fruits and vegetables, to their Home Economics courses. It had been found that the best results can be obtained where the productive side of the question is considered first, and where raising the products precedes their utilization in canning.

The subject of preservation of foods has been only barely touched upon in most of the Home Economics courses. Little time or study in schools has been given this very important phase of food conservation until very recently. Now the colleges of agriculture and colleges for women in nearly all of the states have included in their regular courses work in canning, or they give during the year a short course, which includes such instruction. Some of these courses are planned for Farmers' Week, Farmers' Institutes, and other special short courses. Sometimes courses are given in the state institutions for women and girls who have won the highest and best records in their state in home demonstration work and canning clubs. While the principles presented should cover representative phases of the subject, the practical work done will naturally be determined by seasons. Brief or a more exhaustive study should be given, according to the age and maturity of the students. It is understood that more of the bacteriology of canning will be given to advanced students. In planning courses the teacher should plan her work with reference to

1. Aim.
2. Subject-matter.
3. Methods.
4. Equipment.
5. Library.

A SUMMER SHORT COURSE

For a two-week summer short course the plan outlined below is suggested for the first year's work in canning. Necessary information to carry on such a course may be gotten from the text.

Lesson I. Lecture—Principles of canning.
Lesson II. Canning tomatoes or berries in glass.
Lesson III. Arranging necessary equipment for canning in tin. Canning tomatoes in tin.
Lesson IV. Utilizing tomato by-products: (*a*) Tomato purée; (*b*) tomato paste; (*c*) green tomato pickle; (*d*) tomato ketchup.
Lesson V. Plain fruit canning in tin—either peaches, figs, or pears—giving recipe for putting up a by-product for each fruit used.
Lesson VI. Fancy packing of fruits in glass for exhibit purposes.
Lesson VII. Canning beans and peas in tin.
Lesson VIII. Fancy packing of beans and carrots in glass for exhibit purposes.
Lesson IX. Canning corn in tin; canning baby beets in glass.
Lesson X. Canning sweet Spanish pimientos whole, in glass and in tin.
Lesson XI. Canning soup mixture in glass; packing of vegetable macedoine in glass.
Lesson XII. Arranging an attractive exhibit of products canned. Instructions on judging and scoring. Examination.

The second year's course should include preserving, jelly making, and crystallizing of fruits, as given in the following outline. A longer course in a single season for more mature students might include both.

Lesson I. Lecture—General principles of preserving.
Lesson II. Preserved watermelon rind or citron melon, also bottling fresh fruit juices.
Lesson III. Finishing watermelon rind preserve. Starting berry shrub.
Lesson IV. Preserved peaches, figs, or pears, with recipes for by-products. peach marmalade, fig marmalade, gingered pear, and jams.
Lesson V. Making the by-products of the fruit chosen for preserving.
Lesson VI. Making marmalades and conserves. Grape-fruit, kumquat, or orange marmalade; fig, plum, or rhubarb conserve.
Lesson VII. Fruit pastes or butters: apple, apricot, fig, or peach. Drying fruits and vegetables.
Lesson VIII. Jelly making. Begin crystallizing fruits.
Lesson IX. Pickling. Brining vegetables.
Lesson X. Curing of meats. (Lecture.)
Lesson XI. Making sweet pickles.
Lesson XII. Making relish, chutney, mangoes.
Lesson XIII. Finish crystallizing fruits and packing fruit pastes.
Lesson XIV. Arrange an attractive exhibit of products preserved. Instructions on judging and scoring.
Lesson XV. Summary of work done.

It is impossible to suggest a course of study which might be adopted without changes, since the value of such a course depends greatly upon the choice of suitable products, and those which the people being taught most desire to know about. The locality and the season of the year will cause the selection of material to vary considerably in different sections. However, considerable uniformity can exist in the instructions planned for an organization in a section or an entire state, depending upon a range of latitude and variation in climate.

COUNTY SHORT COURSES

A state-wide plan for all county short courses for canning club girls has helped work out a fine scheme of standardizing the special club products made during the four years' program of work throughout the state. The following is part of the plans which have been outlined for use in short courses:

First-year Canning Club Members.—First hour each day devoted to lecture on one of the general topics: Sanitation, Personal Hygiene, Principles Underlying the Work.

Two- to three-hour period daily for practical work in canning tomato products: salad tomatoes in thick sauce packed in glass, plain canned tomatoes in tin, tomato purée, tomato paste in tin and glass, green tomato pickle in glass, tomato ketchup in bottles, and soup mixture in glass.

A part of the time during these short courses is devoted to other phases of the club work which are emphasized at different seasons of the year, such as gardening, poultry work, winter gardening, sewing, bread making, and cooking and serving of club products.

Second-year Canning Club Members.—The second-year members spend the first hour in assembly hearing the general lecture. The practice period is devoted to work in canning and preserving the special products which they are growing on their one-tenth acre plots; soup mixture in tin, fancy packing of beans, peaches, or figs in glass, vegetable macedoine (band packing) in glass, baby beets, okra, Dixie relish.

Third-year Canning Club Members.—Dixie relish, canned pimientos, chutney, jelly, and preserves.

Fourth-year Members.—(*Canning Club, Home Demonstration Club, and Ladies from Town.*)

Jellies, preserves, marmalades, jams, and conserves. Pickling (brining of vegetables).

The short course outlined above is based upon the general plan of work which has been adopted in all the Southern States. It includes a program of work for four consecutive years. A description of this four-year program is given on page 302. In other sections, North and West, there are similar organizations of girls and women with programs which give gardening and canning work a large place. Such work provides for girls and young women of the farms a useful vocation, stimulating them to broader activities and more useful lives. From the standpoint of the individual, such work gives fine opportunity for development of self-reliance, initiative, and skill in special lines. This skill has a direct economic value, because the girls possessing it are enabled to earn money. By the coöperative community effort called forth by these lines of work, rural life is made more attractive for men, women, and young people alike.

An Outlined Program of Work for Girls' Demonstration Clubs in Oklahoma

I. Canning Clubs

- A. One-tenth acre gardens:
  - First year....... One-tenth acre tomatoes or home garden.
  - Second year.... One-tenth acre tomatoes and one other vegetable.
  - Third year..... One-tenth acre tomatoes, two other vegetables or one-twentieth acre vegetables, one-twentieth acre perennials.
  - Fourth year.... One-twentieth acre new perennials, one-twentieth acre perennials from third year or home garden.
- B. Winter gardens
  1. Fall gardens.
  2. Catch crops.
  3. Cover crops.

(*a*) Standardization of all garden and orchard products: Fresh. Preserved.

(*b*) Economic preservation of all waste products on farm.

(*c*) Exhibits at county and state contests held in the fall.

(*d*) See outlined plan of Home Demonstration Work, page 321.

II. Poultry Clubs

(*a*) Selection of breeds for....................
1. General utility purposes.
2. Egg production.
3. Market.

(*b*) Marketing of poultry and poultry products.

(*c*) Care of flock............................
- Breeding.
- Housing.
- Treatment of diseases.
- Grading.

(*d*) Use of reports.

(*e*) Exhibit........................
- Eggs.
- Pure-bred birds from setting of eggs.

(*f*) See outlined plan of Home Demonstration Work, page 321.

An Outline Plan of Home Demonstration Work for Women in Oklahoma.

1. Labor- and time-saving devices. . { Fireless cooker and oil stoves. Fly-traps and sanitary appliances. Ironing boards, wheel trays, tables with rollers, running water, etc. }
2. Economic production of wholesome food from all garden and poultry club products.
3. Home dairying.................. { 1. Sterile utensils. 2. Care and use of milk. 3. Butter making. 4. Marketing of dairy products. }
4. Sewing:
   (*a*) Making of club uniform... { Cap. Apron. Towel and holder. }
   (*b*) Selection of material for clothing.
   (*c*) Making of simple cotton dress.
5. Bread making................. { Begin with batters and end with yeast bread. Economic use of stale bread. Care of bread. }

COURSE OF STUDY IN FARMERS' BULLETINS FROM U. S. DEPARTMENT OF AGRICULTURE FOR WOMEN COUNTY AGENTS IN OKLAHOMA

For February, March, and April

Farmers' Bulletin No. 183 Meat on the Farm: Butchering, Curing, and Keeping.
Poultry (State lesson sheets).
Gardening (State lesson sheets).
642 Tomato Growing in the South.
679 House Flies.

For May, June, and July

634 (Year Book) Clean Water and How to Get it on the Farm.
607 Farm Kitchen as a Workshop.
541 Farm Butter Making.
375 Care of Food in the Home.
444 Remedies and Preventives against Mosquitoes.

For August, September, and October

51 Standard Varieties of Chickens.
644 Manufacture and Use of Unfermented Grape Juice.
478 How to Prevent Typhoid Fever.
270 Modern Conveniences for Farm Home.
646 Selection of Household Equipment.
132 Correlating Agriculture with Public School Subjects in the Southern States. Study one Text-book on Foods.

GARDENING AND CANNING IN CITIES

Such organizations as Boards of Education and Civic Associations have conducted gardening and canning in a number of cities. In the canning instructions conected with the vacant lot gardens, training farm plots, and school gardens in cities the fruit and vegetables should be canned as they mature. Sometimes a nearby school building which is usually closed during the summer months has available a well-equipped domestic science laboratory which could be used to great advantage in this summer work. If such a place is not available, a shady spot near the garden

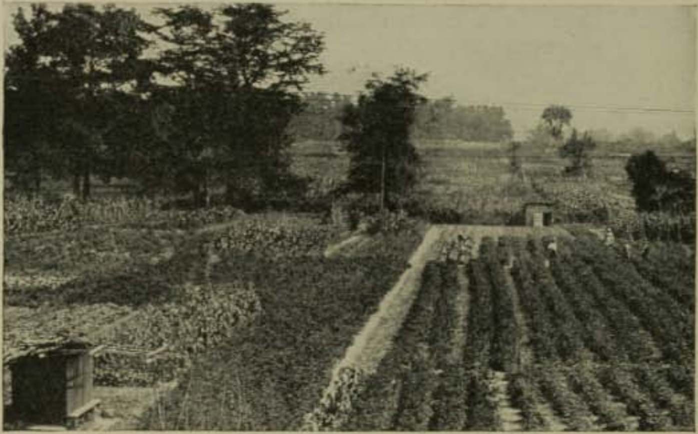


FIG. 143.—A cultivated city vacant lot in Philadelphia.

may be selected and here outdoor equipment set up for the canning work. Only a limited number of utensils are necessary.

Vacant Lot Gardening.—The vacant lot gardening in Philadelphia is typical of what some of the cities are doing and of what all should do (Fig. 145). Many property owners in this city lend their land with the understanding that in case they wish to sell, build, or use the land the gardeners will release it on a six weeks' notice. The work is conducted under the auspices of the Philadelphia Vacant Lot Cultivation Association. Several hundred families are made happier and brought to better health every year because of this opportunity to get close to Mother Nature. Such

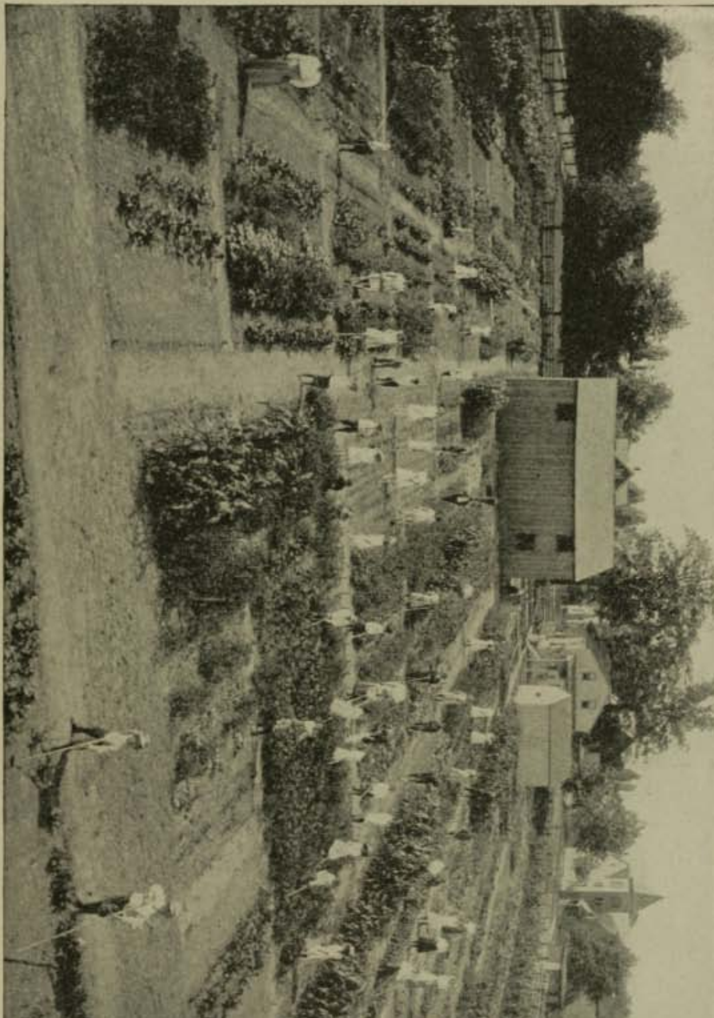


Fig. 144.—A training farm in Cleveland, Ohio, conducted by the City Board of Education and Home Gardening Association.

a privilege enables many people to provide wholesome food and recreation for their families during the summer months. Often a goodly supply of potatoes and other vegetables is grown and stored for winter use. At the same time the city is beautified by growing gardens on the vacant lots (Fig. 143).

What is not used in the homes or sold fresh might easily be canned, or dried, stored, and sold later or used during the winter months.

Fig. 145.—A coöperative neighborhood garden in Philadelphia, Pa.

School gardens (Fig. 144) should be large enough to produce a supply of vegetables for the home table, with a small surplus to sell or to can. In some country schools gardens have been cultivated by the children and the vegetables canned for use during the winter in hot school lunches.

The training farm work in Cleveland, 1910 to 1913, may be cited to show what city school gardens will accomplish. There the children studied the canning and preserving of all vegetables grown in their gardens, these canning lessons being given in the Domestic Science Department of the Schools.

One of the features of the work has been the exhibit of the garden products and canned goods (Figs. 147 and 148). All of the products exhibited were grown and put up by the children in the Willard School Farm (Fig. 149).

After the planting season, before the vegetables mature, there is opportunity to bring together the necessary equipment in a

FIG. 146.—A tomato plot in Geauga County, Ohio.

suitable place. The building of homemade canners and fly-traps may be taught as a part of the preparation for outdoor canning.

The fundamental principles of canning should first be taught through the use of the material most easily canned. Some of the early berries and fruits are easier to can than the vegetables, and lend opportunity for practice before the products which are more difficult to can come into bearing.

CANNING IN HIGHER INSTITUTIONS

Normal schools have already recognized the value of giving

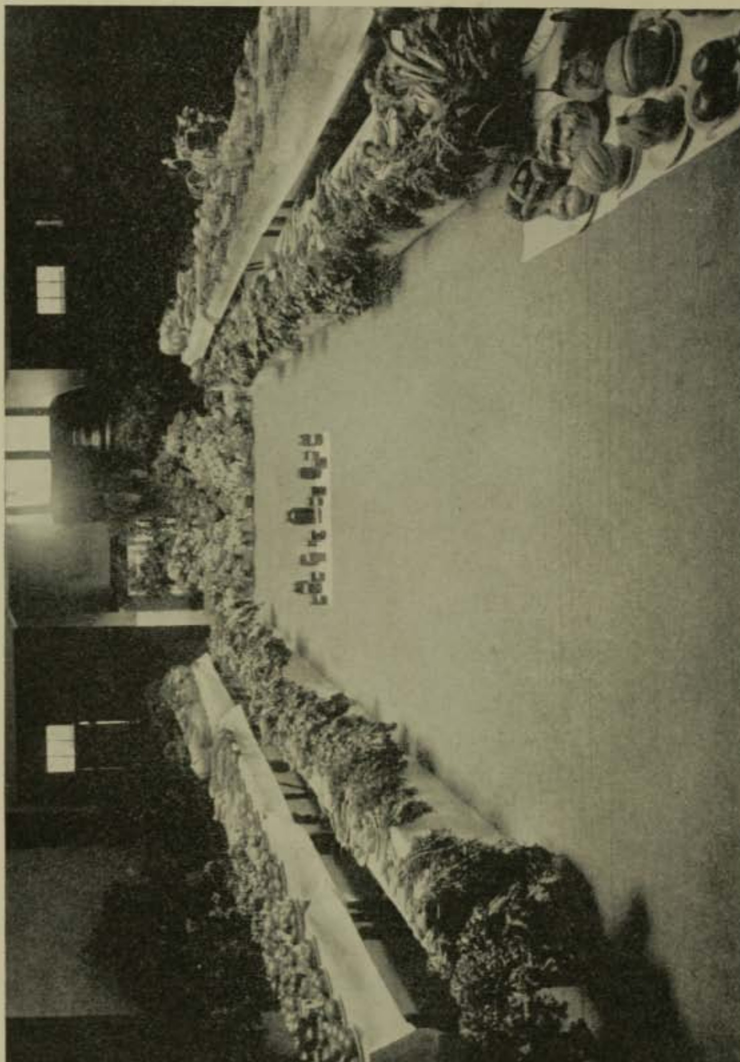


Fig. 147.—Harvest home exhibit, Willard School, Cleveland, 1910.

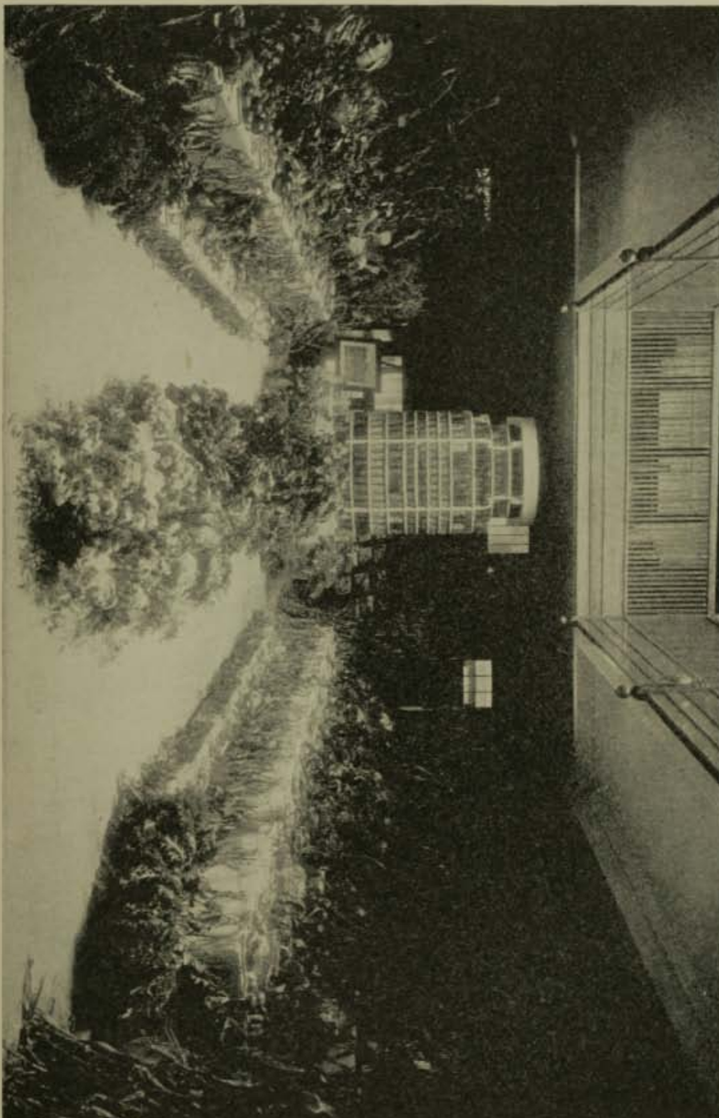


FIG. 148.—Harvest home exhibit in Willard School, Cleveland, 1911.

FIG. 149.—A ten-year-old member with her exhibit from a tiny plot, 18×22 feet.

FIG. 150.—Senior class at Harrisonburg Normal School, Virginia, cultivating and spraying their plants.

FIG. 151.—Staking and tying plants.

their students practical work of this nature so that later, as teachers, they may be prepared to direct these activities among children successfully. In many institutions students have organized themselves into canning clubs which they have conducted for the purpose of learning how to carry on these organizations among children.

The following series of illustrations will given an idea of what was done at one of the state normal schools in Virginia (Figs. 150, 151, 152, 153, and 154). A one-half acre scholarship plot

FIG. 152.—Prize winning short course girls pruning tomato plants.

was given to the senior class. They were to plant, spray, cultivate, stake, and prune the tomato plants. The canning club girls who won the state short course scholarships from various counties came to this school in the summer. The plot furnished opportunity for practical instruction in the garden. When the students returned to school in the fall the garden was in bearing.

The district agent in home demonstration work, who had her headquarters in this school, gave many demonstrations to the senior students in the utilization of this vegetable in various ways. Plain canned tomatoes, whole salad tomatoes in thick sauce, tomato purée, tomato paste, tomato ketchup, and green tomato pickles were the principal products made. The students be-

FIG. 153.—Senior class receiving instructions in canning.

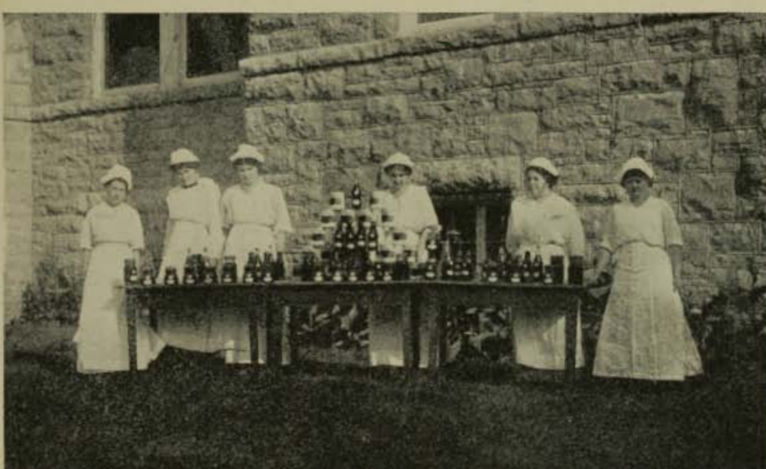
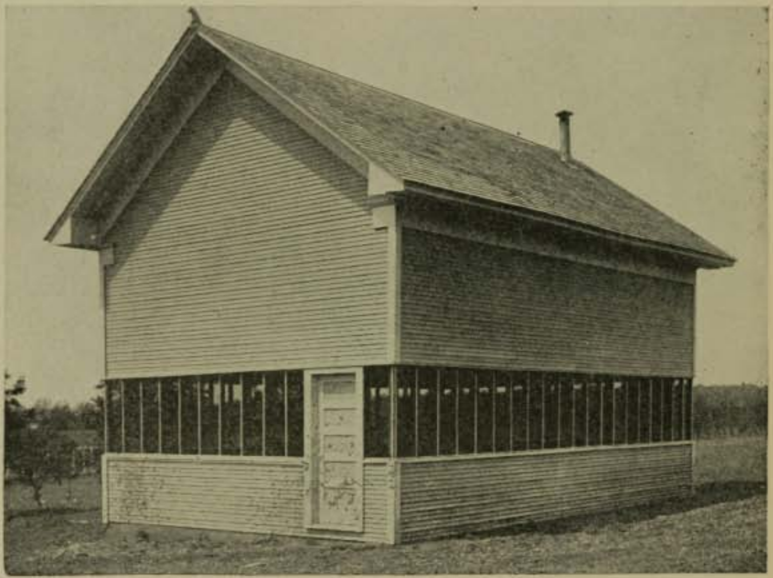


FIG. 154.—Students' display of canning products from the Scholarship Plot.

came skilled in canning and gave demonstrations for the benefit of other members of the school. Some of these products were

FIG. 155.—Tomato plot cultivated by senior class at Hattiesburg Normal School, Mississippi.



Pl an of building used for canning at State Industrial College, Denton, Texas.

used in the school dining hall and some were sold. The proceeds are to be turned each year into a permanent scholarship fund for canning club girls of the state.

The training given in the state normal school has enabled teachers to give fine assistance to the county agent in organizing canning clubs (Fig. 155). Colleges are also giving courses in canning; a notable example is the State Industrial College at Denton, Texas, which has provided a canning laboratory building (Fig. 156).

SUGGESTED LIST OF SUPPLIES FOR A SMALL LABORATORY

Brushes, etc.:

- 1 Fan-shaped sink brush
- ½ Dozen brushes for test-tubes
- ½ Dozen brushes for small cylinders
- ½ Dozen brushes, bristle

Choppers, Slicers, etc.:

- 1 No. 3 food chopper
- 1 Sterling slicer
- 1 Hand bottle capping machine
- 1 Hand fruit press

Cutlery, etc.:

- 2 Silver-plated dessert knives
- 1 Rubber-tipped sink shovel
- ½ Dozen spoons, tea, heavy plated
- 2 Spatulas, steel, nickel-plated, 6-inch blade
- 1 Sure-cut can opener
- ½ Dozen spoons, table, heavy plated (set of 6)
- ½ Dozen forks, table, heavy plated (set of 6)
- ½ Dozen knives, paring, three-inch blade

Crockery, etc.:

- 1 Dozen plates, dinner, 9-inch, plain
- 1 Dozen dishes, side, plain white
- ½ Dozen crocks, glazed stone, 1-gallon, with covers

Enamel Boilers, Pans, Cups, Trays, etc.:

- 1 Tray, white enamel, oval
- 3 Bowls, white enamel, four-quart
- 3 Pans, enamelled, sauce, No. 24
- 3 Pans, enamelled, stew, Nesco six-quart
- 6 Pans, enamelled, milk, round, six-quart
- 1 Pan, dish, tin, large size
- 1 Tureen, oval, enamelled, thirteen-quart (used for hot-water bath processor)
- ½ Dozen cups, enamelled
- 1 Cup, tin, one-quart
- ½ Dozen pans, enamelled, milk, oval
- ½ Dozen bowls, enamelled, one-quart
- ½ Dozen bowls, enamelled, two-quart

Funnels, Jar Fillers, etc.:

- 1 Patent funnel, pint size, copper, nickel lined
- 1 Aluminum jar filler

Glass Containers and Measures:

- 1 Gross No. 12 champagne shaped catsup bottles, roll top and crimp cap
- 3 Glass measuring cups, ½ pint, graduated
- 100 Processing clamps
- ½ Dozen graduates, glass, cone shape, eight-ounce
- ½ Dozen cups, feeding, glass
- 2 Dozen glasses, jelly
- 1 Dozen jars, preserve, Mason's standard one-pint
- 1 Dozen jars, Mason's Atlas one-quart, wide mouth
- 1 Dozen jars, Mason's Atlas one-pint, wide mouth
- 4 Dozen No. 5004 10-ounce vase-shape jar, with hermetic cap
- 4 Dozen No. 5042 12-ounce glass top, screw rim
- 2 Dozen No. 209 10-ounce tumbler-shape jar, with hermetic cap
- 6 Dozen No. 184 4-ounce jar, with hermetic cap
- 1 Gross thick red or gray rubber jar rings

Miscellaneous:

- 2½ Yards oilcloth, white
- 6 Yards denim, upholsterer's dark blue
- 10 Yards cheesecloth, bleached, 36 inches wide
- 5 Yards flannel, white
- 1 Dozen yards towelling, 17-inch linen
- 1 Dozen rolls paper hand towelling

Scientific Apparatus, Scales, and Supplies:

- 1 Scales, double beam, porcelain plate, 10-inch square, with brass scoop
- 2 Confectioner's thermometers, range 80 degrees to 350 degrees F.
- 3 Chemical thermometers, scale range 110 degrees C.
- 3 Chemical thermometers, scale range 230 degrees F.
- ¼ Dozen salt per cent scale, 0 per cent to 100 per cent
- 1 Sugar hydrometer, Balling scale 0 degree to 70 degrees, ½ degree gradation
- 2 Sugar hydrometers, Brix scale range, 0 degrees to 30 degrees, graduated ½ degree
- 2 Sugar hydrometers, Brix scale, range 30 degrees to 60 degrees, graduated ½ degree
- 2 250 c.c. cylinders, for floating spindles
- 1 Small steam pressure processor
- 1 Small "water-seal" canner
- 1 Wash boiler to be used for a "hot-water" canner

Sieves, Strainers, Ladles, etc.:

- 1 Sanitary sink basket
- 1 No. 80 purée sieve
- 1 Oblong wire draining tray for processing boiler
- 2 Aluminum ladle, oval bowl for pouring, hook on middle of handle
- 2 Perforated aluminum skimmers
- 1 Large aluminum strainer
- 1 Wire frying basket with bail for blanching vegetables
- 1 Purée seive
- 1 Colander

Wooden Ware, etc.:

- 2 Flat wooden spoons
- 1 Small potato masher for crushing fruits
- 1 Jar, slop, papier-maché
- ½ Dozen cane packing paddles
- ½ Dozen cane syrup paddles
- 2 Wooden paddles for testing jelly
- 2 Jelly racks

The above list is intended for experimental work; for individual class work the list would need to be supplemented. Can-

FIG. 157.—A North Carolina exhibit of first-year products.

ning instruction can be given in an ordinary cooking laboratory. One does not need a special room, although, as the work develops, a room set aside as "A Canning Laboratory" will tend to dignify the work and simplify the task of the instructor. A lecture room with a raised platform where demonstrations and lantern slide lectures could be given for the benefit of all students would be most useful. A list of catalogues and samples from commercial firms should be secured and students should familiarize themselves with the sources of supplies (see Appendix, p. 346).

Fig. 158.—A parish exhibit in Louisiana.

Exhibits.—Numerous benefits may be derived from exhibiting the finished products of canning and preserving work in schools and clubs. A "harvest home" in the school, a community fair, a county or state fair attracts attention to what has been accomplished and interests a greater number of people. One of the most important results of the exhibit is its use as a means of establishing standards of quality. It impresses forcibly the great necessity for uniform products. Uniform containers for the products improve the appearance of the whole exhibit (Figs. 157 and 158).

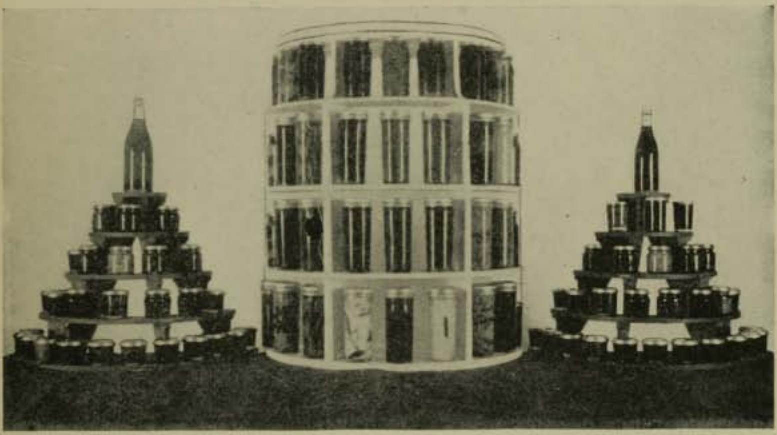


FIG. 159.—A miniature exhibit suggested as a plan for a fair.

Figure 159 shows a miniature exhibit suggested as a plan for a state fair booth. Each small pyramid, which is covered with dark green, is to represent the separate county or parish exhibit. The jars for each stand are usually selected from the best ones shown at the community or county fairs, and should represent the best work done in that county. The larger frame in the center is for special products which have been entered for individual awards.

This plan of arrangement by counties simplifies judging and makes possible a comparison of work done by the different counties at a glance. Standardized special products from the various

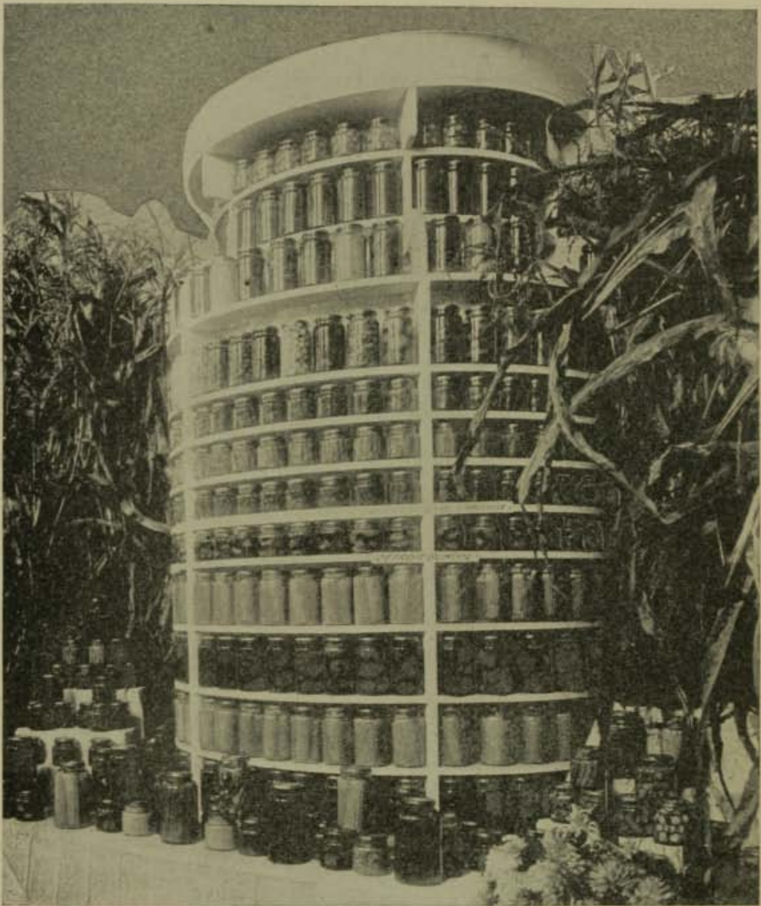


FIG. 160.—A carefully planned exhibit.

counties are assembled together, and the color scheme of the whole display is very effective. The center frame is supposed to represent a glass jar in shape. It is painted white, with a gilt band painted around the top to represent a lacquered jar cap. The white wooden frame is lined inside with white cheesecloth, and if a strong light is placed behind this cloth in the center it will shine through the clear liquid in the jars and make the products show up brighter and to much better advantage. This is an especially fine arrangement to show off effectively clear jellies, preserves, marmalades, and fruit juices. By placing products of one kind only on each shelf all around the frame an effective combination of bands of color can be obtained.

When exhibits are carefully planned and arranged it affords great pleasure to all who see them, and renders much easier the work of those who do the judging and place the blue ribbons (Fig. 160).

Judging the exhibits, if well performed, serves as a means of establishing standards of quality that make for excellence. It

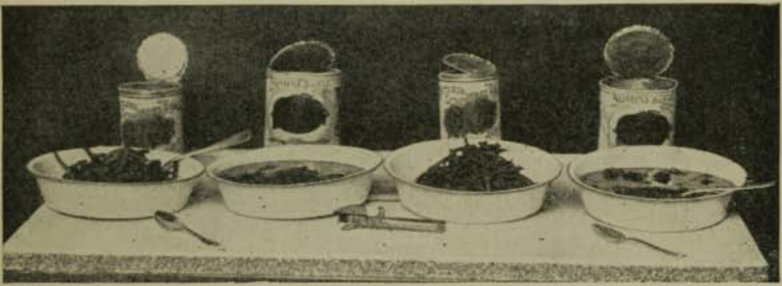


FIG. 161.—Judging canned tomatoes and beans.

emphasizes the importance of careful work, and of uniform packing in standard containers and packages.

Score Cards.—Such a card lists all the essential characteristics of a certain kind of product and assigns percentage numbers on a scale of a hundred; the more important items are given larger numbers, the less important items are given smaller numbers, and the sum of the numbers is made 100. A product is examined and compared by the judge with an ideal or perfect product; the ideal product would be scored 100; the product being judged will be discredited one or more points under the various items, and the score allowed it will be the sum of these discredits taken from the perfect score of 100 (Fig. 161).

The use of the score card has come to be common in judging such materials, and such cards help greatly to emphasize the essential points.

GENERAL SCORE CARD FOR CANNED FRUITS AND VEGETABLES

Appearance	Color	15	
	Clearness	10	25
Texture			10
Flavor			20
Uniformity	Ripeness	10	
	Appropriate size	5	15
Pack (arrangement in glass or weight in tin)			15
Container	Label	5	
	Neatness	5	
	Appropriate package	5	15
Total			100

Fig. 162.—This cow has proved to be a wonderful prize for this Tennessee girl.

Every one who sees such an exhibit and hears the public judging will go away with an intelligent appreciation of the exhibit and be stimulated with a greater desire for improvement through better methods of work.

Somewhat different scores are used for judging jelly, preserves, and relishes, and the following are only suggestive scores which will aid the judges and exhibitors by calling attention to the essential points that make for high standards:

FIG. 163.—A gardening set consisting of a kneeling pad and an apron for tools.

Score Card for Jelly:

Appearance	Color	10	
	Clearness	10	
	Crystals (lack of)	5	25
Consistency			40
Flavor			20
Container	Label	5	
	Neatness	5	
	Appropriate size	5	15
Total			100

The pronounced yet natural color of the fruit is most desirable. Natural fruit flavors and colors are much more artistic than artificially colored and flavored fancy jellies. Clear, sparkling, transparent jelly with no signs of crystallization make the product attractive in appearance. The texture is tender and cuts easily. It breaks with distinct cleavage, and the angles retain shape. The glasses should be uniform in shape and of appropriate size, practical for use in the average home. The clean covers should fit tightly, and a small, neat label should be properly placed.

Score Card for Preserves:

Fruit	Appearance (color and clearness)	10	
	Uniformity of pieces	10	
	Pack (arrangement)	10	
	Flavor	15	
	Texture	10	
	Container	5	60
Syrup	Clearness and color	10	
	Flavor	15	
	Consistency	10	
	Proportion of juice	5	40
Total			100

The preserved product should retain as nearly as possible original shape, color, and flavor of the fresh fruit. Too often the fruit flavor is destroyed by use of too much sugar. Preserved fruits should be plump and firm, yet tender and transparent. The pieces should be of uniform size and arranged in the jar with reference to symmetry and best use of the space within the container. About one-fourth as much syrup as fruit is a fair proportion of syrup to fruit in a jar.

Score Card for Relishes:

General appearance (color and clearness)	15
Choice and proportion of materials	10
Size and uniformity of pieces	15
Attractiveness of pack, garnish, etc	10
Flavor	25
Texture of material	20
Container	5
Total	100

The fresh, crisp texture is usually preferable in relishes. Pieces should be small, but of uniform size; attractive packing and placing the garnish should be considered. Usually for relishes a narrow strip of sweet red pepper, a small whole hot pepper, and a snip of some spice are placed on each seam of the jar. The label is placed midway between these narrow strips and one-fourth inch from the bottom of the jar.

Suggestions for Judging.—For judging vegetable and fruit pickles the general score card may be used. Those who exhibit should be familiar with the score cards and know what points will be considered in judging and understand why products do or do not win the blue ribbons. When the premium or highest award is not obtained the persons competing for it should know how they can improve.

Prizes.—The awarding of prizes should be most carefully planned, since more harm than good may be done if awards are not fairly made. Open competition offers stimulus to many, and larger numbers strive to attain the mark of the goal. Money prizes are not always advisable rewards to offer, unless in the form of bank deposits. Such deposits often establish a basis for the beginning of a savings account. Prizes to be given in city and country are naturally of different types (Fig. 162).

Appropriate prizes will tend to create a greater interest in country life. Many such prizes have been the starting point for much improvement and development about the home, especially where the prize continues to grow and proves a good investment for the time spent on it. Funds from prizes and especially, of course, from the sale of garden and canned products, have made possible further education for many Canning Club girls.

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10. United States Department of Agriculture, States Relations Service, bulletins published by the Office of Investigations on Farmers' Institutes and Movable Schools. Published by the States Relations Service, Department of Agriculture, Washington, D. C.
11. Yearly Reports, Home Gardening Association, Sixth and St. Clair Streets, Cleveland, Ohio.
12. Yearly Reports, Philadelphia Vacant Lot Cultivation Association, 2211 Land Title Building, Philadelphia, Pa.

APPENDIX

ADDRESS LIST OF STATE INSTITUTIONS FROM WHICH AGRICULTURAL EXTENSION WORK UNDER THE SMITH-LEVER ACT IS DIRECTED

For information concerning club work in any state write to the Director of Extension at the State College of Agriculture.

STATE	ADDRESS
Alabama	Alabama Polytechnic Institute, Auburn.
Arizona	College of Agriculture, University of Arizona, Tucson.
Arkansas	Extension Director, Old State House, Little Rock.
California	College of Agriculture, University of California, Berkeley.
Colorado	State Agricultural College of Colorado, Fort Collins.
Connecticut	Connecticut Agricultural College, Storrs.
Delaware	Delaware College, Newark.
Florida	College of Agriculture, University of Florida, Gainesville.
Georgia	Georgia State College of Agriculture, Athens.
Idaho	Extension Director, the State House, Boisé.
Illinois	College of Agriculture, University of Illinois, Urbana.
Indiana	Purdue University, Lafayette.
Iowa	Iowa State College of Agriculture and Mechanic Arts, Ames.
Kansas	Kansas State Agricultural College, Manhattan.
Kentucky	College of Agriculture, The State University, Lexington.
Louisiana	Louisiana State University and Agricultural and Mechanical College, Baton Rouge.
Maine	College of Agriculture, University of Maine, Orono.
Maryland	Maryland State College of Agriculture, College Park.
Massachusetts	Massachusetts Agricultural College, Amherst.
Michigan	Michigan Agricultural College, East Lansing.

STATE	ADDRESS
Minnesota	College of Agriculture, University of Minnesota, University Farm, St. Paul.
Mississippi	Mississippi Agricultural and Mechanical College, Agricultural College.
Missouri	College of Agriculture, University of Missouri, Columbia.
Montana	Montana State College of Agriculture and Mechanic Arts, Bozeman.
Nebraska	College of Agriculture, University of Nebraska, Lincoln.
Nevada	College of Agriculture, University of Nevada, Reno.
New Hampshire	New Hampshire College of Agriculture and the Mechanic Arts, Durham.
New Jersey	Rutgers College, New Brunswick.
New Mexico	New Mexico College of Agriculture and Mechanic Arts, State College.
New York	New York State College of Agriculture, Ithaca.
North Carolina	North Carolina College of Agriculture and Mechanic Arts, West Raleigh.
North Dakota	North Dakota Agricultural College, Agricultural College.
Ohio	College of Agriculture, Ohio State University, Columbus.
Oklahoma	Oklahoma Agricultural and Mechanical College, Stillwater.
Oregon	Oregon State Agricultural College, Corvallis.
Pennsylvania	Pennsylvania State College, State College.
Rhode Island	Rhode Island State College, Kingston.
South Carolina	Clemson Agricultural College of South Carolina, Clemson College.
South Dakota	South Dakota State College, Brookings.
Tennessee	College of Agriculture, University of Tennessee, Knoxville.
Texas	Agricultural and Mechanical College of Texas, College Station.
Utah	Agricultural College of Utah, Logan.
Vermont	University of Vermont and State Agricultural College, Burlington.
Virginia	Virginia Polytechnic Institute, Blacksburg.
Washington	State College of Washington, Pullman.

STATE	ADDRESS
West Virginia..........	College of Agriculture, West Virginia University, Morgantown.
Wisconsin	College of Agriculture, University of Wisconsin, Madison.
Wyoming	College of Agriculture, University of Wyoming, Laramie.

ADDRESS LIST OF FIRMS FURNISHING SUPPLIES FOR CANNING AND PRESERVING

Canning Outfits and Supplies

American Can Company.	Atlanta, Georgia........	Home canners, cans, and labels.
Baehr, Mrs. Hermine....	Baltimore, Maryland.... 29 Garrison Lane.	Tray for boiler (3 in 1).
E. F. Kirwan & Company.	Baltimore, Maryland ...	Hot-water bath canner.
Eubanks, Geo. L........	Union City, Georgia....	Hot-water canners, cans.
Farming Canning Machine Company.......	Meridian, Mississippi...	Hot-water bath canner.
Favorite Manufacturing Company	Tampa, Florida.........	Water-seal canner.
Griffith & Turner Co....	Baltimore, Maryland ... 205–207 N. Paca St.	Steam canners.
Hamp Williams	Hot Springs, Arkansas..	Home canners.
Home Canner Manufacturing Company	Hickory, North Carolina.	Hot-water bath canner.
Henninger & Ayes Manufacturing Company ...	Portland, Oregon	Steam canners.
Monarch Manufacturing Company	Chattanooga, Tennessee..	Hot-water bath canner.
Modern Canner Company.	Chattanooga, Tennessee..	Hot-water bath canner.
Northwestern Steel and Iron Works	Eau Claire, Wisconsin...	Steam canners.
Phillips & Buttorff Manufacturing Company ...	Nashville, Tennessee ...	Hot-water bath canner.
Pressure Cooker Company	Denver, Colorado	Aluminum steam canners and cookers.
Raney Canner Company..	Chattanooga, Tennessee..	Hot-water bath canner.
Royal Home Canner Company	Chattanooga, Tennessee..	Hot-water bath canner.

Southern Evaporator Company	Chattanooga, Tennessee	Hot-water bath canner.
Sprague Canning Machinery Company	Chicago Illinois 222 North Wabash Ave.	Steam canners.
Stahl, F. S.	Quincy, Illinois	Hot-water bath canner.
The Candy Canner Company	Overton, Texas	Hot-water bath canner.
Utility Company	Hickory, North Carolina	Hot-water canner.
West Manufacturing Company	Philadelphia, Pa.	"Carbery Water-seal Canner."

Mechanical Seals and Sealers for Tin and Glass

American Metal Cap Company	Brooklyn, New York Summit St. and Commercial Wharf.	Metal bottle caps.
Bowers Can Seal Company	Boston, Massachusetts 146 Summer St.	Automatic can sealers, tin cans.
Burpee & Letson, Ltd.	South Bellingham, Wash.	Automatic can sealers, tin cans.
Crown Cork and Seal Company	Baltimore, Chicago, San Francisco, and other cities	Metal bottle caps and sealers.
Henninger & Ayes Manufacturing Company	Portland, Oregon	Automatic can sealers, tin cans.
New Process Cork Company	Hoboken, New Jersey 15th and Garden Sts.	Metal bottle caps.
The Enterprise Manufacturing Co. of Pa.	Philadelphia, Pa.	Bottle cappers — from three inches to 14 inches.

Steamers

Wilmot, Castle & Co.	Rochester, New York	Steamers.

Heating Devices

Manning, Bowman & Co.	Meriden, Connecticut	Alcoholite stoves.
Glove Gas Light Company	Boston, Massachusetts	Kerosene gas stoves.
W. J. Baker Company	Newport, Kentucky	Gates folding camp stove, gasoline stove.

Tin Cans, Glass Jars, Earthenware Jars, Bottles, and Rubber Rings

Acme Glass Company	Olean, New York	8- and 10-ounce ketchup bottles.
American Can Company	Baltimore, Maryland Philadelphia, Penna. New York City. Chicago, Illinois. Atlanta, Georgia.	Tin cans.
Ball Brothers Glass Manufacturing Company	Muncie, Indiana	Mason and glass-top jars.
Boston Woven Hose and Rubber Company	Boston, Massachusetts	Rubber rings.
Chesapeake Glass Company	Baltimore, Maryland	Glass jars.
Continental Can Company	Chicago, Illinois	Tin cans.
Hazel-Atlas Glass Company	Wheeling, West Virginia	Fruit jars and tumblers.
Hemingray Glass Company	Covington, Kentucky	Glass jars.
Kerr Glass Manufacturing Company	Sand Springs, Oklahoma	Economy jars.
Marion Flint Glass Company	Marion, Indiana	
Revson, Frank	Atlanta, Georgia	Bottles.
Robins, A. K., & Co.	Baltimore, Maryland	Tin cans and general equipment.
Savannah Wooden-ware Company	Savannah, Georgia	Glass jars.
Schloss, Ben	San Francisco, Calif.	Two-piece top jars.
Smalley Fruit Jar Company	Boston, Massachusetts	Queen glass jars.
Southern Can Company	Baltimore, Maryland	Tin cans.
Staunton Jar Corporation	Buffalo, New York Ellicott Square.	Vacuum seal jars.
Tennessee Can Company	Chattanooga, Tennessee	Tin cans.

Thatcher Manufacturing Company ....Elmira, New York ......Glass jars.
Travis Glass Company..Clarksburg, Virginia ...Glass jars.
United States Can Company ....Cincinnati, Ohio ....Tin cans.
Virginia Can Company..Buchanan, Virginia ....Tin cans.
Western Stoneware Company ....Monmouth, Illinois .....Earthenware jars.
White Crown Fruit Jar Company ....Louisville, Kentucky ...White Crown screw caps for Mason jars.
National Can Company..Baltimore, Maryland ...Tin cans.

Vegetable and Fruit Drying Equipment for Commercial and Home Use

Allen Fruit Company....Salem, Oregon.
Beck Evaporator Company ....Watsonville, California.
Boutell Manufacturing Company ....Rochester, New York.
Blymyer Iron Works Company ....Cincinnati, Ohio.
Caledonia Bean Harvester Works ....Caledonia, New York.
Devine, J. P., Company..Buffalo, New York.
Fahrney, E. B..........Waynesboro, Pa.
Field, J. A., & Co.......St. Louis, Missouri. 6th and Howard Sts.
Gaylord, F. D...........Sodus Point, New York..Furnaces.
General Dehydrator Company ....New York City, N. Y. 114–118 Liberty St.
Goodrich, A. C., & Co...North Yamhill, Oregon.
Granger Manufacturing Company ....Philadelphia, Pa.
Harrison Rich ....Carrolites, California.
Miller, F. H............Caledonia, New York....Furnaces.
Munsville Plow CompanyMunsville, New York.
Palmer & Co...........Noble, Illinois.
Sebastian Brothers.....Odin, Illinois.
Smith's, E., Sons........Buffalo, New York.
Seeley, D. W...........Sodus Point, New York...Furnaces.
Shaver, H. W...........Sodus Point, New York...Furnaces.
Southern Canner and Evaporator Company..Chattanooga, Tennessee.

Sperry, D. R., & Co......North Aurora, Illinois.
Steam Heat Evaporating
Company ....Charlotte, Michigan.
Stutzman Manufacturing
Company ....Ligonier, Indiana.
Trescott, W. A..........Fairport, New York.

Miscellaneous Corrugated Cardboard Containers

American Paper Products Company..St. Louis, Missouri, 205 Bremen Ave.
Andrew Paper Box Company........Chattanooga, Tennessee.
Empire Printing and Box Company..Atlanta, Georgia.
Hinde & Dauch Paper Company.....Sandusky, Ohio.
LaFore Foster Company............Philadelphia, Pa., 1211 Noble St.
Lawrence Paper Manufacturing Company ....Lawrence, Kansas.
Mid-West Box Company............Anderson, Indiana.
Robert Gair Company..............Brooklyn, New York.
Sefton Manufacturing Company ....Chicago, Illinois, 1301 West 35th St.
Thompson & Norris Company.......Boston, Massachusetts.
Brooklyn, N. Y., Prince and Concord Sts.
Brookville, Indiana.

Cardboard Paraffin-coated Containers

American Can Company............New York City, N. Y., 447 W. 14th St
American Mono-Service Company....Newark, New Jersey.
Purity Paper Bottle Company......Washington, D. C., 1341 S. Capitol St
Sanitary Paper Bottle Company.....Sandusky, Ohio.
Weis Manufacturing Company ......Monroe, Michigan.
Wyle, T. Wilson...................Philadelphia, Pennsylvania.

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