FOOD STUDY

A Field of Sugar Cane

The source of one of our important foods

FOOD STUDY

A TEXTBOOK IN HOME ECONOMICS FOR HIGH SCHOOLS

BY

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To

MRS. ALICE PELOUBET NORTON

WHOSE TEACHING HAS BEEN THE SOURCE OF INSPIRATION OF THIS BOOK

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FOREWORD TO THE TEACHER

Home Economics is still so new a study that no apology is necessary for placing another textbook in this subject on the market. Many of the best books which are now available obviously are intended for the benefit of the teacher rather than for the student, while others are little more than carefully selected collections of recipes. The present work is an attempt to present a manual of definite directions which will aid the student in her adventure into the subject, but it is by no means intended to supersede the teacher or to furnish material which can be taught by one untrained in the subject.

As in physics and chemistry, there are principles in cooking which are worthy of consideration, and, as in any science, they should be taught from an inductive standpoint. But, equally, no attempt at a completely inductive course should be made. The accumulated experiences of mankind can be used with benefit. To show a cake, for example, to a student who knows nothing of cooking, and let her guess the ingredients, the methods of combining them, and the temperature used in baking, and then to let her experiment until she produced a perfect cake, might teach cooking, but the road would be long and arduous. On the other hand, here, as in other sciences, sufficient discovery to arouse interest, to enable the pupil to question understandingly, and to give control of the situation, is of undoubted benefit and leads on naturally to research.

Where inductive courses have failed, the reason has been most often that the preparatory steps have been omitted by the teacher, and the student has been set to find out something when she has no knowledge of what she has set out to find. Chance discoveries, of course, find their applications later on, but this is not education. The student needs to have clearly in mind the results looked for, before she begins an experiment. This by no means implies that the result itself should be known, for then interest is dulled. References should be looked up only after the practical work, or its chief value is lost.

If it is necessary to economize on time, where comparative results are to be obtained, as in making tea, the experiments may be divided among the class so that one student compares her results with those of her neighbors. This distribution of work, however, is not possible when preparing dishes which call for skill in handling or involve some special principles in combining or in cooking; but there is no reason why one student may not prepare bean soup while her neighbor makes potato soup. Such a practice often helps to impress underlying principles. College classes have been known to finish their course in cooking with the idea that a special recipe was necessary for each kind of soup or cake, and without knowledge of proportions which would tell them when a recipe was outside the bounds of possibility. This is the result of cooking entirely from recipes. On the other hand, an error quite as bad is made when recipes are never used.

The order of the topics in this book is not that of the conventional cook book, nor is it based on the chief food principles, but is a logical working out of the subject and makes possible certain advantages in presentation, as the early introduction of such subjects as meals and serving. This gives opportunity for the economic study needed as a basis for household management — all too often omitted from courses in home economics — and also affords an occasion for necessary repetition of work, if skill as well as knowledge is to be acquired. Another excellent way to introduce repetition is by contests, in which, for example, the students not only try to see who can make the best bread but also are required to judge the results and show why one is more desirable than another. In this way they learn standards of perfection otherwise difficult to teach. Regulation "score cards" may or may not be used for such work.

The laboratory notes should show clearly the results obtained in all experiments and should also answer all questions asked in the directions. Recipes may be written here, or better, kept in card catalog form. It is well to accustom the student to the handling of a cook book, and familiarity with more than one is surely desirable.

The divisions I, II, III, and the like do not mean divisions of single lessons. The experiments and the cooking presented in each chapter can be carried out in a double period of an hour and a half. Following the laboratory work of each chapter of the text is material intended to be taken up in subsequent recitations. Double periods are not needed for recitation. If the schedule calls for them, part of the time may well be occupied in writing up note books. A double period for laboratory work and a single period for recitation form a unit of work which may be given once in a week, or twice if time permits.

The questions at the end of the lessons are not intended to be written up in the laboratory notes, as they are often much too comprehensive. Neither are they intended to be exhaustive. Their object is to show the student the scope of the subject, to give definite material to look for in the references, and to start the student thinking.

The laboratory work may be extended indefinitely by preparing under each section other dishes which are similar in principle. (See list of supplementary laboratory work.) For convenience in using supplies, other dishes can be substituted for those mentioned. In jelly-making, for example, crab apple and grape are the fruits given, one chosen as a juicy fruit requiring the addition of no water, the other needing water in its preparation; any other fruits answering these requirements may be substituted. Jelly-making, pickling, and preserving are placed first in the course, not because it is the logical order, but because autumn is the best time in the school year to obtain the necessary fruits. An attempt has also been made to consider the amount of skill required in every process. For this reason the dough and batter series has not been introduced directly after the first study of starch, but has been placed after the meat and vegetable work. Since a laboratory using many ovens becomes exceedingly warm, the roasting of meat and the baking of bread, cake, and pies are not left until the end of the course, for the least possible hot work is desirable at the end of the school year.

It has not seemed desirable to explain such processes as how to break an egg, how to beat eggs, how to "fold" in the whites, how to use a rolling-pin, and all the rest. The teacher who shows the process can make it plainer than any words can do.

CONTENTS

CHAPTER I

FRUIT

PAGE

Coddled Apples; Apple Sauce; class experiment (Spoiling of Fruit); lesson on Fruit 1

CHAPTER II

CANNING FRUIT

Canned Peaches; class experiment (Cause of Fruit Spoiling); lesson on Molds 7

CHAPTER III

JELLY

Apple and Grape Jelly; Trial Jelly; Experiments and Tests for Jellying; lesson on Principles of Jelly-making . . 13

CHAPTER IV

JELLY-MAKING

Repeated Extractions; class experiments (Food Preservatives); class work (Cucumber Pickles); lesson on Yeasts and Bacteria 19

CHAPTER V

SWEET PICKLED PEACHES

PAGE

Class experiments (Micro-organisms); lesson on Micro-organisms 25

CHAPTER VI

USE OF WATER IN COOKING

Boiled Potatoes; Mashed Potatoes; class experiment (Stages of Boiling Water); lesson on Potatoes 30

CHAPTER VII

USE OF WATER IN COOKING

Boiled Eggs; Stuffed Eggs; class experiments (Eggs); lesson on Water 39

CHAPTER VIII

USE OF WATER IN COOKING

Poached Eggs; class experiment (Solubility of Egg White); class experiment (Correct Temperature for Poaching Eggs); lesson on Eggs 46

CHAPTER IX

USE OF WATER IN COOKING

Cereal Breakfast Foods; class experiment (Relation of Surface to Evaporation); Cereal with Fruit; class experiments (Cereals); lesson on Cereal Breakfast Foods . 51

CHAPTER X

STARCH

Apple Tapioca; Boiled Rice; lesson on Starch . . . 56

CHAPTER XI

RICE AND INDIAN PUDDINGS

PAGE

Cost of Breakfast Foods; preparation of Rice Pudding, Indian Pudding, and Crisped Cereals; lesson on Cellulose; lesson on Mineral and Organic Salts . . . 62

CHAPTER XII

REVIEW LESSON

Breakfast, preparation and serving; lesson on Setting the Table 67

CHAPTER XIII

TEA

Marshmallow Wafers; individual experiments (Green Tea); class experiments (Black Tea); lesson on Tea . . 74

CHAPTER XIV

COFFEE

Cheese Wafers; class experiments (Making Coffee) . . 79

CHAPTER XV

COCOA AND CHOCOLATE

Oatmeal Cookies; class experiments (Making Cocoa); Preparing Chocolate; lesson on Cocoa, Chocolate, Condiments and Flavoring Extracts 83

CHAPTER XVI

FREEZING

Water Ices; Sherbet; class experiments (Freezing Mixtures); Lemon Ice; class work (Lemon Sherbet); lesson on Freezing Mixtures 90

CHAPTER XVII

RECEPTION

PAGE

Candied Fruit Peel; Marguerites; Sandwiches; lesson on Receptions 95

CHAPTER XVIII

COMBUSTION AND FUELS

Scalloped Potatoes; class experiments (Fuels); lesson on Combustion and Fuels 98

CHAPTER XIX

DRAFTS AND THE COAL RANGE

Baked and Stuffed Potatoes; class experiments (Drafts); lesson on Coal Stoves 104

CHAPTER XX

FLAME AND GAS STOVES

Chocolate Bread Pudding; class experiments (Care of a Gas Stove); lesson on Gas Stoves; How to Read a Gas Meter 108

CHAPTER XXI

RADIATION AND CONDUCTION OF HEAT

Class experiments (Transmission of Heat); Scrambled Eggs on Toast; lesson on Fireless Cookers 114

CHAPTER XXII

CONVECTION OF HEAT

Class experiments (Transmission of Heat); Potato Salad; Broiled Bacon; lesson on Hot-water Systems; lesson on Kitchen Ware 118

CHAPTER XXIII

REVIEW LESSON

PAGE

Second Breakfast; Omelets, Fried Mush and Syrup; lesson on Table Manners 122

CHAPTER XXIV

MEDIUM WHITE SAUCE

Class experiments (Starch); White Sauce; Creamed Chipped Beef on Toast; lesson on Wheat 128

CHAPTER XXV

THICK WHITE SAUCE

Salmon Croquettes; Cheese Soufflé; lesson on Bread Flour . 132

CHAPTER XXVI

STARCH

Class experiment (Comparison of Flour and Cornstarch); Cornstarch Mold; Chocolate Sauce; Macaroni and Tomato Sauce; lesson on Cornstarch 135

CHAPTER XXVII

CREAMED VEGETABLES

Class experiments (Effect of Heat on Starch); Peas and Carrots; lesson on Canned Vegetables 139

CHAPTER XXVIII

THIN WHITE SAUCE

Cream Soups: Celery and Potato; lesson on Classification of Vegetables. 142

CHAPTER XXIX

SCALLOPED VEGETABLES

PAGE

Class experiment (Mineral Ash in Vegetables); Cooking Cabbage or Onion; Cream Soup; lesson on Vegetables . 146

CHAPTER XXX

GREEN VEGETABLES

Spinach; Lettuce; class experiments (Freshening of Green Vegetables); French Dressing; Sour Cream Dressing; lesson on the Amount of Food Necessary . . . 150

CHAPTER XXXI

SWEET-FLAVORED VEGETABLES

Squash; Buttered Beets; class experiment (Sugar Test); lesson on Cane and Beet Sugar 158

CHAPTER XXXII

CANDIES

Class experiment (Stages in Sugar Cooking); class experiment (Crystallization of Sugar); lesson on Carbohydrates 162

CHAPTER XXXIII

MEAT CAKES WITH CREAMED TURNIPS

Class experiment (Tests with Meat); class experiment (Structure of Meat); Broiled Meat Cakes; lesson on Meat 168

CHAPTER XXXIV

TENDER MEAT

Roast Beef; Broiled Beefsteak and Corn Pudding; class experiment (Cooking Meat); lesson on Cuts of Beef and Principles of Cooking Meat 175

CHAPTER XXXV

BEEF STEW

PAGE

Class experiments (Cooking Meat); Beef Stew and Dumplings; class experiment (Keeping Meat Tender); lesson on Meat Inspection 179

CHAPTER XXXVI

LEFT-OVERS

Southern Spoon Bread; lesson on Proteins 183

CHAPTER XXXVII

MEAT SOUPS

Class experiment (Soluble Contents of Meat); class experiment (Use of Bones in Soup); lesson on Meat Soups . 188

CHAPTER XXXVIII

GELATINE DISHES

Lemon Jelly; Snow Pudding; Bavarian Cream; class experiments (Gelatine); lesson on Gelatine 191

CHAPTER XXXIX

REVIEW LESSON

Dinner; Split-Pea Soup; Spanish Cream; lesson on Styles of Serving 194

CHAPTER XL

POULTRY

Roast Chicken; Fried Chicken; class work (Weighing, Dressing, Trussing, Roasting, and Frying Chicken); lessons on Poultry and the Digestibility of Meat 198

CHAPTER XLI

FISH

PAGE

Baked Fish; Boiled Fish with Egg Sauce; Scalloped Fish; Stewed Tomato; lesson on Composition and Digestibility of Fish 202

CHAPTER XLII

OYSTER STEW — FISH CHOWDER

Class experiment (Cooking Oysters); Preparation of Oyster Stew and Fish Chowder; lesson on Oysters . . . 207

CHAPTER XLIII

REVIEW LESSON

Dinner; Tomato Soup; Jellied Prunes; lesson on The Dining Room 213

CHAPTER XLIV

POP-OVERS

Making Pop-overs; class experiments (Measuring Sifted Flour; White of Egg in Hot Fat); lesson on Flour Mixtures 216

CHAPTER XLV

APPLE FRITTERS

Class experiment (Principle of Leavening); Apple Fritters; lesson on Leavening 220

CHAPTER XLVI

SOUR MILK GRIDDLECAKES

Class experiment (Soda as a Leavening Agent); Sour Milk Griddlecakes; lesson on Soda 222

CHAPTER XLVII

LEAVENING

PAGE

Sweet Milk Griddlecakes; Sponge Cake; class experiment (Baking Powder); lesson on Baking Powders . . . 226

CHAPTER XLVIII

MUFFINS

Making Muffins; class experiment (Weight of Flours); lesson on Kinds of Flour 230

CHAPTER XLIX

CAKE

Making a Plain Cake; Frosting; class experiment (Bread Flour and Pastry Flour); lesson on Cake-making . . 233

CHAPTER L

BAKING-POWDER BISCUITS

Biscuits; Sour Milk Gingerbread; lesson on Baking-powder Biscuits 237

CHAPTER LI

SUGAR COOKIES

Class experiments (Yeast); Sugar Cookies; Ginger Snaps; lesson on Yeast 240

CHAPTER LII

BREAD-MAKING

Mixing and Baking Bread; class work (Kneading); lesson on Bread and Bread-mixing 244

CHAPTER LIII

BREAD

PAGE

Rolls; Graham and Oatmeal Bread; class work (Parker House Rolls); lesson on Bread and Bread-baking . . 249

CHAPTER LIV

PIES

Class experiments (Proportions of Fat and Liquid to Flour); Pie Crust; Apple Pie; lesson on Pastry 254

CHAPTER LV

DOUGHNUTS

Class experiments (Fats); Doughnuts; lesson on Fats . 257

CHAPTER LVI

MILK FATS

Butter; Whipped Cream; Philadelphia Ice Cream; class experiments (Cream and Butter); lesson on Butter . . 262

CHAPTER LVII

CUSTARDS

Custard Ice Cream; Boiled Custard; Baked Custard; Frozen Custard; lesson on Milk 267

CHAPTER LVIII

ACIDS AND MILK

Cream of Tomato Soup; Lemon Milk Sherbet; class experiments (Acids and Milk); lesson on Milk (*Continued*) . 272

CHAPTER LIX

CURD OF MILK

PAGE

Cottage Cheese; Junket Custard; class experiments (Effect of Heat on Sour Milk); lesson on Food for Children . 276

CHAPTER LX

CHEESE

Cheese Pudding; Welsh Rabbit; class experiments (Effect of Extreme Heat on Cheese); lesson on Cheese . . 281

CHAPTER LXI

SALADS

Class experiments (Emulsions); Salad Dressings; lesson on Arrangements in the Kitchen and Dining Room . . 285

CHAPTER LXII

LUNCHEON

Prepare and Serve a Luncheon; lesson on Menu-making . 292

APPENDIX

Food Requirements; Tables of Height and Weight; Table of Fuel Values 297

SUPPLEMENTARY LABORATORY LESSONS . . 313

INDEX 315

INTRODUCTION

PLANNING meals is often thought a very simple piece of work, and perhaps it is comparatively so, if it is not necessary to consider either time or money. But people are beginning to believe that it is really their duty to consider both, and many of us have to, whether we would or no.

Think, then, of all that it is necessary to know in order to do this work well. First, the housewife must know what the income is and how it is to be divided. Only thus can she determine what the family can afford to spend for food.

Next, she must know, in order to decide what is to be served for dinner, what is in the market, and a great deal about qualities and prices. In selecting meats, it is necessary not only to be able to tell whether a given piece is good, but to know what cuts are appropriate for different uses. In choosing fresh fruits and vegetables, a knowledge of what is in season is essential for wise buying, since out of season they may be poor and yet command even higher prices than good ones when these are plentiful. Some knowledge of brands of canned and package goods is useful, but will probably have to be acquired locally. Even with all this information, a knowledge of the part played by these foods in nourishing the body, and of their relative value from this point of view, should govern the actual purchases; and, curiously enough, these considerations have no connection with the price.

It is surely necessary to know how to prepare and serve food in an appetizing manner. At first thought a knowledge of cooking might seem necessary for the planner only when she is also the cook; but without such knowledge how is the manager to look out for the use of left-overs, the saving of fuel, the adjustment of plans to oven space, and above all, the amount of work required? One meal which seems very much like another may involve three times as much work in preparation, and the real cost of food is not merely the price paid for it in the store, but also the cost of the labor required to prepare it, and of the fuel to cook it.

From such consideration, it is evident that the planning of meals requires broad knowledge, and it is easy to see why food study is taking such a prominent place in school work, and why it involves so much more than the art of cookery.

FOOD STUDY

I

FRUIT

Coddled Apples
Apple Sauce

A. **Class Experiment.** The Spoiling of Fruits.

Put three test tubes, with corks to fit, in a pan of cold water and heat slowly to boiling. Empty the tubes and half fill with uncooked fruit cut in small pieces.

1. Fill up the first tube with cold water, cork, and seal with paraffin or wax.
2. Cover fruit in the second tube with water and boil for three minutes. Fill up with boiling water; cork and seal.
3. Repeat (2), but do not cork the tube.
4. Take a tube which has not been boiled. Cook a little fruit separately and, when it is cooled, put it into the tube. Add enough of the fruit and juice to fill it; cork and seal.

Note results at the end of twenty-four and forty-eight hours, and after several days. Under which conditions does the fruit keep?

B. Keeping Fruit from Breaking while Cooking.

1. Pare a peach. Cook half of it in half a cup of water. When it is tender, add two tablespoons of sugar.
2. Make a syrup of half a cup of water and two tablespoons of sugar, and cook the other half of the peach in it.

Compare the results.

C. Prepare coddled apples and apple sauce, using one apple.

Coddled Apples.

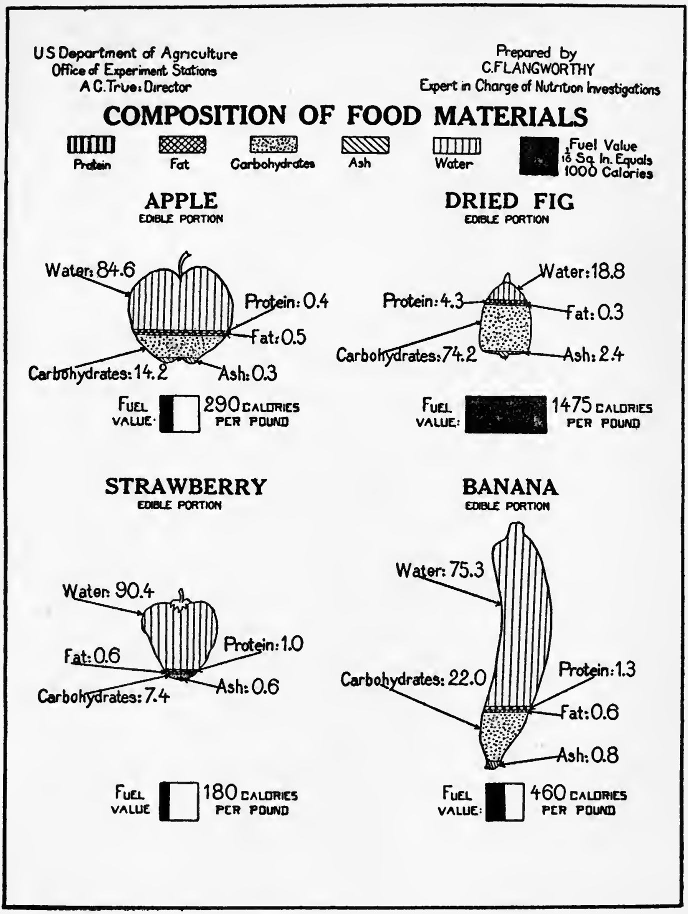
The apple may be washed and pared, and cooked whole or quartered and cored; but the whole apple or the piece, whichever is used, should keep its shape. Therefore cook gently. Use one-third as much sugar as water for the small quantity. When shall the sugar be added? A bit of stick cinnamon may be cooked with the apple.

Apple Sauce.

Wash, pare, core, and cut up an apple. Use about one-third of a cup of water to an apple, and one-third as much sugar as water. Here the apple should not keep its shape. When shall the sugar be added? One-half teaspoon of lemon or nutmeg or cinnamon may be added.

Fruit

The botanist defines fruit as the seed-bearing parts of a plant. However, we commonly call some of the fruits vegetables; as, for example, tomatoes, cucumbers, and squash. Then there are a few vegetables, such as rhubarb, which we use and think of as fruit. Only a few years ago it was hard to obtain fresh fruits in winter. Bananas could be obtained only in the larger cities, and oranges



Composition of Fruits

and lemons were very expensive. Now conditions have changed. Transportation is so much more rapid that with the development of refrigeration we can have fruit shipped from a distance and so are enabled to have fresh fruit all the year round.

Fruit is sometimes classified from a nutritive standpoint, as flavor fruit and food fruit. Some fruit contains so much water that there is comparatively little nourishment to be had from it. Watermelons and strawberries, for example, contain more than ninety per cent water. But nearly all fruit has real food value. Many of the fruits which we think of as flavor fruits contain considerable nutrition. A large-sized orange will furnish as much nourishment as an egg, or as a banana, or as two apples, mainly on account of the large amount of sugar present.

The flavor of different fruits is due to sugars, acids, and "ethereal" bodies. These ethereal bodies, or volatile oils, as they are called, are present in such small quantities that they are sometimes impossible to detect chemically, but it is undoubtedly due to their presence that different fruits have distinctive flavors. The acids present are known as organic acids. In fruits these are such acids as malic, tartaric, and citric. Some of these are burned in the body, just as other food is, and form carbon dioxide and water. They do not have to be excreted as do the mineral acids, and so, in the body, we need hardly consider them as acids at all.

The salts which are present in fruits are valuable. We count the fruits, then, as foods which furnish alkaline elements, and these help in keeping the blood in proper condition.

Dried fruits are, of course, more nutritious, pound for pound, than fresh fruits. A pound of fresh fruit will give about six ounces when dried. A pound of dried fruit, then, will be nearly three times as nutritious as a pound of fresh fruit. We must take facts like these into account when we consider whether dried or fresh fruit is more expensive. We pay more for a pound of raisins than for a pound of grapes, but since the raisins contain so much less water we really are paying less for the amount of food material to be obtained from them.

Fruits are particularly desirable in the diet because of their flavor. They may increase greatly the palatability of an otherwise somewhat tasteless meal. Jam on our bread appeals to all of us. This increased palatability probably means increased digestibility, so that, for this reason alone, we should feel justified in including fruit in the diet. However, the salts and acids present are so important that we need fruits for this reason also, even if their palatability does not tempt us. The salts and acids in some fruits have a laxative effect. Prunes and figs are examples of this class. Blackberries and peaches are not laxative. Most other fruits rank between these two groups.

The amount of fiber present in fruits is small compared with the amount in vegetables, but there is enough to make some varieties distinctly more easily digestible if cooked. Cooking softens the fruit. Fruit is also cooked to preserve it. Cooked, dried, and preserved fruits have all the advantages in the diet of fresh fruits.

Among the fruits considered the most digestible are grapes, oranges, lemons, cooked apples, figs, peaches, strawberries, and raspberries. Some people, however, cannot eat strawberries. Only a little less digestible are raw apples, prunes, pears, apricots, bananas, and fresh currants. Bananas contain a good deal of starch if they are unripe, and so in this condition are not very digestible unless cooked. When they are kept until the skins are dark, the starch is largely changed into sugar and the fruit is more digestible. The "strings", sometimes left on the banana when it is peeled, are indigestible. As a whole, fruits are digestible, although some people have idiosyncrasies which make a particular fruit disagree with them. Over-ripe or green fruit is, of course, harmful.

Since much of our fruit is eaten raw, fruit should be kept as clean as possible while it is marketed. All fruits should be washed before being eaten, even fruits like bananas and oranges, the skins of which we do not eat, because we are apt to handle first the skin and then the fruit. Such fruits as apples and oranges may be washed and rubbed with a cloth to clean them. Fruits that have sticky surfaces, especially if these have dried, are harder to clean and need to be washed in two or three waters. It is better to select packages of dates or figs which are protected from the dust, even if they cost slightly more, than to buy those that are exposed to dirt and flies.

Fruit, then, should not be considered merely as a luxury; and some fruit should be included in every diet. If it is necessary to count the pennies, choose the cheaper varieties, which, fortunately, are as good for us as the more expensive.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 293. "Use of Fruit as Food."

Year Book U. S. Dept. of Agriculture, Separate 610. "Raisins, Figs, and Other Dried Fruits and Their Use."

Questions

1. What is the value of fruit as food?
2. Are these values retained in cooked and preserved fruits?
3. Why is it better to use a silver knife in preparing fruit?

4. Make a list of dried fruits in common use and their cost per pound.

5. Make a list of the common fresh fruits, giving their seasons and usual cost when in season.

II

CANNING FRUIT

Canned Peaches

A. **Class Experiment.** One Cause of Fruit Spoiling.

Take a piece of bread, moisten it with water, and leave it exposed upon a plate during the lesson. Then cover with a saucer; leave for two days. If possible, examine under a miscroscope.

B. To Can a Jar of Peaches.

In canning fruit, use a fourth to a third of the weight of the fruit in sugar and from two and a half to three cups of water for each pound of sugar. Make a syrup by boiling the sugar and water together for three to five minutes. Scald the peaches by dipping in boiling water long enough to loosen the skin; peel, cut in halves, and remove the stones. Then, cook the fruit in the syrup. Often, only part of the fruit is cooked at a time, so that there need not be an excess of the syrup. While the peaches are cooking, sterilize a jar and cover, as the test tubes were sterilized in the last lesson. When the peaches are done, place the jar either in hot water or on a cloth wrung out of hot water. Fill the jar with fruit and pour in syrup until it overflows. If there is not enough syrup, add boiling water. As quickly as possible, put on a rubber and screw on the cover. When the jar is cold, screw the cover as tight as possible, being sure that it is air tight.

C. Another Method of Canning.

Fill a jar with peaches, cut in half and stoned, within one inch of the top. Make a syrup and pour over the fruit. Adjust the rubber, screw cover on lightly or adjust top without clamping, and place the jar in a moderate oven or in a steamer. Cook till the fruit appears clear and waxy. Then remove from the oven and tighten the cover.

Compare the advantages and disadvantages of these two methods of canning.

Molds

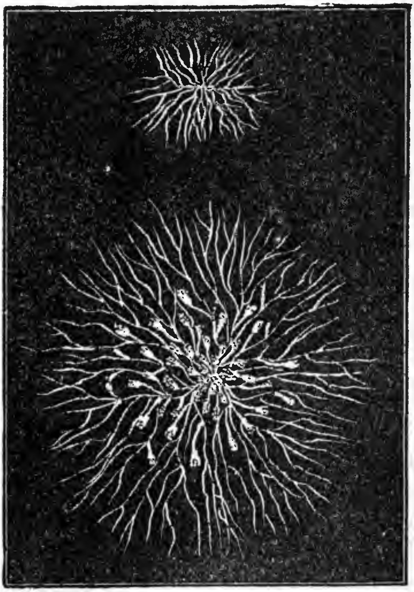
(One Cause of the Spoiling of Food)

Molds are so well known to everyone that it is surprising to learn that there is no such botanical classification. All plants that do not contain chlorophyll, the coloring matter which makes an ordinary plant green, are called colorless plants or fungi. The fungi include mushrooms and toadstools, but of more interest to the housekeeper are molds, yeasts, and bacteria. All these are plants which feed on organic food and so may be found living on any of our foods that are not properly taken care of.

While nearly everyone recognizes molds at sight, few have looked at them closely enough to realize what really beautiful plants they are. When they begin growing, they appear at first as soft, fluffy masses which are made up of a tangle of much-branched threads. Each thread, called a mycelium, looks white as it is seen ordinarily, but appears nearly colorless under a microscope. When the mold is older, perhaps after two days, it may show a color, blue, green, brown, black, red, or pink, each color marking a different variety of mold. The color is due to the so-called spores, which are reproductive bodies and which, if they contained nutritive material, would be seeds.

Each different species of mold has a different way of forming spores.

Perhaps the most common household mold, one that is almost always found on moldy bread, is penicillium. This is a blue mold; that is, at the time of spore formation, it becomes blue, or bluish-green. This color is due to the color of the spores themselves. When the mold is a day or two old, the mycelium sends up vertical threads which soon divide into many little branches. Then, each branch begins to divide by ring-like constrictions as if it were trying to make beads of itself, until, finally, the branch is nothing more than a string of little round balls, each of which is a spore. These spores are so light that a breath of wind blows them away, and they float off in the air in search of new food material.

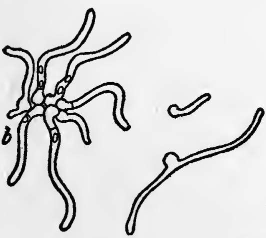


From Conn's "Bacteria, Yeasts, and Molds in the Home."

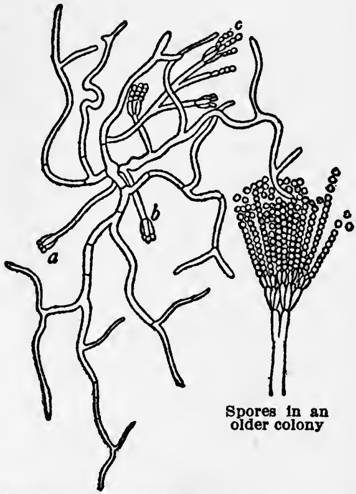
PENICILLIUM, COMMON MOLD, AS SEEN UNDER THE MICROSCOPE

Mucor, another mold commonly found on bread, is coarser than penicillium, so that the threads are seen more easily. When it is ready to form spores, the vertical threads, instead of branching, form on their ends small round knobs or sacs, and inside these balls are formed thousands of spores, which, when the sac bursts, are sown broadcast. These knobs on the mold look like small black specks. Another mold, aspergillus, instead of forming the spores inside the sac, forms them as beads on the outside.

During the process of growth, all these molds may send their branching threads deep down into the food on which they are growing so that more than the surface may be affected. As a result of their growth, they soon change not only the appearance of the food, but the flavor and odor as well. If the mold is allowed to go on growing, the food may be entirely spoiled. On the other hand, some molds produce delicious flavors, and many of the distinctive flavors of our different cheeses are produced in this way. Fruits are particularly subject to decay as a result of mold action. If the skin of fruit is broken, the molds



Spores of Penicillium Sprouting

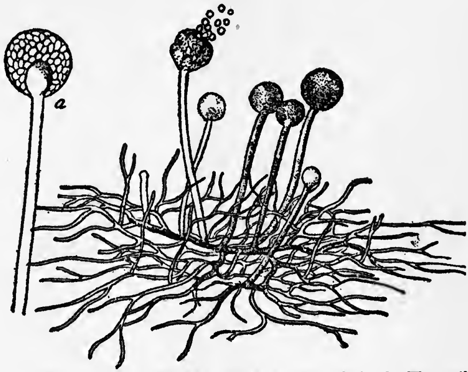


From Conn's "Bacteria, Yeasts, and Molds in the Home."

Growth from Two Spores, Two Days Later

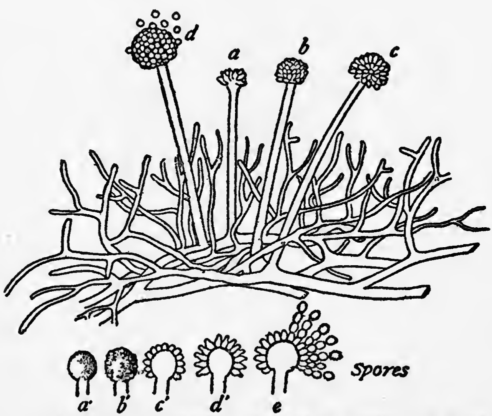
have an especially good chance to get at the food material inside and begin the process of decay.

A temperature as hot as boiling, or even a little lower, will soon kill a plant, and molds are no exception to this rule. When fruit is canned, then, it is boiled not so much to cook the fruit, as to be sure that it contains no live spores; and then it must be put away air tight so that no new spores can blow in.



From Conn's "Bacteria, Yeasts, and Molds in the Home."

MUCOR, ANOTHER MOLD FOUND ON BREAD



From Conn's "Bacteria, Yeasts, and Molds in the Home."

ASPERGILLUS, SHOWING MYCELIUM AND SPORE CLUSTERS

This is one of the things accomplished in canning, although the plants to be guarded against may be bacteria and yeasts as well as molds.

References

CONN. "Bacteria, Yeasts, and Molds in the Home." Section I, Molds.

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U. S. Farmers' Bulletin No. 426. "Canning Peaches on the Farm."

U. S. Farmers' Bulletin No. 359. "Canning Vegetables in the Home."

U. S. Farmers' Bulletin No. 203. "Canned Fruits, Preserves, and Jellies."

Ohio State University Extension Bulletin, Vol. VI, Supplement 2, No. 2. "The Canning of Fruits and Vegetables."

Questions

1. After sterilizing, why must the fruit be kept covered and air tight?
2. After a jar is sterilized why should it not be wiped out with the dish cloth? Why must care be taken not to touch the inside of the jar with the fingers?
3. Why is the rubber dipped in boiling water, and why is it not boiled with the jar and cover?
4. How can the jar be tested before using? If leakage is due to a poorly made jar and not to a poor rubber, what uses may be made of the jar?
5. Describe the different methods of canning.
6. How can a jar that sticks be opened?
7. What different styles of cans are commonly used? Discuss the advantages of each kind.

III

JELLY

Apple and Grape Jelly

A. Trial Jelly.

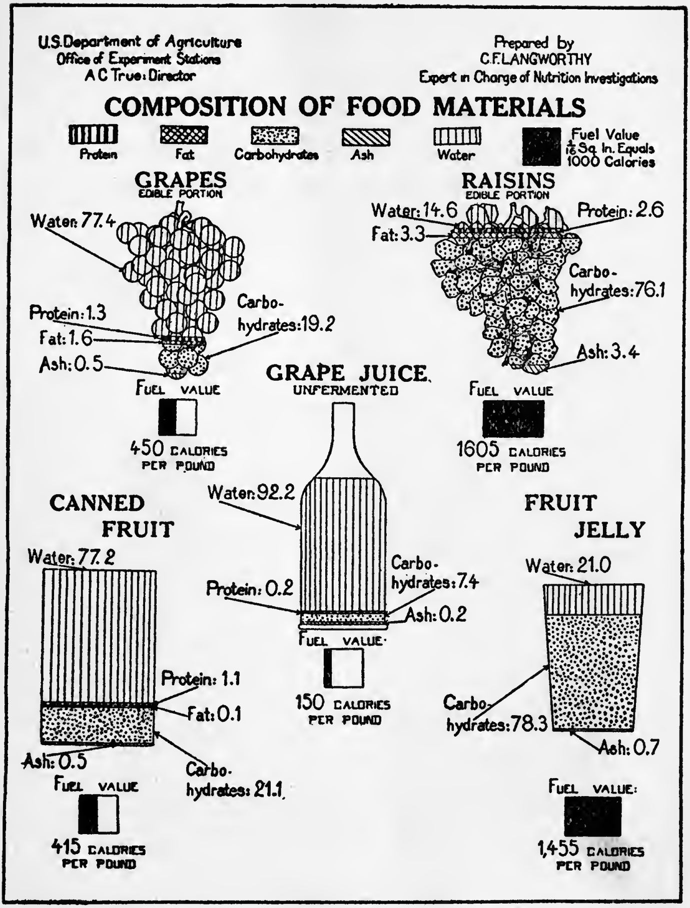
Place in saucepans one-half cup of crab apples and one-half cup of pears or peaches, cutting them into pieces. Just cover with water, later adding more if necessary. Cover and boil, until fruit is soft and will mash easily. Make a jelly bag out of double cheesecloth by folding and sewing it in the shape of a cornucopia; and, when the fruit is done, allow it to drip through the bag, at first without squeezing. Examine juice, then squeeze the remainder through and note the difference.

1. Place in glass cups one teaspoon of each juice obtained, and add an equal amount of alcohol. Let it stand five minutes. Observe the pectin, the substance which furnishes the thickening for jelly. Compare the amounts found.
2. Now try to make jelly out of the rest of the two extracts by adding to each an amount of sugar equal to three-fourths of the amount of the juice, and boiling until it is determined whether the mixture will "jell."

Tests for jellying:

Place a few drops of jelly on a cold plate and put in a cold place. When it is done the drops should harden over the surface and wrinkle when scraped with a knife or spoon. While making the test, remove the jelly from stove to prevent over-cooking.

Perhaps the best, because the quickest, test is to allow a little of the juice to drop from the spoon. When the mixture is done, these drops should jelly and break off.



COMPOSITION OF FRUITS AND FRUIT PRODUCTS

B. To Make Jelly.

Make grape jelly, using one cup of material. The grapes should be picked over and washed before being put into the saucepan. It is not necessary to add more water. After the sugar is added to the juice, remove any scum that forms. Sterilize the jelly glasses before filling. When the jelly has hardened, cover with melted paraffin.

Principles of Jelly-Making

Because fruit juices differ so much in their composition, it is impossible to give general directions sufficiently exact always to insure a perfect jelly. In fact, perfect jelly is rather seldom made. To be ideal it should not only be beautifully colored and transparent, but so tender that it cuts easily, and firm enough to keep its shape, but not so firm that it does not quiver.

In order to make jelly, fruit juices must contain two substances, acid and pectin, and these should be present in proper proportion. When fruit is cooked, pectin is formed by the action of water and heat on a substance called pectose which is present in the raw fruit. This pectose is closely related to cellulose [1] and probably is closely associated with it in the cell walls of the fruit. It is absolutely unlike cellulose, however, in its property of being affected by boiling water. The pectin which is obtained from the pectose is the substance which gives texture to our jellies. It is possible to make jelly by great concentration without the addition of any sugar at all to the fruit juice, but the jelly that is formed is tough and gummy and not palatable, as well as being much less in amount than is produced ordinarily. The addition of sugar in the presence of the

[1] Cellulose is the chief substance of which the cell-walls of plants are composed.

right amount of acid seems to precipitate the pectin and make the jelly set.

Not only does one fruit differ from another in the amount of these two substances which it contains, but different lots of the same kind of fruit may differ materially. As fruit ripens it contains less acid, and less pectin as well, and over-ripe fruit may fail to jelly at all. Fruit that is not fully ripe is much safer to use than that which is over-ripe. Some fruits contain too much acid, unless they are diluted with water, but it is quite possible to add so much water that there is neither enough pectin nor enough acid present. As a rule, very juicy fruits need have only sufficient water added to prevent burning. When they are soft enough to mash easily, the whole is transferred to a cheesecloth bag wrung out of hot water, and the juice is allowed to drip through. If the pulp is squeezed, the resulting juice is not so clear, but the flavor is not changed. Less juicy fruits must be covered with water while they are cooked. The alcohol test for pectin may be relied upon to tell whether the proper concentration is obtained.

The amount of sugar used, like the water, varies with the kind of fruit. It is better to err on the side of using too little, rather than too much. Jelly made from currants and grapes that are rather green may have as much as one part of sugar to one part of juice, but, in general, three-quarters of the amount of the juice is the right proportion of sugar. If at any time the alcohol test does not show plenty of pectin, lessen the amount of sugar. Too much sugar not only will give a jelly which is very sweet, but may give one that is syrupy. The amount of acidity can, perhaps, be as well judged by taste as in any other way. Before the sugar is added, the fruit juice should be distinctly tart.

Jelly can be made from fruits that are lacking in acid by the addition of some acid of vegetable origin, such as tartaric or citric. This does not always improve the flavor. The acid is commonly added by stewing with such fruits some other fruit which will supply the lacking acid.

Most housekeepers do not realize that if fruit is allowed to drip and is not squeezed through the jelly bag, the pulp may be returned to the kettle and boiled with more water, which gives additional extractions. The last should be concentrated until the alcohol test shows the right proportion of pectin. The first extract is usually made into jelly by itself, because it has the finest flavor, while the subsequent extractions are worked up together. Sometimes even a fifth extraction, if it contains sufficient pectin to make it worth while, can be made.

The time necessary for making jelly differs with different fruits, with the amounts of pectin and acid present, and with the proportion of sugar used. The jelly, however, should be made as quickly as possible. If the fruit is allowed to simmer, too long heating of the pectin with the acid may entirely destroy this substance. For this reason the sugar is heated before it is added to the juice; if it cools off the mixture, the whole must be cooked a longer time.

There are three ways of making jelly. In one, the sugar is added at once to the fruit juice; in another, the fruit juice is boiled for some time before the sugar is put in; while in the third, it is put in when the fruit juice has cooked about half the total time necessary for making the jelly. Probably the third of these methods is the best.

After the jelly has hardened, it may be covered in the old-fashioned way by cutting a piece of paper which will just fit into the top of the jelly glass, and dipping it into alcohol or brandy, placing this directly on the jelly, and then covering the top of the glass with another piece of paper large enough to tie or paste down. The alcohol is used to prevent the growth of molds, spores of which may have settled on the surface while the jelly was cooling and forming. The outer piece of paper is used to prevent the access of fresh spores and to lessen evaporation. A somewhat easier method is to pour a layer of melted paraffin over the top of the jelly. The paraffin should be hot, so as to kill any germs which may be present. If, in cooling, the paraffin shrinks from the side, leaving a crack between it and the glass, more paraffin should be poured in.

Jelly keeps best in a cool, dry place. Since the color of fruit sometimes fades, it is well to keep jellies and fruits where they are not exposed to too much light.

References

Cornell Reading Course for the Farm Home. Vol. 1, No. 15. "Principles of Jelly-Making."

U. S. Farmers' Bulletin No. 203. "Canned Fruits, Preserves, and Jellies."

U. S. Farmers' Bulletin No. 388. "Jelly and Jelly Making."

Questions

1. Why should not saucepans or spoons made of aluminum, or tin, be used in cooking fruit?
2. Why should jelly bags be dipped into hot water before being used?
3. Why are jelly glasses put in hot water, or on a cloth wet in hot water before filling?
4. Why, in jelly-making, is fruit not quite ripe preferred to fruit over-ripe?
5. Why is jelly covered after making?
6. Where is it best to store jelly for keeping?
7. Make a list of fruits which are good for jelly-making and star those that are so juicy as to require no water added in the making.

8. Make a list of combinations of fruits that would make good jelly.

9. Compare the cost of the canned fruit and jelly made in the laboratory or at home with that of the commercial products.

IV

JELLY–MAKING (*continued*)

A. Repeated Extractions of Juice for Jelly-Making.

Use sour apples or quinces.

1. Cut fruit in small pieces, without peeling or removing seeds. Place one cup of fruit in a kettle, cover with water, and cook until the fruit can be mashed easily. Strain juice through a jelly bag, allowing it to drip through without squeezing the bag. Reserve the pulp for a second extraction. Test one teaspoon of the juice for pectin. Keep the juice for jelly-making, marking it "Extraction 1."
2. Add water to the pulp reserved in (1) and proceed as before. Test one teaspoon of the juice for pectin. Reserve the rest of the juice, Extraction II, for jelly-making.
3. Make a third extraction. Again test one teaspoon for pectin. Reserve this third extraction for jelly-making.

B. Jelly from These Extractions.

1. Make jelly from Extraction I, using:
   a. Three-fourths as much sugar as juice.
   b. Equal parts of sugar and juice.

2. Boil Extractions II and III together rapidly, until the resulting juice approximates the richness of Extraction I. (This may be tested by alcohol, by the color and taste.) Measure. Make jelly, using proportion of sugar to juice that is found to give the best results.

C. **Class Experiments.** Food Preservatives.

Sterilize small bottles or test tubes.

1. Place a piece of uncooked fruit in each.
   a. Cover fruit with brine.
   b. Cover fruit with a fifty per cent solution of sugar.
   c. Cover fruit with a ten per cent solution of sugar.
   d. Cover fruit with water and add ground cinnamon, clove, or mustard.
   e. Cover fruit with water and add allspice or nutmeg.
   f. Cover fruit with vinegar.
   g. Cover fruit with oil.
   h. Cover fruit with alcohol.
2. Allow the tubes to stand for several days and examine from time to time until it is determined which substances act as preservatives.

D. **Class Work.** Prepare Cucumber Pickles.

Make unripe cucumber pickles, using one-fourth of a cup of cucumbers.

Wipe about a dozen small, unripe cucumbers and cover them with brine made by dissolving one tablespoon of salt to a cup of boiling water. After three days, drain off the brine, reheat it to boiling, and again pour it over the pickles. After a second three days, drain the cucumbers, cover them with boiling water in which a salt spoon of alum has been dissolved for every cup of water used. Allow them to stand for six hours, then remove them from the alum water, and cook for ten minutes in a part of the following mixture heated to boiling:

1 pint vinegar	$\frac{1}{4}$ tbsp. allspice berries
$\frac{1}{2}$ red pepper	$\frac{1}{4}$ tbsp. whole cloves

Pack the cooked pickles in a jar and strain the rest of the mixture over them.

Yeasts and Bacteria

As has already been said, yeasts as well as molds belong to the colorless plants and fungi. The yeast which is used in making bread is a collection of thousands of tiny yeast plants, each of which is too small to be seen without the aid of a microscope. These plants are even less like ordinary plants than are the molds; they consist merely of a single cell which appears, under the microscope, as a colorless oval. These yeast plants are so small and light that, like the spores of the molds, they float about in the air.

Fruits preserved in sugar are especially apt to undergo a change which, as can be seen at once, is not due to mold growth. This is the action that takes place when preserves "work" or ferment, and it may occur also in jellies or syrups. Anything which contains sugar and water may show this change. The change is characterized by a sharp, pungent taste, and at some stages by the formation of bubbles through the liquid. Whenever these phenomena occur, it is a sign that growing yeasts are present. For yeasts, when they grow, are able to break up the sugar which is present and change it partly into alcohol, which gives the stinging taste, and partly into a gas called carbon dioxide, the escape of which through the liquid makes the bubbles.

While yeasts are producing these results, they are multiplying rapidly by a method called budding. In this way new cells are formed which appear first as very tiny buds on the sides of the first cells and gradually grow larger and larger until finally they separate into independent cells. When active fermentation is going on, the yeast present is always found to be in this growing state. If, however, conditions are unfavorable, some yeast plants can form within each cell a number of spores, each of which is capable of developing again into a new plant. This spore formation usually happens if there is sufficient moisture present, but not enough food to produce growth. The air may be laden with these spores and even with some of the yeast cells themselves, as well as with the spores of molds.

Other micro-organisms carried by the air are called bacteria. They are as simple in structure as the yeasts, and like them consist of single cells. They may, however, have three distinct shapes. Some are like little rods and are called bacilli (a bacillus, for a single one), others are like spheres and are called cocci, the third variety is spiral and is named spirilla (in the singular, spirillum). But all these, no matter what shape they may be, reproduce in the same way, and it is this method of reproduction which distinguishes them from the yeasts. Each cell grows a little longer than it was before and then breaks in two, each half being an individual. This process, known as reproduction by fission, gives to bacteria the name of fission fungi.

Like yeasts, some bacteria can produce spores under unfavorable conditions. A bacterium, however, instead of producing a number of spores, forms only a single one. The advantage of the spore state seems to be in the greater power of resistance that the spore possesses — it is less easily killed by heat or cold or drying. If food is being sterilized and spore-forming bacteria are present, it is quite possible that the heating will kill all of the bacteria but the spores will be left alive. By the following day, however, the majority of these spores will have again changed themselves into the ordinary forms of bacteria, and a second heating will kill these forms. A third heating is safest to make sure that any spores remaining the second day are destroyed. Both yeasts and bacteria are too small to be seen without a microscope; but of the two, yeasts are much the larger. While a yeast cell is about one three-thousandth of an inch in diameter, even the largest bacterium has a diameter of not more than one ten-thousandth of an inch. It might well seem as if organisms as small as this could not do us either much harm or much good, and this would probably be true if it were not for the wonderful rate at which they can multiply. In a bacterium, division may take place every half hour, and at that rate, in only one day, conditions being favorable, a single cell could produce about seventeen million others. If, then, food is to be kept from spoiling, it is obviously necessary to exclude the entrance of even one bacterium.

When bacteria first act upon food, the result may be only beneficial; the good flavor of butter and some cheeses is undoubtedly due to their action. Bacteria, however, will finally render food unfit for use, producing decay and putrefaction. But what a world it would be if micro-organisms did not bring about these processes. Our world would be littered with useless material, and the soil long ago would have become exhausted.

Bacteria may be divided into three distinct classes: first, those capable of producing diseases, such as typhoid and diphtheria; second, those which in the process of growth produce substances poisonous to us. These substances, called ptomains, are the cause of the ptomain poisoning cases which occur from time to time. The third class is composed of those that are either harmless or beneficial to us. The bacteria which cause milk to sour not only are not any more poisonous to us than are any of the other vegetable plants used for food, but they may be of positive benefit in keeping down the growth of more harmful organisms.

"Swat the fly" has become a slogan in modern times. A glance at the enlarged diagram of a fly, particularly of the feet, will show why it is considered objectionable to have flies around, and especially so to have them crawl over food. Coming from infected material and filth, they may bring with them all kinds of germs. If the germs are introduced into food material, where every condition is right for their reproduction, it is evident how trouble may occur. It is very necessary then, that flies be excluded from houses as far as possible. Any flies that find entrance must be killed or caught, and care must be taken not to allow heaps of manure or garbage, or other fly-breeding material, to stand long enough for their larvæ to develop and escape. Much the easiest method of keeping free from flies is to control possible breeding places. A new kind of garbage can acts as fly-catcher and, placed just outside the house, may catch many flies which would otherwise find their way in. Then garbage and flies together must be disposed of. Other insects may, of course, also act as carriers of germs, but the fly especially brings them.

Reference

Conn. "Bacteria, Yeasts, and Molds in the Home", sections on Bacteria and Yeasts.

Questions

1. Give instances in which bacteria are beneficial.
2. Why may there be more spores on the fruits and vegetables

growing in a very dry season? Why would such fruits be harder to can successfully?

3. Why, in making cucumber pickles, is the brine reheated at intervals?

4. How should garbage cans be cared for?

5. What are the best means of disposing of garbage?

6. Why should all foods and dishes be covered carefully when sweeping or dusting is going on?

V

SWEET PICKLED PEACHES

A. Prepare Sweet Pickled Peaches.

Use one peach.

½ peck peaches	1 pint vinegar
2 lbs. brown sugar	1 oz. stick cinnamon

Cloves

Scald the peaches, peel them, and stick them with three or four cloves. Cook until tender a few of them at a time, in a syrup made by boiling together the sugar, cinnamon, and vinegar. Put in jars.

B. **Class Experiment.**

Conditions favoring Growth of Micro-organisms.

Try the following experiments, using petri dishes, or saucers covered with tumblers or sheets of glass:

1. Place a piece of bread in each of two dishes. Leave the first piece of bread dry; moisten the second piece with water. Expose both to the air for five minutes in a room where people are moving about. Cover, and keep both in a dark place (as, for example, in a cupboard) for two days, and observe the results.

2. Place a piece of bread in another dish and moisten it. Expose it for five minutes in a room when no one but yourself is present, and do not move more than you can help during the exposure. Keep this dish also in the dark for two days and compare with the second dish in (1).
3. Put pieces of bread (moistened) in four dishes, and expose all at once for five minutes in a room with people moving about.

   a. Keep the first in a warm room.
   b. Keep the second in an ice-box.
   c. Keep the third in the sunlight as much as possible.
   d. Keep the fourth in a dark, warm place.

Examine these at the end of two days. If necessary, let them stand longer. What effect has dryness or moisture, warmth or cold, light or darkness, on the growth of mold? Account for the difference in (2).

Conditions Favorable to the Growth of Micro-organisms

Food might seem to be the first condition necessary to the growth of micro-organisms, and so it is; and yet they seem able to live for a fair length of time without food. They blow around in the air, or are transmitted by water, in neither of which elements are they fed. Under these circumstances, it is true, they are not growing or multiplying, and may even be in the spore state, but once the organisms reach available food, they begin to grow and reproduce with wonderful rapidity.

Water, as well as food, is necessary, but different organisms vary somewhat in regard to the necessary amounts. Bacteria and yeasts require a goodly proportion of water, and it is only in watery foods that they are capable of much growth. Sugar and flour, for example, are much too dry for them. Twenty-five to thirty per cent of water is necessary for any growth, and, even then, it will not be vigorous. Most bacteria cannot grow in foods which are strongly acid, but molds do not mind the acid, and as only small percentages of moisture are necessary to keep them alive, in damp weather as dry a food as flour may become moldy. Even books and clothes may mold in a damp room. Mildew is one species of mold.

Bread that is in a closed bread-box is apt to become moldy if left too long; but if bread is spread out, exposed to the air, it will probably dry without any molding at all. Possibly this is because a moving current of air dries up the moisture; but, whatever the reason, it is true that mold grows best in still air.

Bacteria differ greatly in relation to air. Some grow only in the presence, others in the absence of it, and some can prosper either way. The bacteria that live without air cause putrefaction and are perhaps most likely to produce ptomains; but the majority of bacteria grow best in an abundance of air, and most foods begin to spoil on the surface.

Direct sunlight rapidly kills bacteria, and any daylight makes them grow more slowly and less vigorously. Molds may grow in either light or darkness, but they, too, grow best in a dark place. Plenty of light and fresh air, then, are the housekeeper's allies in the fight against micro-organisms.

Another method of checking the growth of micro-organisms is by means of low temperatures. Few organisms can make any but the most feeble growth in the cold. Even rather slight differences in temperature seem to have surprisingly great effects.

For this reason food is placed in an ice-box to delay the growth of the micro-organisms, but as the temperature, even in very well-constructed refrigerators with a large ice chamber, is forty to forty-five degrees, usually nearer fifty degrees Fahrenheit, growth can be delayed only for a limited time. Such food will spoil eventually. But a temperature even of sixty degrees is still a great aid in keeping food temporarily. Cold storage is more efficient than home refrigeration, because a lower temperature is used.

There are other means of preserving food, besides the use of cold temperatures. Drying evidently prevents the growth of bacteria, since they need so much water, and, if this is thorough, it may also prevent mold action. Dried fruits of all kinds have long been used, as have also some dried vegetables. Lately, more kinds of dried vegetables have been put upon the market, and even desiccated soups. All these are good food, as nutritious as before drying, but they do not retain quite the original flavors.

Foods which can be boiled and canned may be made truly sterile, and if the process is carried out properly, such materials will keep indefinitely. Fruits and vegetables may well be taken care of in this manner.

In recent years, still another method of preserving food has been used. This consists in the addition of something which will at least lessen the growth of germs, if not entirely prevent it. The difficulty is to find substances which will do this and yet have no harmful effect upon the people who eat the food. Among the substances commonly used for this purpose are borax, benzoic and salicylic acids, and formalin. These are all known to be harmful if taken in large amounts, but they are believed to have comparatively little effect in small quantities. But because, if they are allowed at all, it is difficult to be sure that they will be in sufficiently small amounts, and because repeated doses possibly may cause trouble, or small doses from a number of foods combine to make a large dose, and because some people (such as young children and invalids) are more susceptible to them than others, the national pure food law has forbidden the ordinary use of them, unless the kind and amount of any such added substance is plainly printed on the bottle or can in which the food is sold.

There are, however, some food substances which, themselves, have something of the preserving effect. Mixing foods with sufficient sugar protects them well from bacteria or mold growth, but not quite so well against yeasts. Raisins, dates, and figs all have so much sugar in them that it is not necessary to add any more to insure their keeping well, when they are partially dried. Salt, too, has preservative action, and salting fish is a usual device for keeping it. Other foods, like corned beef, are kept immersed in brine, — that is, in salt and water. Salted butter, too, keeps better than fresh, and perhaps that is why so little fresh butter is used in this country. Salty foods are undoubtedly not so digestible as fresh, and the use of such foods for invalids and young children is questionable. Vinegar, sometimes reinforced by spices, is another food preservative, but pickled foods will not keep indefinitely. Many of the common spices also have some preservative power. Mince meat, if kept cool, will remain in good condition for a long period. Fruit-cake, which is highly spiced, keeps well. Sausage is another food which is spiced in order to prevent spoiling. But pickled or spiced food, like that preserved in salt, is probably far less digestible than in the original form, and the too frequent use of it is to be avoided.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 375. "Care of Food in the Home."
Farmers' Bulletin No. 459. "House Flies."
Farmers' Bulletin No. 353. "The Ice-Box."
Conn. "Bacteria, Yeasts, and Molds in the Home", sections on Yeasts and Bacteria.
Cornell Reading Course for the Farm Home. "Preservation of Food in the Home", especially pages 281–286 inclusive.

Questions

1. Under what circumstances is it wise for a housewife to put up much fruit?
2. Why is drying a means of preserving fruits and vegetables?
3. What preservative is sometimes added to commercial catsup?
4. How must an ice-box be taken care of?
5. What foods should never be placed in an ice-box?
6. What kinds of foods is it unnecessary to keep in a cool place, and why?
7. Why should butter and milk be covered when in the refrigerator, and if possible kept in a compartment by themselves?
8. When a bread-box smells musty how must it be cared for?

VI

USE OF WATER IN COOKING

Boiled Potatoes

Mashed Potatoes

A. Various Methods of Boiling Potatoes.

(Each student is to try one way and compare the result with the others.)

1. Wash and scrub a potato. Cook it in boiling salted water until it is soft. Allow one teaspoon of salt to one quart of water.

2. Boil a potato as directed in (1), but pare it before boiling.
3. Boil a potato as in (1), but, before boiling, cut off a strip of the skin all around the potato.

How do these potatoes differ in color and in mealiness, after they are done?

Mash the potato with a fork. Beat till light and creamy. Add two teaspoons of hot milk, one-half teaspoon of butter, and season with salt, while beating. Heap the potato on a buttered plate and make an indentation in the middle of the heap. Open an egg, being careful not to break the yolk, slip it into the indentation in the potato, and place all in an oven until the egg is cooked sufficiently to suit taste. Season egg with a very little butter, salt, and pepper. Pimento may be rubbed through a strainer and beaten into the potato at the beginning to add color and flavor.

B. **Class Experiment.** Composition of a Potato.

(To be carried out while the potatoes are boiling.)

1. Pare a small potato; cut off a slice and leave it exposed to the air for half an hour.
2. Grate the rest of the potato into a piece of cheesecloth. Gather up the corners of the cloth and, by squeezing, press out all the liquid possible. Then wash in a bowl of water till nothing more can be extracted. Allow the water to stand, and examine the sediment. Look at it under the microscope. Boil a portion of it. Test a portion with iodine. A blue color indicates the presence of starch.
3. Examine the contents of the cheesecloth. What ingredients of potato have you found so far?
4. Put a pared potato into a large kettle of cold water,

and then put the kettle on to boil. When the potato is cooked, compare it with those started in boiling water in (A).

C. **Class Experiment.**

DIFFERENT STAGES IN THE BOILING OF WATER.

Heat some water in a saucepan to boiling; meanwhile, with a thermometer, take the temperature of the water at the following stages:

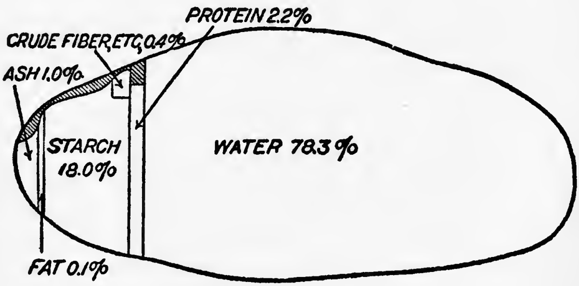
1. When the first small bubbles appear on the bottom and sides of the pan. (What are these bubbles?)
2. When the water feels neither hot nor cold to the hand. (Lukewarm)
3. When somewhat larger bubbles appear around the edge and at the bottom of the pan. (Scalding) What are these bubbles?
4. When the bubbles begin to rise. (Simmering)
5. When the bubbles rise rapidly, breaking, and completely agitating the surface of the water. (Boiling)
6. Increase the heat and see if the water gets hotter.

POTATOES

The name potato is a corruption of the last part of the Latin name for sweet potatoes, *ipomœa batata,* but the name by common consent is given to our white potato. White potatoes are a native of America, perhaps of Chile, and were not known in Europe until about 1580. They were introduced into North America about the same time. At first, they did not meet with great favor in Europe, and it was not until there was shortage in a series of staple crops that they sprang into favor. Now they have been adopted in Ireland to such an extent that they form a large part of the food of the people, and for that reason are often called Irish potatoes.

Potatoes form forty per cent of the total vegetable crop of the world, so that their name of king of vegetables is not undeserved, and they are next in importance among the vegetable products to cereals. When we compare these facts with the report that at the time of our American Revolution a well-to-do family thought itself fortunate if it had at most a barrel of potatoes for its winter supply, and that these were only served on special occasions and for honored guests, we can see how greatly the relative importance of the position of the potato has changed.

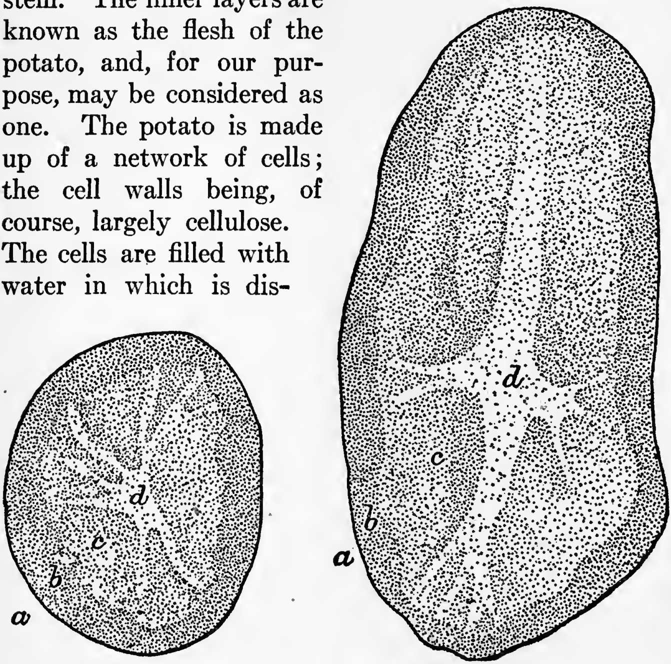
The potato is a tuber, that is, an underground stem which is thickened and has become a storehouse for future plants. The eyes of the potato are buds from which the new plants will sprout under proper conditions. These new plants use the food material which is stored in the potato, and the tuber itself is thereby gradually rendered unfit for food.



Composition of the Potato

The average loss of nutrients from boiling is shown by the shading.

If a thin slice across a potato is held up to the light, four distinct parts are observable. First comes the grayish brown skin, which corresponds with the bark of an ordinary stem. Underneath this is the cortical layer, which may be from a tenth to a fifth of an inch thick, and is often slightly colored. If this layer is exposed to sunlight for some time, it will turn green, showing its relation to the green layer which is found underneath the bark of an ordinary stem. The inner layers are known as the flesh of the potato, and, for our purpose, may be considered as one. The potato is made up of a network of cells; the cell walls being, of course, largely cellulose. The cells are filled with water in which is dis-



SECTIONS OF THE POTATO

a, skin; *b*, cortical layer; *c*, outer medullary layer; *d*, inner medullary layer.

solved mineral matter, a little sugar, and most of the protein * which is found in the potato. In the cells and surrounded by this water are the starch grains. While a

* Protein is the foodstuff containing nitrogen, and is essential for building body tissue which contains nitrogen.

little fat is also present the amount is so small that it need not be taken into consideration.

The potato is largely composed of water, seventy-eight and three-tenths per cent, so over three-quarters of the whole weight is water. Of the eighteen and four-tenths per cent carbohydrate, about sixteen per cent is starch. There is only four-tenths of one per cent of cellulose present. Although they are small in amount, the two and two-tenths per cent of nitrogenous matter and one per cent of mineral matter are important.

Besides the substances already mentioned, there is also a trace of solanin, a poisonous substance which may occur in greater or less amounts and which is said to give the characteristic flavor to the potato. This trace of solanin is supposed to be volatilized during the cooking of the vegetable, and so it is improbable that we ever eat it in any large amounts. If the potato is old and has been allowed to sprout, if it is unripe, or if it has been grown too near the surface and so has a decidedly green color, it may contain sufficient solanin to cause some digestive disturbance. Instances of this, however, are probably very rare. A fear of it makes us careful to cut away the flesh immediately around the sprout in an old potato. Care should also be taken to prevent sprouting, not only for this reason, but because the sprouts use up the food material in the tuber. Potatoes, then, should be stored in a dark, dry, cool place, and should be protected against freezing. A potato that has been frozen has a sweetish taste and is never so mealy as a good potato.

Potatoes are distinguished as mealy, soggy, and waxy. Most people prefer a mealy potato. This quality in the vegetable is supposed to be due to the amount and distribution of the starch. If, however, in cooking, the steam in a potato is allowed to condense to water, the potato becomes soggy. For this reason potatoes should never be allowed to cease boiling while they are cooking; they should be dried out as completely as possible when they are done, and served in an uncovered dish. Baked potatoes should be pricked with a fork or opened at once when they are done. Some potatoes are naturally soggy, but a good potato can be made so by poor handling in its preparation for the table. New potatoes are much more waxy than older ones, owing, perhaps, to the larger amount of protein present.

Potatoes are sold both by measure and by weight, but in many places dealers are now required to sell by weight, because that gives a more uniform amount to the customer. Potatoes should run fifteen pounds to a peck. In selecting, those of medium size and with a smooth skin should be chosen. A large potato is more liable to break up in cooking, and a small one means too much trouble in preparation if it is to be pared.

In preparing potatoes for the table, they should first be washed and then scrubbed with a small brush. If they are to be boiled, they may or may not be pared before cooking. If they are pared and then exposed to the air for any length of time they will turn dark, owing to the action of oxygen, together with a ferment which is found in the potato. This can be prevented by dropping the potatoes into cold water, which excludes the air. Soaking, however, should be avoided, for it removes some of the food material, which means loss of nutriment, and is only permissible if the potato is rather old, wizened, or inferior. In that case, the product is so much improved by the soaking that we are justified, even though some food value is lost. Since the cortical layer contains a higher percentage of both the protein and mineral salts than the rest of the potato, unless paring is carefully done we lose a large part of the most valuable ingredients. If much fruit and salad vegetables are included in the diet, it may not be necessary to consider the loss of mineral salts; but if it is desired to preserve them, the potato should be cooked in its jacket. This means that the potato is not quite so white, but there is no special reason why a perfectly white potato should be demanded. If potatoes are put on in cold water to boil, the same effect as soaking is obtained. Most of the mineral matter and protein, and some of the starch are lost. If, instead, the potatoes are placed in boiling water, the protein is coagulated quickly and less of it escapes. Most of the mineral salts are still dissolved by the water and so lost, since potato water has rather too strong and disagreeable a flavor to be palatable and is usually thrown away. Potatoes may be steamed with little loss of nutriment, or baked, in which case practically nothing is lost but water. Potatoes are cooked partly to hydrate the starch, and partly because the expansion of water into steam means the breaking of the cellulose walls of the cells, whereby the contents become more readily digestible. Probably the chief reason is the improvement of flavor.

Since potatoes contain a small amount of cellulose, compared with most other vegetables, they are digestible, and there is comparatively little difference in their digestibility as a result of different ways of cooking. A mealy potato seems to be more digestible than a soggy or waxy one, probably because it is better broken up, and so the digestive juices can get at it better. Potatoes have long been classed as a starchy food, and most books state that there is so little protein present that it need not be taken into account. Max Rubner, in a recent paper, states that the protein present is of such a character and amount as to form a balanced ration, if it were possible to consume the necessary bulk to supply the needed energy. Potatoes are so bulky, on account of the large amount of water present, that they cannot serve as a sole food.

Sweet potatoes differ botanically from white in that they are thickened roots instead of stems. Chemically, they contain about nine per cent less water, and more carbohydrate. Most of this additional carbohydrate is sugar, which accounts for the sweet taste. Sweet potatoes grown in different regions vary greatly in the amount of sugar, those grown in the south containing a larger percentage than those in the north. There is so little difference in food value between sweet and white potatoes that they may be substituted for one another in the diet.

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Questions

1. Why should not potatoes be tightly covered while boiling?
2. How should they be cared for when done?
3. Why are new potatoes more often cooked in their skins or jackets than old potatoes?
4. When do new potatoes come into market?
5. What is the average cost of potatoes?
6. Is it fairer to sell potatoes by weight or measure? Would a bushel of very large potatoes or of very small potatoes give the purchaser most for his money?
7. How should potatoes be kept to prevent sprouting? What harm does the sprout do the potato?
8. Are old or new potatoes considered more digestible? Why?

9. If you are going to use the potato mashed, what is the advantage of cutting the potato into slices before cooking? What is the disadvantage?

10. Why should potatoes be pared as thinly as possible without too great waste of time? Where do the mineral salts in potatoes lie?

11. If the potatoes you wish to boil together are not all one size, what will you do?

12. Compare the temperature you obtained for boiling water with the temperatures to be obtained at sea level, and on high mountains. Explain the variations.

VII

USE OF WATER IN COOKING

Boiled Eggs
Stuffed Eggs

A. **Class Experiments.** Eggs.

1. Weigh out a pound of eggs. How many average-sized eggs in a pound? Repeat with small eggs. With large eggs. Would it be fairer to sell eggs by the pound instead of by the dozen?
2. Boil an egg in a strong solution of cochineal for half an hour. Break open and examine. What property of the shell is shown? What problem does this present in the care of eggs?
3. Tests for freshness.
   a. Place eggs in a ten per cent salt solution. What is the relation of the freshness of an egg to its specific gravity?
   b. Roll up a large sheet of paper into a cylinder. Place an egg in one end and look through the other end. Hold in front of a strong

light. What may a dark appearance indicate?

c. Note the feeling of the shell, rough or smooth.

d. Shake various eggs.

Are all these tests reliable with cold storage eggs?

B. **Class Experiment.**

COOKING TEMPERATURE OF WHITE OF EGG.

1. Put a little white of an egg into a test tube and immerse the test tube in cool water above the level of the egg inside. Hold a thermometer in the egg white, and heat the water gradually, watching the egg carefully. As soon as it becomes opaque remove the tube from the water and note the temperature. Try some of the egg, and notice how tender it is. Replace the test tube with the rest of the egg white and heat as long as the temperature rises. Remove and compare with the first.
2. Cook an egg in boiling water for three minutes. Cook another by keeping it five minutes in water just below the boiling point (about 175° F.). Break and compare consistency.
3. Boil an egg for twenty minutes. Compare with an egg kept in water just below the boiling point for forty-five minutes.

C. **Class Experiment.** BOILING EGGS.

1. Place three eggs in three pints of boiling water. Cover closely to retain heat, but remove from flame. Remove:

   a. one egg in five minutes,

   b. one egg in seven minutes,

   c. one egg in ten minutes.

2. Give directions for cooking correctly:
   a. a soft-cooked egg,
   b. a medium-cooked egg,
   c. a hard-cooked egg.

D. Prepare Stuffed Eggs.

Cut a hard-cooked egg in halves; carefully remove the yolk. Season the yolk by mashing and mixing with it

¼ tsp. vinegar	A pinch of salt
1 ssp. mustard	A few grains of paprika

Add melted butter, about a fourth of a teaspoon, so that the yolk can be molded, shape into balls, and refill the whites. Cheese or minced ham may be added to the yolk.

Water

Water, as everyone knows, exists in three states or conditions. It may be solid, in which case it is called ice; it may be liquid, and then it is really called water; or it may be a vapor, in which case it is spoken of as steam. The difference between these states is merely one of temperature. It takes heat to turn ice into water, and it takes heat to turn water into steam. Since water cannot, under ordinary circumstances, grow any hotter than its boiling point, cooking will not proceed any faster because the water is boiling fast instead of slow. All that is accomplished is the turning of more water into steam. If the object is the concentration of the material, then it is of course desirable to boil fast; but in most boiling it means merely a waste of heat. Occasionally the rapid motion is itself desirable, because it keeps the food from settling to the bottom of the pan and perhaps burning. The pressure cooker is a device for retaining the steam and so increasing the pressure that the water itself actually is hotter than the usual boiling point. Food can, of course, be cooked faster in it than in the usual covered kettle, because the temperature is really higher.

Water is used in more than one way in cooking. Sometimes it acts as a carrier of flavor, as when it is used to extract the flavor of tea or coffee; sometimes as a means of conveying heat to the food to be cooked. This is its use in boiling or steaming. At other times water is taken up into the food itself. In cooking rice, for example, there is much starch present but not enough water to hydrate it. This is the reason that rice cannot be put in an oven and baked as a potato can.

Water is composed of two gases, oxygen and hydrogen. It is true that some water is actually manufactured in the body by the oxidation of some of the hydrogen contained in food, but as the water we consume as such is never broken up in the body into these two gases, it is not necessary to consider further its chemical composition.

Although water is not capable of furnishing the body with energy, it is absolutely necessary to us. While people have proved that it is possible to go without food for weeks, it is impossible to live any length of time without water. The body itself is about two-thirds water. This means that there must be water to build up into body substance. Besides this, water has many important functions. For example, it moistens the digestive tract; makes it possible to swallow food; softens the food itself; mixes with the digestive ferments, and so enables them to act upon all parts of the food. It dissolves the food as it is digested and carries it through the lining of the digestive tract. Then, the blood is composed largely of water, as are all the other fluids of the body; so it is water that carries nourishment to all the different cells in the body.

Water in the blood circulating through the body acts as a distributor of heat, and, again, the evaporation of water as perspiration helps to regulate the heat of the body. It is water, too, that dissolves and carries away the wastes of the body. But these are only some of the important functions of water. It is probable that none of the chemical and physiological changes which go on in the body can take place except in the presence of water.

The body gives off from the lungs, skin, and kidneys about four and one-half pints of water daily. About one-sixth of this amount is the water that was spoken of as manufactured from the oxidation of food; the remaining amount must be taken into the body daily. Of course, a good deal of water is furnished by foods themselves. Soups and beverages obviously contain large amounts of water, but many other so-called solid foods, like potatoes, contain large amounts. It is usually said that a person needs about eight glasses of liquid a day.

At one time it was considered harmful to drink water with meals, for it was feared that the water would dilute the digestive juices to such an extent that they would fail to act upon the food. This notion is still popularly believed. Recent experiments, however, were tried to determine the truth of the matter. Healthy men were fed test meals, in some cases water being given and in others withheld. After a certain length of time, the contents of the stomach were examined to see how fast digestion had proceeded. In every case it was discovered that digestion took place more quickly if water had been given. We know now that the taking of water at meals is beneficial, stimulating digestion and not hindering it. What has been said is not in any way intended to imply that the washing down with water of poorly chewed food is anything but harmful. That is an entirely different question; nor is it intended to imply that the drinking of large quantities of very cold water may not have a different effect from the one described. Cold stops digestion, or slows it, and too much ice water at a meal may readily have this effect.

People who wish to grow thin are often told to go without water at meal times. The reason this is an aid is not that water itself is fattening, but because less is eaten if no liquid is taken. The same effect would be accomplished if we should in any other way lessen the amount eaten. Anyone going without water at meals should be sure to drink the needed amount of water between meals, for water is just as necessary to him as to anyone else.

Water is usually classified as surface and ground water. Rain water and water from streams and rivers belong to the first class. Well water and deep spring water belong to the second. Rain water is our purest water, if it is collected from a clean surface after the dust in the air has been washed out. This water, flowing along the ground or through it, dissolves or carries along with it many different substances. Water which has much mineral substance dissolved in it is called hard; this is the water that will not lather easily with soap. Hard water is, however, of two kinds. In one case there is present a soluble lime salt which precipitates if the water is boiled. This is the water which leaves a crust on the inside of a tea kettle. It is called temporarily hard because the water itself is softer after the boiling. Water containing salts of lime and magnesium which are unaffected by the boiling is called permanently hard. Permanently hard water may, however, be softened by the addition of such chemicals as soda, ammonia, and borax. Soft water is much the best for washing and also for cooking, but it is not so palatable as harder water. Water that is very hard is possibly not so good for us. If it can be softened by boiling, it may be cooled and used for drinking.

Water is a carrier of bacteria, and the most harmful water is not hard water, but water which contains harmful bacteria. There are many kinds of domestic filters which are supposed to remove the bacteria from the water. Most of them are not reliable and, in any event, need great care. They must be sterilized frequently or the water which goes through them will be found to contain more bacteria than it did before. If there is any reason to believe that the water is dangerous, it is much safer to sterilize the water by boiling it. All that is necessary is to bring the water to boiling and then cool it. Water which has been boiled tastes flat because it contains less air dissolved in it. The palatability can be increased by pouring the water back and forth from one pitcher to another so as again to dissolve air in it.

Freezing does not sterilize water. While in cities, at least, our water usually comes from a reservoir that is carefully protected from contamination, our ice supply may come from a private pond in which the water may be quite impure. Unless it is known that the water from which the ice was made was pure, the ice itself should not be put into beverages or foods. Instead, they can be set on ice to cool. So-called artificial ice is manufactured by freezing water in large tanks, the necessary cold temperature being often obtained by the evaporation of ammonia. Such ice is as pure as the water from which it is made.

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Questions

1. What diseases are most frequently carried by water?
2. Why is the water from shallow wells often dangerous?
3. How should such wells be protected?
4. Why is deep well water usually safer?
5. How is the question of sewage disposal bound up with the question of a safe water supply?

VIII

USE OF WATER IN COOKING

Poached Eggs

A. **Class Experiment.** Solubility of Egg White.

1. Cut a small piece of uncooked egg white with a pair of scissors. Shake the egg white with some cold water. Filter. Has any of the egg white dissolved? Find out by testing as follows:
    a. Boil some of the filtered water.
    What happens?
    b. Add nitric acid to a second portion and boil. Cool, and add ammonia. Note color given.
    c. Try the effect of the acid and ammonia on some of the egg white itself. Egg white contains large amounts of protein, and protein gives the color with the acid and ammonia.
2. Repeat the experiment, but use water which is nearly boiling to shake with the egg.

B. **Class Experiment.**

The Correct Temperature for Poaching Eggs.

1. Drop one teaspoon of egg white into a pan of water which is at about 150° F.

2. Repeat, but have the water boiling hard and let it continue boiling for a moment or two.
3. Repeat, but have the water just below boiling.

Why does the egg white spread in one, and break up in another? In which is the temperature too high to give the cooked egg a good consistency?

C. Poach an Egg. From the results obtained in the previous experiment, account for the temperature of the water suggested in the following recipe. While it is desirable, the muffin ring is not essential. Serve on toast. What will happen if the water used is too cold? Too hot?

Dropped Eggs. (Poached)

Have ready a shallow pan two-thirds full of boiling, salted water, allowing one-half tablespoon of salt to one quart of water. Put two or three buttered muffin rings in the water. Break each egg separately into a cup, and carefully slip into a muffin ring. The water should cover the eggs. When there is a film over the top, and the white is firm, carefully remove with a buttered skimmer to circular pieces of buttered toast, and let each person season his own egg with butter, salt, and pepper.

From the "Boston Cooking-School Cook Book." By Fannie M. Farmer.

Eggs

The United States government bulletin on eggs tells us that "perhaps no article of diet of animal origin is more commonly eaten in all countries or served in a greater variety of ways." But eggs are even more interesting when it is remembered that, like milk, they are a complete food intended for the sole nourishment of the young animal. They must, of course, contain everything that is needed for growth. Even after what has been said about the need for water, it may be a surprise to learn that the edible portion of eggs is about three-fourths water, averaging about seventy-four per cent. The amount of protein present is high, fourteen and a half per cent; and this, together with the large amount of fat, ten and a half per cent, makes eggs rank with milk and meat in the diet. Then the ideal form of the iron and phosphorus present in the mineral matter adds to the value of eggs from the dietetic standpoint, and they are probably even better building material than meat. This nutriment is not divided evenly between the white and yolk, for the white contains more water and less protein and mineral matter than the yolk; and practically all the fat is found in the latter. This highly nutritious yolk is intended to be the first source of food for the embryo chick. This embryo can usually be seen as a tiny dark speck lying close to the yolk. The white is food used at a later stage.

The problem in buying eggs is to obtain them fresh, and the term fresh is by no means the same as new-laid. The new-laid egg is, of course, the most desirable grade, but often can be had only at an exorbitant price quite beyond the pocketbook of the average person. Eggs, like other foods, are affected by bacteria. The shells are a partial protection, but since they are porous, bacteria can enter and soon begin the process of decay. The earliest change is mainly in flavor. Later, the membrane which surrounds the yolk is partially absorbed and it becomes difficult to separate the yolk from the white. The white can never be beaten stiff and dry if part of the yolk is mixed with it. An egg kept too long in cold storage often will have a white which will not beat properly.

As eggs do not keep long under usual conditions and as hens do not lay uniformly throughout the year, many methods of preserving eggs have been tried. The most successful method for home use is a water-glass solution. This substance, which is a silicate of potassium or sodium, or a mixture of the two, can be bought as a syrupy liquid at a few cents a pound and diluted with ten times its volume of water. The water used should be pure and is better boiled and cooled before mixing. The diluted water-glass is poured over the eggs so as to cover them completely, and then they must be put into a cool place. This method is not only the easiest to use, but also the one that keeps the eggs best and with least disagreeable flavor. Eggs laid in April, May, and June are the best to use for this purpose, as they seem to keep most satisfactorily. The best method of all for keeping eggs is cold storage, and such eggs in certain seasons are about all that are on the market. Eggs which have been kept in this way will rattle somewhat when shaken, because of the evaporation which may have gone on, and yet be fresh enough for use.

Eggs should be washed before use. As the mucilaginous substance on the outside of the shell helps to render it less porous, it is better not to wash the shell until the egg is to be used.

Eggs are becoming costly, and it is necessary to consider this in their use. Many recipes which call for eggs for thickening can be modified so that flour or starch may be substituted for all or at least some of the eggs, and baking powder may take the place of the egg used for leavening.

For most people eggs are an easily and completely digested food. Sometimes an uncooked egg swallowed whole causes disturbance, because it has not sufficient flavor to start the flow of the digestive juices, and since the egg is not broken up, what ferment is present cannot well get at it. A raw egg beaten up with a little milk is much less apt to cause trouble. Eggs cooked in any way are very completely digested, and the ordinary person does not have to consider the small differences in digestibility which result from different methods of cooking. Even hard-boiled eggs, if they are not swallowed in lumps instead of being properly masticated, can be included in this statement. A soft-cooked egg is, however, more acceptable to most people than one that is hard-boiled.

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Questions

1. How can the freshness of an egg be determined before breaking?
2. Why does an egg become stale?
3. Are cold-storage eggs good food?
4. What is the best method of preserving eggs at home?
5. Why should eggs that are to be kept for some time not be washed before being put away?
6. Why must precaution be taken against putting eggs away near strong-smelling foods?
7. Why should eggs be washed before breaking?
8. What use is made of egg shells?
9. How many eggs of average size in a pound?

10. What were the maximum and minimum prices of eggs during the past year? At what season of the year are eggs most expensive? Cheapest?

11. Why are eggs valuable as food?

IX

USE OF WATER IN COOKING

Cereal Breakfast Foods

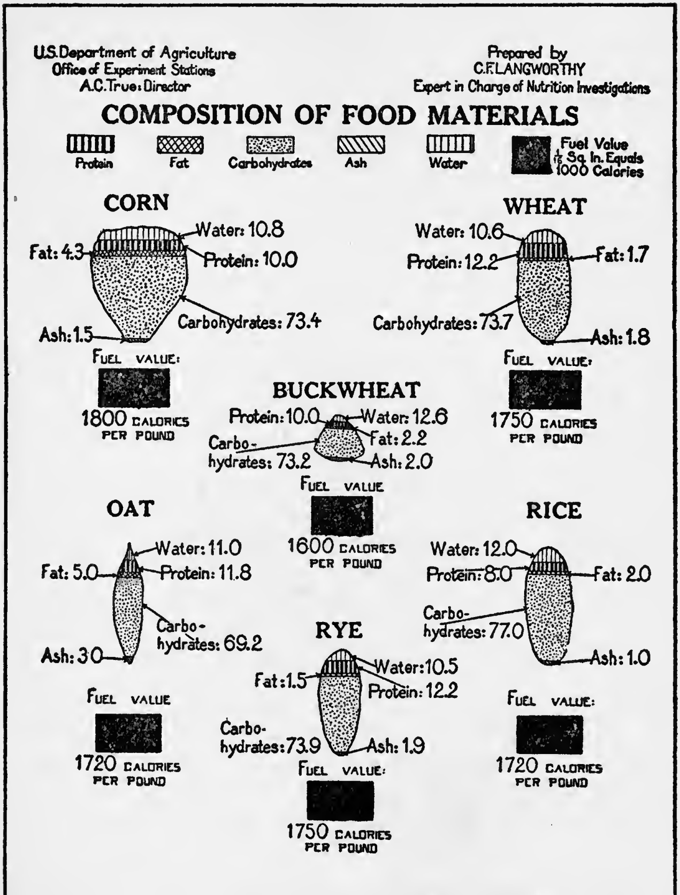
A. **Class Experiment.**

The Relation of Surface to Evaporation.

1. Put equal amounts of water into two saucepans, one much larger than the other, and heat both the same length of time, until the water in one is about half gone. Cool and measure roughly the amount of water left in each. To what, besides time, is the rate of evaporation proportional? Would you increase or decrease the amount of water to be used in cooking a small amount of cereal in a large pan?
2. Repeat the experiment, but with the saucepans closely covered. Is there any difference? Explain the result.

B. Prepare Cereal with Fruit.

1. Add gradually two tablespoons of wheatena to a cup and a quarter of actively boiling water, to which one-sixth of a teaspoon of salt has been added. After ten minutes cooking over the direct flame, finish over hot water. This will probably take thirty minutes. A few moments before the cereal is done, add the meat of five dates cut very fine. Serve with sugar and cream.



COMPOSITION OF CEREALS

2. Repeat (1) to the point where the cereal has been cooked over the direct flame, but use only five-sixths of a cup of water. Then, instead of finishing over water, place it in a fireless cooker or hay box.

C. **Class Experiments.** CEREALS.

1. Test cereals for both starch and protein.
2. Examine rice- and oat-starch under the microscope. Notice size, shape, and any apparent markings.

CEREAL BREAKFAST FOODS

Cereals are cultivated grasses, but the seeds of these grasses are often called cereals. Sometimes, the term includes all products of cereals such as flour and macaroni as well as the grains themselves. Common usage, however, often makes the word cereal synonymous with breakfast food. The seeds of the cultivated grasses are the part of the plant used, because they are packed with nutriment for the embryo. The grains commonly used for breakfast food are wheat, oats, corn, rice, and, occasionally, barley. Rice contains a larger amount of starch than the others, but little fiber, and it is on this account easily digested. Of the three grains most commonly used for breakfast foods, wheat, oats, and corn, oats furnishes most protein and fat, and has the highest calorie value * per pound. Wheat, however, does not differ very greatly in nutritive value and contains less fiber and so is more easily digested. Corn has a very tough fiber and ranks below the other two in calorie value. All these differences are comparatively small, and we can rank cereals together in their place in the diet, with the following average composition:

* The calorie value of a food is the amount of energy, measured in calories, which a given food furnishes to the body.

Water	10–12 per cent.
Protein	10–12 per cent.
Carbohydrates	65–75 per cent.
Fat	2–8 per cent.
Mineral Matter	2 per cent.

These figures are for the raw grains. Mushes and porridge contain a great deal of water. Cooked oatmeal contains nearly eighty-five per cent of water, but shredded wheat and the flaked breakfast foods have practically the same composition as the original grains.

The cost of breakfast foods varies somewhat with the cereal from which they are made, the cost of those made from corn being least, those from oats next, while wheat is the most expensive. Cost, however, differs even more with the amount of preparation that has already been made. From this point of view, breakfast foods may be divided into four classes. In the first are foods like oatmeal or cracked wheat in which the grain has been husked but not cooked. Next, comes the class of partially cooked foods. These have been steamed until they are somewhat softened and then, if they are to be put on the market as flakes, they are passed between hot rollers which flatten the kernels. Rolled oats is an example of this class. The third class is composed of those which are sold ready to eat, as grape nuts or shredded wheat. Sometimes malt is used in the process of manufacture and is supposed to change the starch into sugar and so start the process of digestion. In most breakfast foods which are malted, not much change in the starch will be found to have occurred, and since, for the healthy person, it is of little moment whether this change has occurred or not, this fourth class, called predigested, is not of great importance. Breakfast foods which belong to the third class cost much more per pound than those in the first class, because more trouble has been taken in the preparation. The advantage to the housewife is in the saving of time necessary to prepare the food. Foods of the first class need to be cooked many hours in order to render them thoroughly digestible. This is more or less trouble even on a coal or wood stove, and on a gas stove is an expensive process. Cereals can, however, be easily and cheaply prepared in a fireless cooker, and if both cost and attention are to be considered, this is the method of preparation which should be chosen. The foods of the second class need, usually, to be cooked about twice as long as the time given on the package. The manufacturer, in order to attract custom, cuts the necessary time of preparation down to a minimum.

Many of the breakfast foods may be purchased both in bulk and package. The advantage of the package is greater surety of cleanliness. Most of the milling is carried on under excellent sanitary conditions. The package assures us that the goods have come to us in the same condition as that in which they left the mill. Bulk goods are often protected neither from dust nor insects. As, however, the uncooked cereals sold in bulk are thoroughly sterilized in cooking, this protection is far less necessary than in the case of such foods as bread, which is eaten as bought.

Since cereals do not keep well, it is better to buy them only in moderate amounts. There is often considerable saving, however, in buying even two packages instead of one.

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U. S. Dept. of Agriculture.

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Farmers' Bulletin No. 237. "Cereal Breakfast Foods."
Farmers' Bulletin No. 249. "Cereal Breakfast Foods."
Farmers' Bulletin No. 316. "Cooking Cereal Foods."

Farmers' Bulletin No. 298. "The Fireless Cooker."
The Exp. Station Bulletin No. 200. "Course in Cereal Foods."

Questions

1. Make a list of all the kinds of grain you know.
2. How does the English use of the word "corn" differ from the American?
3. Give illustrations of the different groups of breakfast foods on the market.
    a. Uncooked grains.
    b. Partly cooked.
    c. Ready to eat.
    d. Predigested.
4. What are the advantages and disadvantages of the different groups?
5. Is the greater cost of package foods justified?
6. Why is it well to keep cereals in glass jars tightly covered?
7. Why are cereals so important as food?
8. How can the "skin" which sometimes forms on top of a cereal while it is cooking be prevented?
9. Why will soaking the grains for an hour or so beforehand shorten the needed time for cooking?
10. What are the advantages of using a fireless cooker in preparing cereals?

X

STARCH

Apple Tapioca
Boiled Rice

A. Prepare Apple Tapioca.

$1\frac{1}{2}$ tbsp. Minute tapioca
$\frac{1}{3}$ c. water
A pinch of salt

Cook together in a double boiler until transparent (about fifteen minutes). Pare and core a sour apple. Put in a buttered baking dish, and fill the cavity in the apple with sugar. Pour the tapioca over it, and bake in a moderate oven until the apple is soft. Serve with sugar and cream.

B. Rice.

Wash the rice thoroughly in a strainer in a bowl of water, rubbing the rice between the hands. Change the water, until it remains clear. Cook by the following methods:

1. Gradually sprinkle two tablespoons of rice into two cups of rapidly boiling water with one-half teaspoon of salt added.
2. Cook two tablespoons of rice in two-thirds of a cup of boiling, salted water for five minutes. Finish cooking in a double boiler. (Why is less water used?)
3. Cook two tablespoons of rice in two-thirds of a cup of boiling, salted water for five minutes. Then place in a mold and steam.

In all cases cook until the rice is soft.

a. Compare the time used to cook by the different methods.

b. Compare the appearance of the kernels as a result of the different treatments.

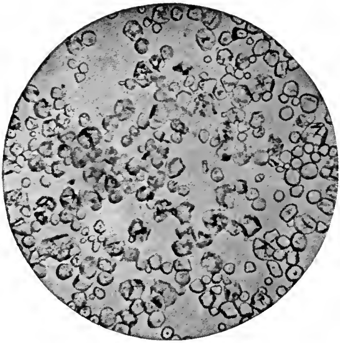
c. Note also the relative amounts of rice before and after cooking.

Starch

Starch occurs in the cells of all plants as tiny white granules, but the size, shape, and appearance of these differ with the kind of plant from which they are taken. A plant manufactures sugar from the carbon dioxide in the air and from water, and this sugar is used as nutriment for the plant, being dissolved in the juice or sap and circulating through it. But since the plant has to store some of this nutriment for future use, it manufactures starch from some of the sugar. Starch has the advantage over sugar that it is not soluble in water. The material is carried into the cell as a solution of sugar which can pass readily through the cell wall and is then turned into granules of starch. When the starch is finally used as the plant food, this process is reversed, the granules change into sugar again, and can then pass out through the cell wall.

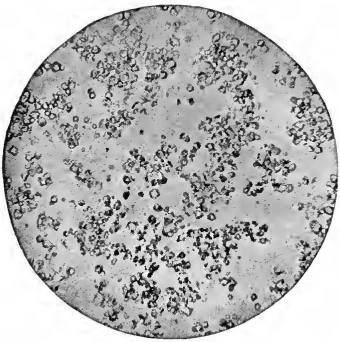
Scientists do not agree entirely in regard to the construction of starch granules, but they believe that they are made up of at least two kinds of starch which are sometimes named red and blue amylose. Amylose is merely the scientific name for starch, and the names red and blue are given to the two kinds not at all because of their color, for they are both white, but because of the colors which they turn with iodine. The starch inside the granules and composing the greater part of the grains is blue amylose, easily digested. Its outer covering is red amylose, much more difficult of digestion and impervious to cold liquids. If the starch grain is heated in water, it begins to swell, till its outer covering is stretched thin and allows liquids to pass readily through it. In this form digestive juices can get at the starch inside to digest it; and, therefore, cooked starch is more digestible than raw.

Starch granules found in potato and arrowroot seem to be made up of only these two kinds of starch, but those in cereals seem to contain a small amount of a third kind called rose amylose. This is more difficult of digestion than is either of the other kinds, but with long boiling can be made to change into blue amylose. As it seems to be rather hard to cook the starch granules when they are shut up in the cell walls of the seed, this may be the reason why cereals take such a long time to cook. Corn starch is, of course, a cereal starch, and ordinary wheat flour, too, contains an abundance of starch; but in grinding the grains, the cell walls are broken and so there is not the



Corn Starch

Oat Starch



Rice Starch

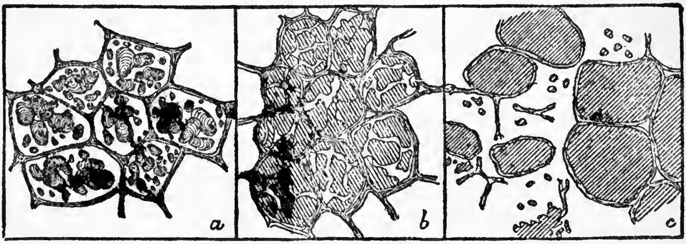
Wheat Starch

STARCH GRAINS, MAGNIFIED MANY TIMES

From Leach's "Food Inspection and Analysis."

same difficulty in getting at the starch for cooking. If, during the cooking of starch, as, for example, in the cooking of oatmeal, the surface is left exposed so that the top dries, the starch is changed into a hard skin which is exceedingly difficult of digestion. If the oatmeal is stirred occasionally and kept covered so that the steam is confined in the space above the surface, no such change occurs.

When a vegetable food containing much starch, such as potatoes or cereals, is cooked, the starch granules swell in the process until they burst most of the cell walls of the plant.



CHANGES OF STARCH GRAINS IN COOKING

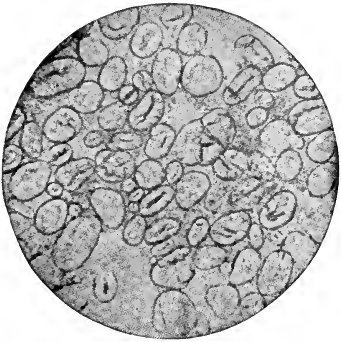
a, cells and starch grains in a raw potato; *b*, in a partially cooked potato; *c*, in a thoroughly boiled potato.

Starch is not soluble in cold water, but, when heated, the granules finally break down and gelatinize. This is only partial solution. When a substance really dissolves, it disappears entirely from view, as sugar does in water. It may impart a color to the solution, but it does not render it opaque. Because starch does not dissolve, it cannot pass through the lining wall of the intestines and so must be changed in digestion before it can be absorbed. A ferment called ptyalin is found in the saliva, which is capable of acting on starch and changing it to sugar. There is an intermediate stage in this action, for the starch is first changed into dextrine. Dextrine is whitish like starch, but with iodine turns a beautiful wine red. Unlike starch, it is soluble in cold water. When starchy food is chewed saliva is mixed with it, and as the food lies in the fundus (or middle part) of the stomach the ptyalin has a chance to act on it. It used to be thought that this action stopped as soon as the food reached the stomach, for ptyalin cannot act in gastric juice, but it is now known that this change can go on for about two hours before the gastric juice is so mixed with the food that the action is stopped. Therefore it seems a somewhat important matter that such food should be chewed thoroughly and mixed with saliva and not swallowed whole or washed down with liquids. In the stomach, however, not all of the starch is digested. Probably most of it does not go beyond the dextrine stage.

In the intestines there is another ferment, sometimes called amylopsin, which, like the ptyalin, can digest starch. We are, then, apparently, well equipped to digest starch, and this is fortunate, for starch forms a large proportion of the nutrients of our diet.

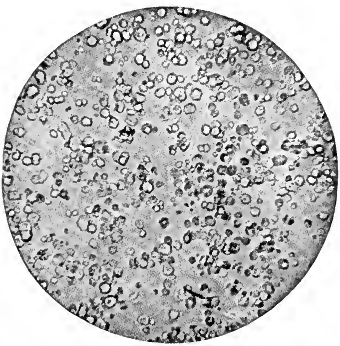
Dextrine may also be formed by heating dry starch very hot, at least to 320° F. It is formed somewhat in toast, and in the crust of bread, and in browned flour, since in these cases the starch is exposed to intense heat. Some breakfast foods are partially dextrinized and this is supposed to make them more digestible. In reality, so small a percentage of the starch is changed that they are really not very different.

Browned flour does not possess the thickening power of ordinary flour because the dextrine in it dissolves instead of gelatinizing. Since heating with acids will dextrinize starch at a much lower temperature, and only a few drops of acid are necessary to bring this about, it is sometimes

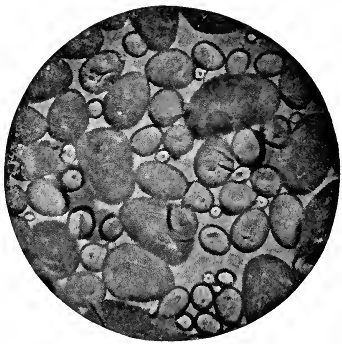


Pea Starch

Bean Starch



Buckwheat Starch



Potato Starch

STARCH GRAINS, MAGNIFIED MANY TIMES

From Leach's "Food Inspection and Analysis."

possible to obtain this result when it is unexpected and undesired. When a lemon filling for a pie or a boiled dressing that is made with flour are cooked too long or with too much acid, they may grow thinner instead of thicker as the cooking continues. So, also, if creamed oysters are kept hot too long a thick white sauce may become very thin.

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U. S. Dept. of Agriculture. Exp. Station Bulletin No. 202. "The Digestibility of Different Kinds of Starches . . . as Affected by Cooking."

Questions

1. Where does a plant obtain the necessary elements to make starch? How does it take in water? How does it get carbon?

2. What purpose has the plant in manufacturing starch, and in what parts of plants would you expect to find the largest stores of it?

3. How is rice grown, and where do we obtain our largest supply?

4. What is the composition of rice? Why is it not used as an exclusive diet?

5. What is the difference in price of different grades of rice, and to what is this due?

7. Why not bake rice as we do potatoes?

XI

RICE AND INDIAN PUDDINGS

Cost of Breakfast Foods

A. Prepare Rice Pudding.

½ c. steamed rice	1 tbsp. sugar
½ c. milk	¼ tsp. salt
½ egg	2 tbsp. raisins

Scald the milk before using it. Beat the egg with salt, add sugar, and pour the scalded milk over the mixture. Put into a buttered baking dish with rice and raisins. The raisins may be omitted and a little grated rind of a lemon used; or cinnamon, ginger, or nutmeg. Molasses or maple syrup may be substituted for the sugar. Or:

Prepare Indian Pudding.

Use one tablespoon of Indian meal to one cup of milk and other ingredients in proportion.

5 c. scalded milk	½ c. molasses
⅓ c. Indian meal	1 tsp. salt
1 tsp. ginger	

Pour the hot milk over the meal, and cook twenty minutes in a double boiler. Add the other ingredients, and bake very slowly in a buttered dish.

B. Crisped Cereals.

Examine and taste a "ready-to-eat" cereal as it is purchased. Place a little of it in a pan and put it for a moment in an oven; compare with the portion not heated.

C. Cost of Breakfast Foods.

Take packages of well-known cereals. Determine how much of each must be used for one serving, then how many servings each package will give. Calculate the cost of a serving of each, and fill in the following table.

Name of Cereal	Cost of Package	Amount of One Serving	Number of Servings in a Package	Cost per Serving	Cost per Ounce

Cellulose

Cellulose is the fiber which makes up part of the framework of vegetable foods. It has the same chemical composition as starch, but is much less soluble, and human food contains only a small percentage of it. It is a form of carbohydrate which is of less importance to mankind than to animals. While animals have ferments in the digestive tract which are capable of digesting cellulose, none with this power are secreted by man. Nevertheless, the scientists find that man digests some cellulose. This is one of the beneficial acts of bacteria present in the intestines. These bacteria are capable of acting on tender cellulose and changing it, perhaps into sugars and organic acids, in which forms it can be absorbed and burned as fuel to furnish the body with heat and muscular energy. Undoubtedly some of the breaking down of the cellulose proceeds further than this, and hydrogen and other gases are produced which have no nutritive value.

But not all forms of cellulose are easily enough broken down to have such changes occur. Cotton is a form of cellulose which would be absolutely without nutritive value. Such tender cellulose as is found in the cell walls of seeds like the cereals, and in vegetables, especially when young, is more capable of being digested. Still, it is probable that the less cellulose there is present in a vegetable food, the more digestible it is. This is probably the reason that rice is so easily digested, for it contains less cellulose than the other grains.

Boiling in water does not change real cellulose at all, just as cotton clothes are not changed by boiling. But the cellulose cell walls of a plant are stiffened with other related substances; for one, with the pectose which changes to pectin. Cooking dissolves out some of these intercellular substances and also hydrates the starch, and so cooked vegetables are softened. Then, as has already been explained, by thorough cooking the cellulose walls may be ruptured by the swelling of the starch grains within the cells and so the contents exposed without its being necessary first to digest the cell walls.

Some authorities believe that inert particles like cellulose are sufficiently rough to stimulate the intestines to peristaltic action, that is, to movements which hasten the passage of food through the intestines and which are an aid in combating constipation. But, since foods are not laxative in proportion to the amount of cellulose they contain, others believe this action is due rather to the stimulus of certain salts which occur largely in the husks of the cereal; and that it is due to the presence of these salts and not to the larger amount of cellulose in them that such articles of food as cracked wheat and graham bread are more laxative than those cereals which have undergone more extensive manufacturing processes.

Mineral and Organic Salts

Mineral matter occurs not only in the teeth and bones, but in every tissue of the body and in all the fluids. It is necessary in all the vital processes. The principal mineral elements in the body are calcium, magnesium, iron, sodium, potassium, phosphorus, chlorine, iodine, fluorine, silicon, and sulphur. These occur as compounds, forming both mineral and organic salts. Unlike carbohydrates, fats, and proteins, mineral salts are not changed in digestion nor are they oxidized, and so they do not furnish the body with energy. When organic matter is burned, these salts remain unconsumed as the ash.

Mineral matter is present in all the digestive juices and plays its part in the digestion and absorption of foods. Mineral matter is dissolved in the blood and regulates its specific gravity and its alkalinity. It is found in all tissues, where it is concerned in metabolism.* Mineral matter, too, probably stimulates the contractions which cause the heart to beat.

Since man excretes every day a large amount of mineral matter, this loss must be replaced. The necessary amount of mineral matter is found in an ordinary mixed diet. Common salt, sodium chloride, is the only mineral which is added to food, but it is probable that there would be enough of this furnished in the food of a mixed diet. In fact, it is possible that large quantities of salt are really bad for us rather than helpful. People, like the Esquimaux, who are unaccustomed to its use easily detect the addition of an exceedingly small amount and dislike it, but those who are habituated to its use crave it. Salt seems to accentuate flavor.

* Metabolism includes all the processes which food undergoes after it is digested and absorbed and before it is excreted.

In the metabolism of proteins, mineral acids are formed which must be neutralized by such basic substances as sodium, potassium, calcium, and magnesium, in order to preserve the alkalinity of the blood. As these basic elements are abundant in vegetables and fruits, it is necessary that the diet should contain liberal amounts of both and not consist too largely of meat. The modern diet is likely not to be well balanced in this respect, because it consists of liberal amounts of meat, fats, and sugar, all of which contain insignificant amounts of mineral salts.

At first thought it seems strange that fruits should be added to prevent over-acidity when fruits themselves are acid; but the acids present are organic acids, such as citric, malic, tartaric, and oxalic. Some of these are decomposition products of starch and are oxidized by the body to produce energy and are then given off as carbon dioxide and water, just as starch is metabolized. Mineral acids cannot be oxidized in the body and must be neutralized into salts and then excreted, and that is why they require basic elements with which to unite to become salts.

It is important to remember the need for generous amounts of vegetables and fruit in the diet, for these often seem expensive materials in comparison with the amount of energy and of building material which they contain, and the poor are tempted to leave them entirely out of their rations.

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U. S. Dept. of Agriculture. Office of Exp. Station Bulletin No. 43. "Losses in Boiling Vegetables."

Journal of Home Economics, Vol. 4, No. 5, "Losses in Boiling Vegetables."

Questions

1. Are mineral elements so abundant in foods that they do not need to be taken into consideration in menu making?
2. What foods contain iron? What special use has the body for this substance?
3. Why is milk so valuable a food for babies?
4. How may carelessness in preparation waste or lose the salts contained in foods?
5. Discuss the boiling, baking, and steaming of vegetables from this point of view.
6. What uses may be made of the water in which vegetables have been cooked? When is this worth while?
7. Do canned and dried vegetables retain their mineral salts?

XII

REVIEW LESSON

Breakfast

Prepare and Serve a Breakfast.

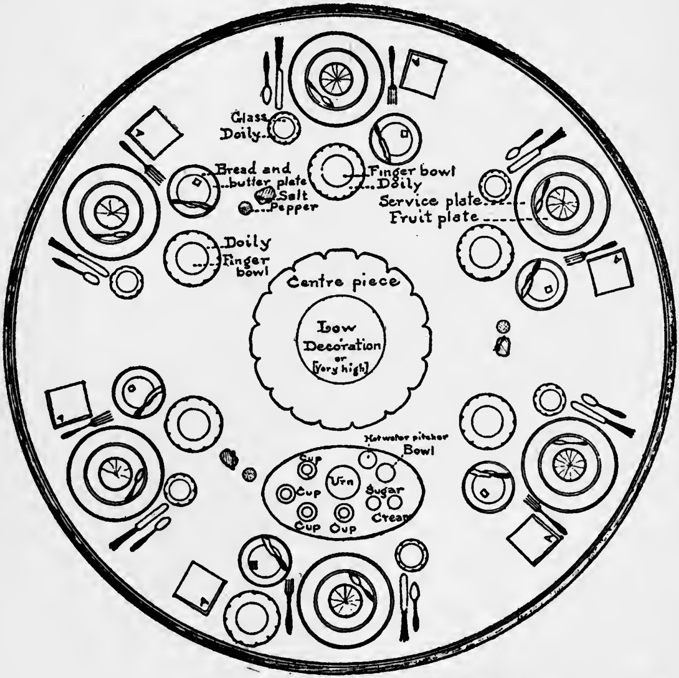
Calculate the cost per person.

Suggested menu:

Fruit, fresh or stewed.
Cereal, cooked or ready-to-eat.
Eggs, boiled or poached.
Serve with toast or bread.
Milk.

Setting the Table

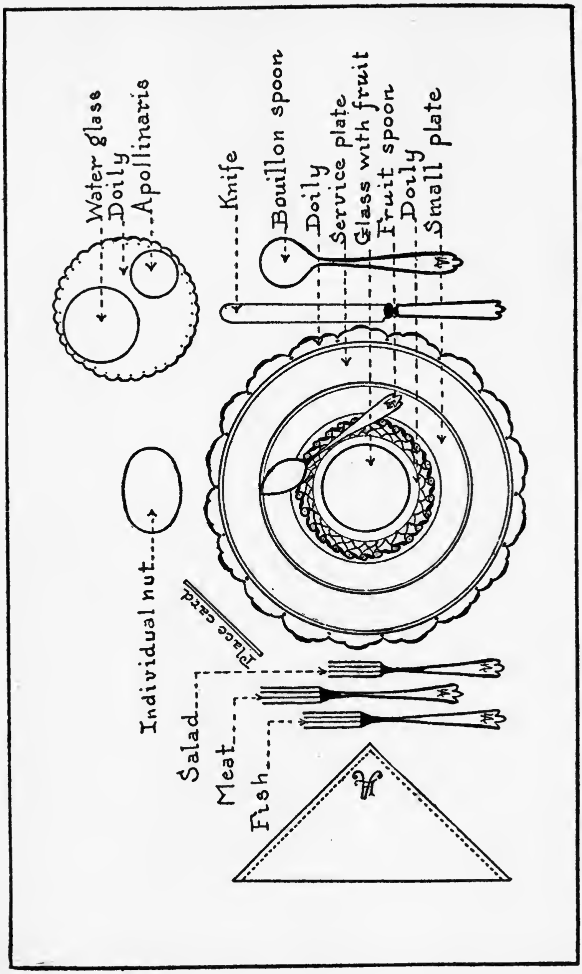
Scientists have established the fact that our state of mind when eating is an important matter, a sense of comfort and pleasure going far toward making a meal easily digested. It is imperative, then, to try to make the table as attractive as possible. Everything on the table must be scrupulously clean, so clean that there is no question



From "Table Service," by Lucy G. Allen.

DIAGRAM OF BREAKFAST TABLE

about it. For this reason the use of a colored table-cloth, which was common at one time, is no longer tolerated. It is often difficult, especially with children, to keep all parts of a table-cloth unspotted. In that case it is well to consider the use of doilies which may be replaced as each



From "Table Service," by Lucy G. Allen.

LUNCHEON COVER IN DETAIL

is soiled without greatly increasing the labor of washing. They are often preferred even in houses where cost and work are not a consideration, especially for the less formal meals. Often, only one fairly large doily is used at each place, but in more formal service or with a very highly polished table smaller doilies for the glass, cup and saucer, and bread-and-butter plate are also used.

In many homes the table-cloth is not removed between meals. This is usually unfortunate, because it is seldom possible to make the cloth appear as fresh as when all the wrinkles are shaken out. Often, not all the crumbs are removed. If the housekeeper is so busy that leaving the table set is a necessary practice, at least some clean outer covering should be spread over it to keep away the dust. A "silence cloth" is not only a comfort in lessening the noise, but it helps protect the table from hot dishes. It also greatly improves the appearance of the tablecloth and keeps it from wearing out so fast against the edge of the table.

At each place the fork or forks are placed for convenience with the tines up and on the left of the plate; for the same reason the knife or knives on the right with the sharp edge toward the plate. Knives and forks should be placed at such a distance that they give neither a crowded nor a sprawled-out appearance and are set about an inch from the edge of the table. Spoons, bowl up, are usually placed at the right of the knives; occasionally, however, they are put at the top of the knives to save room. When much silver is to be used, the various kinds are sometimes arranged according to size; but it is better form, because less confusing, to arrange them in the order of use, placing those to be used first on the outside. Since the soup spoon is large and unmistakable, it is sometimes placed out of order between the knives and smaller spoons. The napkin should lie at the left of the forks unless for lack of room, then it may be placed between the knives and forks. The glass, right side up, at the end of the knife, and a butter plate or bread-and-butter plate, just back and a little to the left of the fork, usually completes the individual service except for the plate itself. This may or may not be in place when the meal begins.

It is difficult to give general rules in regard to the dishes to be used. Some prefer to use plates under soup plates and cereal dishes, and consider that as these protect the table and table-cloth they are real labor savers. But, in general, the use of extra dishes is not best; and vegetables, for example, should be served on the main plate unless they are so liquid that this would be unpleasant.

If the food is to be served from the table, it should be so arranged that it can be reached as conveniently as possible by the one who is to serve. Near each dish should be placed the utensils which will be needed; these should not be used in common with another dish, and if the dishes are passed to allow each to serve himself, they should be passed with the dish so that no one is tempted to use his own fork or spoon. In serving, if very few people are present, ladies may be served first. Usually, however, it is now customary for the host or hostess to serve in order, beginning for the first course with the person on the right and at the next course with the person on the left.

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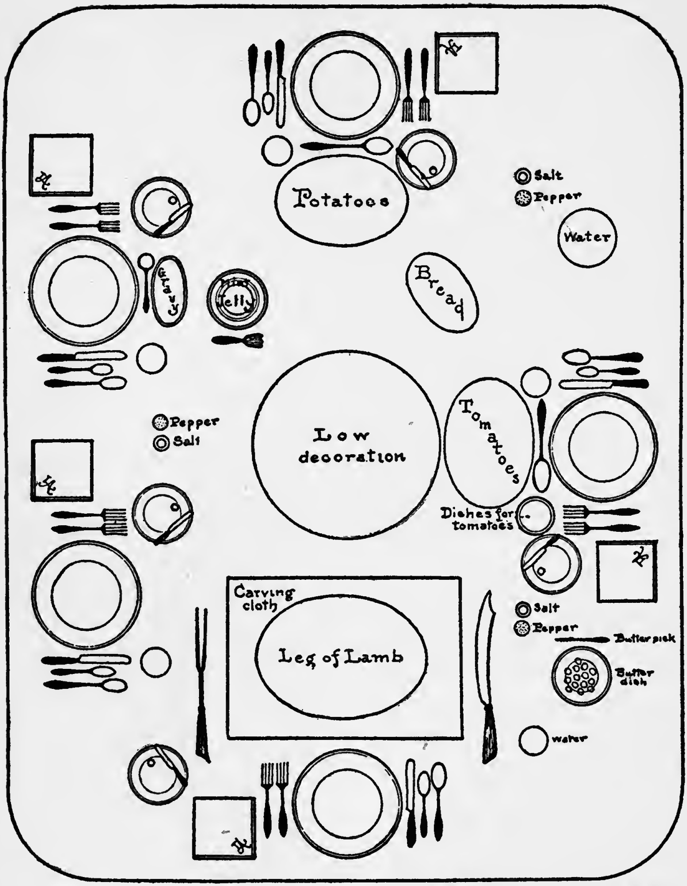


From "Table Service," by Lucy G. Allen.

DIAGRAM OF TABLE LAID FOR HOME DINNER (WITHOUT SERVICE OF MAID)

Questions

1. What is the principle underlying the arrangement of silver and dishes on the table?

2. Tell: *a.* Where should the napkin be placed while you are eating?
   b. Should the napkin be laid on the table while it is being folded at the end of the meal?
   c. Is it ever permissible not to fold the napkin?
   d. Show the proper ways of using knife, fork, and spoon.
   e. Where should the knife and fork be placed in passing the plate for a second serving? Why?
   f. From what part of the spoon should we eat?
   g. Why should the spoon not be left in the cup?
   h. Why should a whole slice of bread not be spread at a time? How should bread be eaten?
   i. Discuss courteous ways of offering to serve another, of accepting or refusing.

3. Why should dishes offered by a waitress always be passed to the left of the person seated?

4. Why should finger bowls and tumblers not be filled too full of water?

5. In pouring a glass of water, why should the waitress avoid touching the rim of the glass? Should the same precaution be taken in putting away glasses after washing?

6. What care must be taken in laying a table-cloth? In folding it?

7. Why are doilies sometimes used in place of a table-cloth? At what meals are they most often used?

8. How should a napkin be folded when it is laundered?

9. What conditions modify the number of courses in which it is desirable to serve a meal?

XIII

TEA

Marshmallow Wafers

A. Prepare Marshmallow Wafers.

Dent a marshmallow by pressing on it, as hard as you can, with the handle of a knife. Put in this dent a piece of butter about the size of half a pea, and place the marshmallow on a square cracker laid on an unbuttered tin. Put it in the oven, until it puffs up and browns slightly. Remove from the oven, and, as it grows cold, place in the dent a piece of a candied cherry.

Serve with tea.

B. Weigh a Teaspoon of Tea. Allowing one teaspoon of tea to one cup, what would each cup cost?

C. Green Tea.

1. To one-half teaspoon of tea add one-half cup of water which is hot, but not boiling. Let it stand three minutes.
2. To one-half teaspoon of tea add one-half cup of boiling water, and boil, covered, for five minutes.
3. To one-half teaspoon of tea add one-half cup of boiling water. Let it stand three minutes, and then strain about half of it from the leaves.
4. Let the remainder from (3) steep twenty minutes and then strain.
5. Pour one-half cup boiling water through one-half teaspoon of tea in a fine strainer or tea-ball.

Compare 1, 2, 3, 4, and 5, as to color, flavor, and strength.

Put a teaspoon of each into five test tubes, add one-half teaspoon of ferrous sulphate solution and set aside until black precipitate settles. This precipitate shows the amount of tannin (a substance in tea liable to cause digestive disturbances) which is extracted from the tea by each method.

D. **Class Experiments.** BLACK TEA.

Repeat *C*, but use black instead of green tea.

Judging from these experiments which method of making tea is best? Why?

Compare the amounts of tannin in green and black tea.

E. MAKE A CUP OF TEA.

Serve with the wafers.

TEA

Chinese tradition recognizes the use of tea since 2700 B.C., but it was not used in England or on the Continent until the latter part of the seventeenth century, nor was it imported into America until 1711. In 1660 Pepys, an Englishman of some political and social experience, records in his diary the taking of his first cup of tea, which he explains is a "China drink." Now England and Australia use large quantities of it per capita compared with its consumption in the United States.

Tea comes to us mainly from China, Japan, Ceylon, and India. There has been an attempt, however, to grow it in our own country, and some is produced successfully in South Carolina. Tea is made from the leaves of a shrub called *thea*, which grows from three to six feet high. In order to obtain the best flavor only new, tender leaves and buds are used, but as these shrubs send out four sets of shoots a year, there are four harvests. There are different grades and varieties of tea plants, but, in general, the tea from each country has a characteristic flavor. Great differences, however, are due to the age and size of the leaf. The two leaves nearest the tip are the choicest and make the real Flowery and Orange Pekoe; but it is said the finest grades are so highly prized in their own countries that they are never sold in the United States. The leaves

TEA LEAVES

a, Flowery Pekoe; *b*, Orange Pekoe; *c*, Pekoe; *d*, Souchong (first); *e*, Souchong (second); *f*, Congou; *h*, Bohea.

which grow farther and farther down the stem make less and less desirable teas. In selecting teas, then, the size of the uncurled leaves and their uniformity should be considered. The substitution of a larger leaf than the brand calls for, or the addition of tea "dust", or of too large a proportion of stems, are now the chief adulterations.

There are two chief methods of preparing the leaves for market, and these affect not only the appearance but also the flavor and the composition of the beverages made from them. It is these methods of preparation which give us black and green teas. The green color of the leaf is preserved in green tea by drying the leaf by artificial heat and at a temperature high enough to destroy any ferments that are present. During the drying, constant stirring will cause the leaves to roll and curl. In making black tea, on the contrary, the leaves are only withered and left sufficiently moist to ferment before they are curled and dried thoroughly. This fermentation not only changes the color, but also somewhat affects the composition of the leaf. The exact process, number of dryings, and so forth, differ in different localities. Formosa-oolong is a cross between black and green tea. It is a semi-fermented tea which appears black, but has the flavor of a green tea.

Although the tea leaf is itself rich in protein, the infusion contains practically only caffein, tannin, and essential oils. None of these are in any sense food materials. Caffein, a stimulating substance also found in coffee, acts upon the nerves, producing a feeling of well-being, but it is this which prevents sleep if the drinker is unaccustomed to the drug. Caffein is so soluble that practically all of it is extracted from the leaves however the infusion is made. This is also true of the essential oils which give the characteristic flavor. These so-called oils are not really oils at all, but are chemical substances present in very small amounts, and are somewhat volatile. For this reason tea leaves should be kept in covered cans or jars.

The bitter ingredient, tannin, is drawn out more and more if tea stands on its leaves, or is boiled. Tannin is disagreeable in taste, but, besides this, it may hinder the flow of digestive juices, and retard digestion. As a result of fermentation, black tea contains much less tannin and is usually recommended for that reason; but it is somewhat more stimulating than green tea, for it contains a little more caffein. Most people select the variety of tea they use merely by preference for its flavor without thought of composition.

Individuals differ greatly in their sensitiveness to the stimulants in tea, as well as to the tannin. Children are always much more easily affected than adults, and should not be allowed to take any stimulating drink. Authorities say that no one should touch tea or coffee until over thirty. Nervous people, of course, are most prone to notice bad effects from the caffein, and those with weak digestions may be troubled by the amount of tannin which even well-made tea contains.

References

Freeman and Chandler. "World's Commercial Products."

Questions

1. What is a beverage?
2. What is a decoction? An infusion? Which should tea be? What is meant by steeping?
3. Make a drawing of a tea leaf, and a sketch of a tea plant.
4. Make lists of some of the best varieties of both black and green tea with their present prices.
5. What ought you to expect to pay for good tea? For fancy varieties?
6. How can the effects of tea-drinking be minimized?
7. Should the use of tea be encouraged? What people should avoid its use entirely?
8. Why should a teapot be scalded immediately before making tea in it?

XIV

COFFEE

Cheese Wafers

A. Prepare Cheese Wafers.

Sprinkle grated cheese, seasoned slightly with salt and paprika, on thin crackers, and heat them in the oven until the cheese melts.

Serve with coffee.

B. Cost of Coffee. Determine the number of cups a pound of coffee will make, allowing one rounding tablespoon of ground coffee to each cup.

C. **Class Experiments.** Making Coffee.

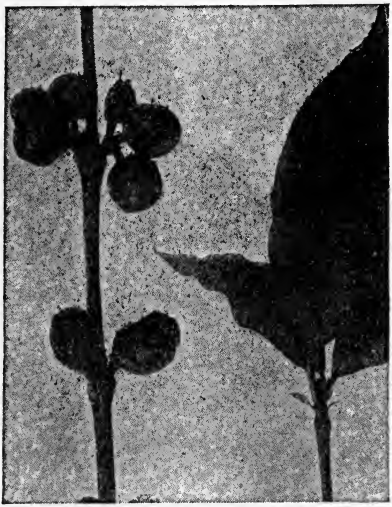
1. Mix one rounding tablespoon of coffee with one-half teaspoon of egg white and one tablespoon of cold water. Add one cup of boiling water. Boil three minutes and let stand in a warm place or over hot water for five minutes.
2. Repeat (1), omitting the egg. Why is the egg used?
3. Repeat (1), using one tablespoon of egg white. Compare carefully the resulting coffee for color and flavor with that made in (1). Can too much egg be used?
4. Repeat (1), omitting the egg, but adding one tablespoon of cold water after boiling. Compare carefully with (1) and (2). What is the use of the cold water?
5. Repeat (1), omitting the egg, but tying the coffee in a piece of cheesecloth.

D. Percolated and Drip Coffee.

Coffee made by these methods may be compared with that made by boiling.

Coffee

The coffee bean is the seed of a fruit resembling a cherry. Coffee grows on an evergreen tree, originally a native of Arabia, but now cultivated in nearly all tropical countries. The berries are produced three times a year. They are picked and allowed to ferment to soften the pulp which is later removed. This leaves a husk which encloses two berries with their flat sides next each other. After the removal of the pulp the husk is dried and broken open and the berries released.



Coffee Berry and Leaf.

These raw berries are exported to the countries in which they are to be used, and then roasted to develop flavor and to make them brittle for grinding. After washing they are sold either ground or unground. As after grinding they lose flavor somewhat quickly, the housewife usually buys either the whole berries and grinds them as she uses them, or gets the grocer to grind the whole for her, or else she buys ground coffee in air-tight cans.

Mocha, Java, and Brazilian coffees are the three principal kinds. The first two are used as trade names for coffees having special characteristics and do not signify the place of production. Most coffee comes from South America, largely from Brazil. Differences of flavor are due partly to differences in variety, but are largely the result of differences in the maturity of the berries when gathered and in the length of time they are roasted. Berries are picked green, or left to turn red, or ripen fully to a purple. Rio, a brand which is very familiar, is a Brazilian coffee. Brazilian coffees cost less than Java. Mocha is most expensive. A mixture of Mocha and Java is a general favorite.

Perhaps the most economical way to purchase coffee is to buy the roasted bean in five- or ten-pound bags and store in tins until needed. The whole beans bought in bulk cost less than the coffees sold in pound tins. The crispness of the bean and the aroma tell whether the coffee is sufficiently fresh to be good. The flavor of old coffee can be somewhat improved by spreading it out well and re-roasting in an oven.

The beverage coffee is chemically much like tea. It contains caffein and essential oil and tannin, but the tannin is in a somewhat different form and is perhaps less objectionable. While the percentage of caffein in the bean is less than in tea leaves, so much more coffee is used in making a cup of the beverage that a cup of coffee contains about as much caffein as three-quarters of a cup of tea. Coffee, then, like tea, should be avoided by the nervous, by those who have digestive disturbances, and by children. Cream or milk in coffee and tea seem to render it less digestible to some people. Individuals differ greatly in their sensitiveness to tea and coffee. Some are much more affected by one than by the other; some are sensitive to both. It is easy to find out how much one is stimulated. Those unaccustomed to coffee can see whether it makes them feel nervous or produces sleeplessness or indigestion. But coffee drinking becomes a habit and no great effect may be noticed. If, however, the individual accustomed to it will try going without, he can soon tell whether it was affecting him. If he has headache, or is unduly sleepy and dull, he may be sure he has been depending on coffee as a stimulant.

A small cup of black coffee taken at the end of a hearty meal sometimes acts as a promoter of digestion. This usually signifies that the person benefited has eaten too much and would be better off if he ate less and went without the coffee.

References

Freeman and Chandler. "World's Commercial Products."
U. S. Dept. of Agriculture. Farmers' Bulletin No. 122. "Coffee Substitutes."

Questions

1. Where is coffee grown? How prepared for the market?
2. What varieties of coffee are on your local market?
3. What do these varieties cost? What is a reasonable price to pay for a good coffee?
4. Why does an egg settle coffee? Why are egg shells sometimes used? If the shells are to be used for this purpose, when should they be washed?
5. Explain why cold water settles coffee.
6. Is coffee a decoction or an infusion?
7. Describe the care which should be taken of a coffee pot.
8. Name some of the coffee substitutes. From what are these usually made? How does their cost compare with that of coffee?

XV

COCOA AND CHOCOLATE

Oatmeal Cookies

A. Prepare Oatmeal Cookies.

Use one-eighth of the recipe:

½ c. sugar	¼ tsp. salt
½ tbsp. melted butter	1 tsp. vanilla
1 egg	1 c. rolled oats

1 tsp. baking powder

Mix the dry ingredients and add the egg beaten slightly and the melted butter. Drop from a teaspoon on a buttered tin. Bake from five to seven minutes in a slow oven (365° F.).

B. **Class Experiments.** Making Cocoa.

1. Try mixing one teaspoon of cocoa with cold water.
2. Try mixing one teaspoon of cocoa with boiling water.
3. Try mixing one teaspoon of cocoa slowly with boiling water.
4. Try mixing one teaspoon of cocoa with one-half teaspoon of sugar, then add boiling water.

Make Cocoa. Mix as seems best from the results of *B.* Use:

1 tsp. cocoa	¼ c. water
½ tsp. sugar	¼ c. milk

A few grains of salt
A few drops of vanilla, if desired

Mix cocoa, salt, sugar, and water, and boil one minute. Add milk and boil until it begins to froth. Remove at once. Let half of this stand a few moments. Beat the other half with an egg-beater or a wire whisk until it foams. What is the advantage of "milling" (beating)?

C. Prepare Chocolate.

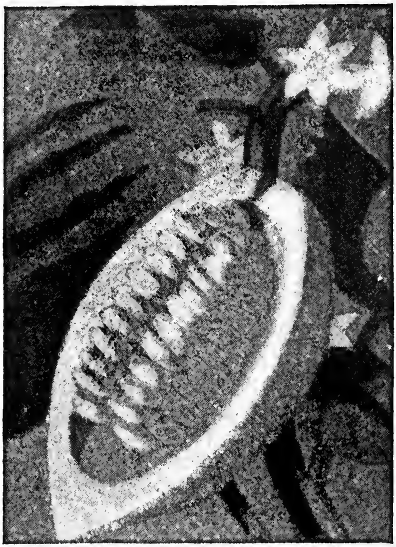
Use the same proportions as for cocoa, but use a weight of chocolate equal to the weight of the teaspoon of cocoa. Melt the chocolate with sugar in a saucepan over hot water, add boiling water slowly, stirring until smooth. Then boil one minute, add milk, and proceed as in making cocoa. Serve with cookies.

When would it be better in making cocoa and chocolate to scald the milk first?

Cocoa and Chocolate

The cocoa tree, a native of tropical American countries, produces a pod from seven to ten inches long, and shaped somewhat like a thick cucumber. In the pod are found from twenty to forty beans from which chocolate and cocoa are manufactured. The pods are harvested twice a year, the beans being freed from the pod and allowed to ferment. This fermentation is carried on very carefully, for upon it depends the development of the flavor. Drying in the air changes the color of the bean from white to red. Roasting changes the beans further and loosens the husk, which is removed and sold as cocoa-shells, to be boiled with water for a beverage. The part of the bean under the husk is called the nib. This is sometimes crushed and put on the market as cracked cocoa, but more often is ground and molded into a cake which is known as bitter or cooking chocolate; or, mixed with sugar, as sweet chocolate. The latter is often flavored, usually with vanilla.

Cocoa is made from chocolate by the removal of part of the fat, approximately fifty per cent. The fat, in American manufacture, is merely pressed out and, as cocoa butter, forms a valuable trade product. Dutch manufacturers treat the chocolate with alkali in the process of making cocoa and add some spice, usually cinnamon, as well as vanilla. So-called "soluble cocoas" are merely those which are finely ground and so remain in suspension a longer time.



Cocoa Pod and Beans

Cocoa, as a beverage, differs from tea and coffee in being fairly nutritious. As larger amounts of milk or cream are usually used in its preparation, this, too, increases the food value. Cocoa contains tannin, but in a quite different form from that found in tea, and its stimulating ingredient, theobromin, although like caffein in its effects, is much milder. However, there is something of a reaction against the too free use of chocolate and cocoa, even in cases when the large amount of fat in chocolate does not cause trouble. Doctors caution some invalids and children against the use of chocolate. Many who do not feel stimulated by it notice the diuretic effect. Still, chocolate is probably much to be preferred to tea and coffee as a beverage, particularly as we are not likely to demand it with the same frequency.

Condiments and Flavoring Extracts

Substances possessing practically no nutritive value, but consumed either for their stimulating effects or for their flavor, are known as food adjuncts. Tea and coffee belong under this head, as do condiments which increase the appetite and stimulate the flow of digestive juices. Condiments are largely aromatic fruits, seeds, and leaves, containing volatile oils. Little children are considered better off without spiced foods, as natural, unstimulated appetite is the best guide to the amount of food which should be eaten. Then, too, the spices which are preservatives may hinder digestion and so cause difficulty. The flavorings vanilla, orange, and lemon are usually considered harmless.

Allspice. The fruit of an evergreen tree which grows in the West Indies and belongs to the same family as the clove. The fruit is gathered when it is full grown, but before it is ripe, and is dried in the sun. The name comes from the supposed resemblance in taste to a mixture of cinnamon, clove, and nutmeg.

Anise, coriander, cumin, dill, and fennel, are all fruits of various plants.

Bayleaf, marjoram, mint, and summer savory are dried herbs.

Capers. These are the flower buds of the caper bush. They are picked and dried, and stored in vinegar, but afterwards removed and packed for shipping without the vinegar.

Caraway. These so-called seeds are the fruit of a plant growing in northern and central Europe and Asia; it is also cultivated in this country, especially in California.

Cayenne. Cayenne or red-pepper is the fruit of the capsicum, not a true pepper, several species of which are grown in the tropics. They belong to the same family as the potato and tomato.

Cinnamon. True cinnamon is the inner bark of a plant native to Ceylon. Cassia is a thicker bark, resembling cinnamon in flavor, but less delicate, coming from India, China, and the East Indies. Much so-called cinnamon is really cassia. Both have a right to the botanical name cinnamon.

Clove. The flower buds of an evergreen grown largely in Zanzibar, British East India, and the West Indies. The buds are dried in the sun or treated with wood smoke. Dark, well-formed cloves are best. Ground cloves deteriorate more quickly than do whole cloves.

Ginger. The root of a plant native to southern Asia. The plant, not unlike the iris in appearance, grows freely in moist places in tropical countries. The root is gathered when the stem withers, is scalded, or washed and scraped, to prevent sprouting, and is sometimes bleached. Preserved, Canton, and crystallized ginger are made from young roots.

Horse-radish. This is the root of a plant related to the cress or nasturtium family. It is ground for use, and is sometimes mixed with vinegar.

MACE. This spice is made from the covering which surrounds the nutmeg seed.

MUSTARD. The product is ground from the seeds of various species of the mustard plant. The hulls may or may not be removed. Unground white mustard seeds are frequently used in pickling. French mustard is prepared by mixing ground mustard with vinegar and other flavoring materials, such as garlic and spices.

NUTMEG. Nutmegs are the dried seeds of a tree which resembles the orange. The tree is native to the Malayan Archipelago.

PAPRIKA. This is prepared by grinding the ripe fruit of the capsicum, carefully excluding seeds and stem. This gives a product which is far less peppery than Cayenne.

PEPPER. The fruit of the pepper plant, a climbing perennial shrub, grown in the East and West Indies. The unripe peppercorns make black pepper. The ripe pepper, with the husk removed, is ground into white pepper.

SALT. Table salt is composed largely of sodium chloride, usually with other mineral matter, such as calcium sulphate. Traces of calcium and magnesium chloride may also be present. In the United States, nine-tenths of all the salt produced comes from New York, Ohio, Michigan, and Kansas. Salt is obtained by mining rock salt, from salt wells, or by the evaporation of salt water from the ocean or from salt lakes. Salt produced in the third way must be refined by re-dissolving in water and then re-crystallizing.

VINEGAR. In the United States, vinegar means the product resulting from the fermentation of apple juice. This is sometimes called apple or cider vinegar, but various vinegars made from other materials may also be sold under their appropriate names; as wine vinegar, malt vinegar, and grain or spirit vinegar.

EXTRACTS

Extracts are solutions in alcohol of the volatile oils and other substances which give the characteristic flavors to various plants. Extracts of many varieties are on the market, but vanilla, lemon, orange, and almond are, perhaps, the most commonly used.

Vanilla is a bean from a climbing vine, native to tropical America. The beans grow in a pod which is allowed to ferment after it is picked. Then the beans are dried for market. To make extract they are cut up and extracted with alcohol. Sugar is sometimes added. The Tonka bean has a similar flavor.

Lemon and orange extracts are prepared by soaking the peel of the fruits in strong alcohol.

Almond extract is made from the oil of bitter almonds. This oil may be obtained not only from bitter almonds but also from the seeds of apricots and peaches.

All spices and extracts sold in interstate commerce must conform to certain fixed standards prescribed by Federal laws. Many states also prescribe standards.

References

"History and Use of Cocoa and Chocolate." Walter Baker & Co. Ltd., Dorchester, Mass.
"The Chocolate Plant." Walter Baker & Co. Ltd.
OLSEN. "Pure Foods."

Questions

1. Is it economical to buy a sweetened cocoa and pay as much per pound as for ordinary cocoa?
2. Which costs most per pound, chocolate or cocoa?
3. What are the advantages and disadvantages in using cocoa in place of chocolate in making frostings, cakes, and the like?
4. Is it easier to melt or grate chocolate for such use?
5. How do cocoa and chocolate compare in food value with tea and coffee?

XVI

FREEZING

Water Ices

Sherbet

A. **Class Experiments.** A STUDY OF FREEZING MIXTURES.

1. Prepare a small bowl of:
   a. cracked ice.
   b. mixture of one part of salt to one part of ice.
   c. mixture of one part of salt to seven parts of ice.
   d. mixture of one part of salt to ten parts of ice.

   Insert a thermometer in each bowl as soon as the ice and salt are mixed and find the lowest temperature obtainable in each case, also the length of time necessary to obtain this temperature.

2. Effect of different freezing mixtures.
   Prepare a syrup, using two tablespoons of sugar to one-half cup of water. Pour into four test tubes. Prepare bowls as in (1) and insert one of the test tubes in each. Compare the time required to freeze, and the textures of the frozen syrups. Which freezing mixture will you use to freeze an ice or a sherbet?
3. Insert in a freezing mixture of one part of salt to seven parts of ice test tubes containing:
   a. a tablespoon of water.
   b. a tablespoon of water and a saltspoon of ground spice.
   c. a tablespoon of syrup (one part sugar to four parts of water).
   d. a tablespoon of syrup (one part sugar to one part of water).
   e. a tablespoon of stiffly beaten white of egg.

   Notice the time necessary to freeze and the texture of each. Take the temperature of each when frozen. What is the effect of suspended and dissolved substances on the freezing point of water?

B. PREPARE LEMON ICE.

Boil two tablespoons of sugar with half a cup of water to make a syrup. Add one tablespoon of lemon juice. Cool, pour into a tin measuring cup or similar container, cover, and surround with ice and salt. (What proportion will you use?) Stir while freezing.

C. **Class Work.** PREPARE LEMON SHERBET.

Prepare a syrup, using the same proportions as in (*B*) but make enough to serve the whole class. Freeze in a regular freezer.

1. Use two teaspoons of gelatine for every quart of liquid. Soak the gelatine in a little cold water, while

the syrup is cooking. Then pour the hot syrup over it. Add lemon in the same proportion given in (*B*) and strain. Grated lemon peel may be added.

Or:

2. When syrup is cool, mix in stiffly beaten white of egg, using one-half to one egg white for each cup of liquid. Add lemon as before.

Freezing Mixtures

Without a knowledge of physics it is rather difficult to understand how ice and salt act as a freezing mixture. In order to understand it at all we must know some preliminary facts. In the first place, the subject of energy must be considered. Cold is not a thing in itself, but merely the absence of heat. Heat, light, electricity, magnetism, and motion are all forms of energy and can be transformed one into another. Electricity in our lamps, for example, is changed into light and also gives off heat. In an electric flat-iron, heat is produced without any light at all. The heat of the fuel is, in a locomotive, turned into the motion which carries the train along. It is well-known, too, that some substances, as a piece of hard rubber such as is found in a fountain pen, can easily be electrified on a cold day by rubbing briskly on a woollen surface and that they will then attract bits of paper. These are all cases where one form of energy is turned into another; and it is a law in physics that no energy is ever destroyed, but continues to exist. When a solid like ice is changed into a liquid like water, or a liquid such as water is changed into a gas such as water vapor, heat is necessary for the change. This is said to be used up in performing work and is spoken of as hidden, or latent heat.

The same kind of action is illustrated by boiling water.

The temperature of the water rises until the boiling point is reached, but no further application of heat will raise the temperature above this point. This is because as fast as the heat is supplied it is used up in turning the water into steam; the more the heat supplied, the more steam there is formed, but the temperature of the steam itself is the same as that of the water from which it comes. But when it is said that the heat is used up, it is not meant that it is destroyed; for if the vapor be changed back to water, or the water to ice, the energy again manifests itself and appears as heat.

A second point to be understood is what is shown by the freezing experiments: a liquid that has another substance dissolved in it no longer freezes at the same temperature, but at a lower one. The more substance there is dissolved, the lower the freezing point becomes.

Now what happens when the ice and salt are mixed that makes the two so much colder than before? The ice is at 32° F. and the salt much warmer, but as soon as they are mixed the temperature falls rapidly. What occurs is this. The ice and salt which are next each other are mixed to form brine. But brine, being really water with salt dissolved in it, should not freeze at 32° but at a much lower temperature. If it cannot be frozen, the ice must melt. But, as has already been said, heat is necessary to bring this about. The only available heat is in the mixture itself or the surrounding objects with which it comes into contact. This heat is used up in doing the work of melting the ice and becomes latent,—that is, disappears and is no longer evident as heat. Some heat also is used in doing the work of dissolving the salt in the water. As a result of these two actions the temperature of the mixture drops.

There are certain substances which conduct heat readily. It is well known how hard it is to hold the end of a metal spoon while the other end is in boiling water. No difficulty is experienced, if a wooden spoon is used. Wood, then, is a poor conductor of heat and metal a good one.

An ordinary ice-cream freezer has a container made of metal. This is so that the heat in the cream can easily be "conducted" to the freezing mixture to be used up in melting the ice and so disappear. On the other hand, the outside tub of the freezer is usually of wood. That is in order to keep the heat of the air from being easily conducted into the freezing mixture, lest this heat be used instead of that in the cream which is to be frozen. The difficulty with the wooden tub is that as it stands unused it is apt to shrink and then leak, and, besides, it is heavy and clumsy. So some ice-cream freezers have a metal outside. They undoubtedly take a little more ice and salt to do the work, but otherwise are quite satisfactory.

References

Agri. Exp. Sta., Burlington, Vt. "The Principles and Practice of Ice Cream Making."

Questions

1. Why does an ice-cream freezer have a dasher?
2. Which is cheaper, ice or salt? How does this point affect the choice of the proportions of ice and salt to be used in a freezing mixture?
3. What proportion of ice and salt would you use for chilling?
4. How is ice cream packed and how is it covered for keeping?
5. Can you make an ice cream or an ice mixture so sweet it will not freeze? Why?
6. Can snow be used to make a freezing mixture instead of ice?
7. Could ice have been frozen as readily in a glass cup as in a tin cup? Explain.
8. Explain why cologne rubbed on the forehead feels cool.
9. There are pressure cookers on the market which boil at a temperature above 212° F. These cookers are of metal with a cover which screws or clamps tightly into place, preventing the escape of the

steam until the pressure reaches a certain degree, when an automatic escape valve opens. The steam pressing on the surface of the water prevents the ready formation of more steam. Why does the temperature of the water then rise above that of ordinary boiling water?

XVII

RECEPTION

Candied Fruit Peel

Marguerites

Sandwiches

Hold a Reception.

Prepare bread-and-butter or jelly sandwiches, candied fruit peel, and marguerites or marshmallow crackers, cocoa or tea, or coffee, as desired.

1. Candied Fruit Peel.

Wash and remove the skin of an orange or grape fruit. Boil in water until tender. If the peel is very oily, the water may be changed during the process. When the peel is soft, scrape off some of the inside white and cut the peel into even, narrow strips. Make a syrup, using half a cup of sugar and an equal amount of the water in which the peel was cooked. Add the peel and cook until the syrup is nearly evaporated, stirring. Drain the peel and roll it in granulated sugar. Let it dry before serving.

2. Marguerites.

12 wafers
1 egg white
$\frac{1}{2}$ tsp. salt
2 tbsp. powdered sugar
$\frac{1}{4}$ tsp. vanilla
$\frac{1}{2}$ c. chopped nuts or raisins or the two mixed

Mix the salt with the egg, and beat until very stiff. Add the other ingredients, and spread on wafers. Heat in a moderate oven until a delicate brown.

3. Sandwiches.

In cutting bread for sandwiches, cut the slices as thinly and evenly as possible. The crusts may or may not be removed. If they are cut off, save them to use as bread crumbs. If the butter is creamed before using, it will spread more easily. After the slices are put together, they may be cut in squares, oblongs, or triangles. Sandwiches cut in rounds are rather wasteful, unless the original loaf was a cylinder. In order to prevent drying, sandwiches should be wrapped in a dry cloth with a damp one outside, until just before serving.

Receptions

Going to a reception sometimes seems a formidable undertaking to one not used to it, but in reality it is a simple affair for the guest. If the reception is formal and the invitation "requests the pleasure of your company", a reply must be sent in like form. But if the reception card is informal as that for an "at home", and if the invitation is to be accepted, unless the invitation says "please reply" or "R.S.V.P.", which is an abbreviation for the French words meaning the same thing, it is not necessary to respond. If one cannot attend, a calling card should be mailed or sent to the hostess. If more than one name appears on the invitation, a man sends one calling card for each person, a woman one for each woman, but all are merely enclosed in the one envelope and directed to the hostess. Nothing is written upon the cards.

The guest may appear at any convenient time during the hours set. Hat and gloves are worn at an afternoon reception, but coats are ordinarily removed. Hats are not worn at an evening affair.

The guest shakes hands first with the hostess, then with any others who may be standing with her. Whether any chatting may be done depends upon the number of guests waiting for a chance to speak to the receiving line. After mingling with the others for a few moments, one may be invited to go to the dining room, or in the case of very informal affairs left to find one's own way out. After being served, one may chat again with friends, or go directly to the receiving line to say good-by, and express one's pleasure. Before leaving the house, cards are left, the same rules applying as if they were sent.

An invitation to a reception is supposed to necessitate a call upon the hostess afterwards, but at the present time this rule is generally disregarded unless the invitation has not been accepted.

The hostess is busy receiving her guests, so that it is necessary that she be relieved of other cares. At informal affairs friends are asked to pour at tables or to serve, sometimes to invite to the dining room. Those assisting do not wear hats. In some places it is a pretty custom to pin favors, a flower or a knot of ribbon, to each guest as he is served, so that no one shall be overlooked.

References

Farmer. "Boston Cooking-School Cook Book," illustration opposite p. 601.

Questions

1. What is the chief difference in the arrangement of the table for a meal and for a reception?

2. If you were instructing a person ignorant of how to behave at a reception, what points would you make?

3. Write a formal invitation and acceptance for a reception.

4. Under what circumstances do you send a card to a reception? When do you leave a card?

XVIII

COMBUSTION AND FUELS

Scalloped Potatoes

A. Prepare Scalloped Potatoes.

Wash, pare, and cut a potato into very thin slices. Put in layers in a baking dish. Season each layer with salt and butter, and pepper if desired. Cover with milk, and bake in a slow oven until the potato is soft.

B. **Class Experiments.** 1. Fuels.

Take a narrow test tube and fill it two-thirds full of wood — the stems of matches will do. Heat, holding it cautiously in a flame. As smoke escapes, put a lighted match in the smoke and see if it can be set on fire. Notice the black residue left in the tube. This is charcoal.

2. Is air necessary to combustion?
Lower a candle or a burning splinter of wood into a bottle of air and cover as closely as possible. Does it continue to burn?

3. What is formed when fuel burns?
   a. Hold a cold glass tumbler for a moment over a burning candle. Observe whether moisture forms on the inside of the glass.
   b. Burn a candle or a piece of wood in a covered bottle till flame is extinguished.

Remove the candle or wood quickly and pour in a little lime water, and shake it around. Does it become milky? Try lime water in a clean bottle of air. Carbon dioxide is the gas which turns lime water milky.

c. It is commonly said that food acts as fuel in the body. See if the "products of combustion", water and carbon dioxide, can be detected in the air breathed out.

Test as follows:

(1) Breathe on a cold pane of glass. Does moisture collect?

(2) Breathe through a glass tube or a lemonade straw into lime water. Do we breathe out carbon dioxide?

Combustion and Fuels

When the word combustion is used, it ordinarily means burning, that is, the union of a substance with the oxygen of the air with such rapidity that both heat and light are produced. But in order to have this combustion take place, it is necessary to have something more than a combustible substance and oxygen. Wood is a combustible substance, but it does not burn unless it is sufficiently heated to "take fire." Not all materials have to be heated to the same degree to make them burn, and the point to which each must be heated is called the kindling temperature of the substance. Phosphorus has a low kindling temperature and can easily be set on fire by the heat of friction; that is why it is used on the heads of matches.

Most combustible substances contain both carbon and hydrogen as well as a little oxygen. When they are burned in the air the carbon unites with the oxygen to make carbon dioxide, and the hydrogen with oxygen to form water, oxygen from the air being used in the process. The common fuels are inexpensive substances which are largely composed of these three elements. Foods, too, contain the same elements in large amounts. When food is burned in the body the process is a much slower one than ordinary burning and no light at all is produced, but the heat maintains the body temperature. Some fuels, like some foods, have nitrogen in them, but this does not help in the production of heat. The elements in fuels and foods are put together so differently, however, that they are entirely unlike in their nature, and the body could not burn coal or wood instead of food.

The fuels that are most widely used in this country are wood, coal, kerosene, and gas. Wood is becoming so expensive and requires so much space for storage, that, in cities, it is used only in starting a coal fire. In country districts where wood is cheap, wood stoves are still in common use. Wood must be set on fire by piling it on top of burning paper, straw, or shavings. Such kindling is not sufficiently hot to set fire to coal, so, in laying the coal fire, both paper and wood are used. Wood is roughly divided into two classes, hard and soft; the first is desirable when long-continued, steady heat is necessary; the other for quick, hot fires. For kindling, soft wood must, of course, be chosen. The usual way of selling wood is by the cord, which consists of one hundred and twenty-eight cubic feet.

Coal is of two general kinds, anthracite or hard coal, containing about ninety per cent of carbon and very little gas, and bituminous or soft coal which contains gas and burns with considerable flame. The latter variety is dirty to handle and gives off much soot. It costs less by the ton, however, than hard coal, especially in some parts of the country, so it is often commonly used. A fire made with it requires more frequent attention than one made with hard coal, and when this and the cost of the cleaning and laundering which it necessitates, as well as the wear that this extra laundering means for fabrics, are all taken into account, it is doubtful whether the use of soft coal is really cheaper. Coal is sold by the ton; a long ton is 2240 pounds, a short ton only 2000 pounds.

Kerosene is also a much-used fuel, and in the blue-flame stoves a very satisfactory one. It is one of the oils present in petroleum, a mixture of natural oils found in the ground in large quantities in some parts of the country. In order to be sure that the more inflammable oils are not left in the kerosene, in most states the quality is regulated by a requirement that the flashing point shall not be below a certain temperature. The flashing point is the temperature at which the vapor from the kerosene will catch fire or flash. The kerosene itself does not burn, and the vapor only for an instant. The temperature required below which the vapor must not flash varies from 110° F. to 200° F., the latter meaning a very high-grade oil. Probably 149° F. is sufficiently safe, but as all kerosene is explosive, care must be taken in its use. Stoves and lamps should be filled only by daylight and never when they are lighted or hot. Kerosene is sometimes poured on a fire of coal or wood to act as kindling, and there have been many accidents from such use. Safety requires that it should never be used in kindling. The danger lies in pouring it on after the fire is started, or when there are hot ashes in the bed of the fire.

Gas is a much cleaner fuel to use than any of those already mentioned. There are many varieties. Natural gas, like kerosene, is found in the ground in certain parts of the country. Its cost is much below that of artificial gas. The latter gas is made by two different methods, one giving us coal gas, the other water gas. Coal gas is obtained by heating coal, usually semi-bituminous, in retorts so as to drive off the gas which it contains. Water gas is made by passing steam over heated coal; then this is enriched by the addition of other gases in order to make it more efficient. Any gas is dangerous, because, when it is mixed with a certain amount of air, it becomes explosive, and because some of the gases present, if they escape unburned, are highly poisonous. Water gas is particularly poisonous. Leaks in gaspipes should not be neglected. A light should never be taken into a room where there is a strong smell of gas, windows and doors should be opened, and, if necessary, the gas should be turned off from the whole house by the main stopcock near the meter. The surest way to detect small leaks is to paint over the suspected places with strong soapsuds, and notice where bubbles are blown.

Acetylene is another sort of gas used for fuel in special stoves. It is manufactured, usually on a small scale, by the automatic dropping of calcium carbide into water. The gas requires special burners, but gives a brilliant light. It seems still to be a matter of dispute whether it is highly poisonous as well as explosive.

Gasoline gas, sometimes called air gas, is made by pumping air through gasoline. The law requires the gasoline tank to be outside and at a certain distance from the house, although the mixing chamber where more air is added may be nearer. The gas makes an excellent fuel and does not contain carbon monoxide, the compound in coal gas which is most poisonous.

There are two kinds of alcohol which are common. One, wood alcohol, ought not to be used, because its fumes are poisonous. It is much cheaper than the other variety called grain, or ordinary alcohol, because that is so highly taxed. In recent years a way out of this difficulty has been found in the use of denatured alcohol. This is merely grain alcohol to which some substance has been added that makes it impossible as a beverage and thus it escapes having to pay the heavy tax otherwise imposed. The substance added in no way impairs its use as a fuel.

The use of electricity for cooking has certain advantages which are furnished by none of the fuels. In its use there are none of the products of combustion to get rid of, there is no flame to set fire to the unwary, no matches to be looked after, and its control is simple. It is, however, generally too expensive for common use. Electricity is measured by the kilowatt hour, the cost varying from about ten to fifteen cents. The dials on an electric meter are not unlike those on a gas meter and can be read easily.

References

White. "Fuels of the Household."

U. S. Dept. of Commerce. Bureau of Standards Circular No. 55, sections on Coal, Wood, and Heating Value of Fuels.

Questions

1. Name the different substances which may be used as fuels and arrange them in the order of their kindling temperatures.
2. Name the different kinds of coal used in the house, and, briefly, characterize each.
3. Determine the comparative costs of the different fuels used in your locality. Which is most commonly used and why?
4. In an ordinary wood or coal stove, what becomes of the products of combustion? Where do they go in a gas range? Account for the difference in arrangement.
5. How is illuminating gas manufactured?
6. What source of heat, sometimes used for cooking, is not the direct result of combustion?

XIX

DRAFTS AND THE COAL RANGE

Baked and Stuffed Potatoes

A. Prepare Stuffed Potatoes.

Wash a potato, scrubbing it well with a vegetable brush. Bake in a hot oven until soft. Cut a piece off the top and remove the contents with a fork, taking care not to break the skin. Mash the contents with a little butter, salt and pepper, and moisten with hot milk. Replace in the skin and reheat.

B. **Class Experiments.** Drafts.

1. What is the effect of a draft in a stove? Try the following experiments to find out:
   a. Put a lamp chimney over a lighted candle, but hold it so high that it will not touch whatever the candle is standing on. Take small pieces of some light material (threads of cotton wool will do) and hold them first above the chimney, then underneath it. Is the draft passing through the chimney and in what direction, up or down?
   b. Place a lighted candle in a saucer of water, and put the lamp chimney over it so that it, too, rests in the water. Why does the candle go out?
   c. Fit a piece of pasteboard lengthwise into the lamp chimney. Relight the candle and replace the chimney, but set it so that the candle flame is on one side of the pasteboard partition. Why does the candle behave differently? Test the draft.

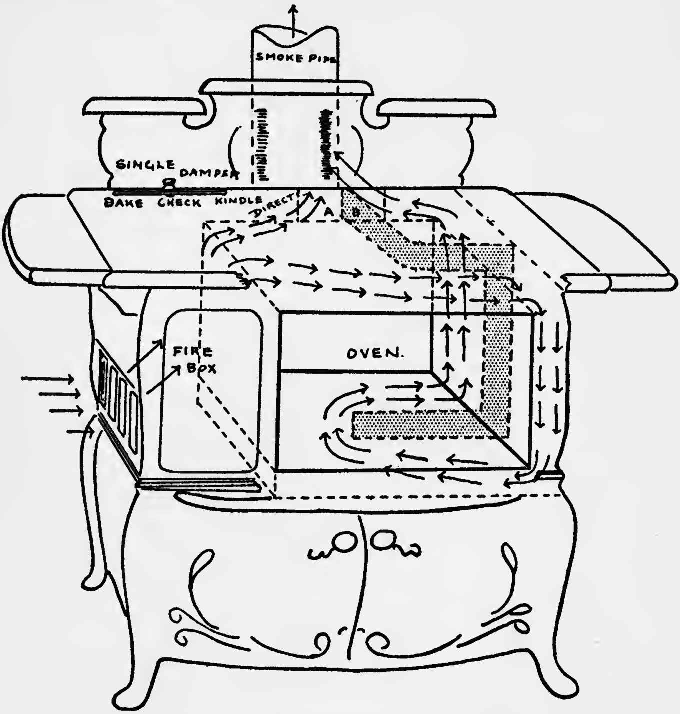
d. Take an empty pasteboard shoe box. Cut two holes in the cover, one at each end. Each hole is to be a little smaller than the bottom of a lamp chimney. With a drop of melted wax, stick a lighted candle to the bottom of the box so that the flame will be under one of the holes when the cover is put on. Cover, and put a lamp chimney over each hole. Test the draft by holding threads of the light material over each chimney.

2. Examine a wood or coal stove, or range. Is there a place for the air to come in as well as a place for the products of combustion to pass out? Can the size of these openings be regulated?

Coal Stoves

Since air or oxygen is necessary for combustion, there must be a constant supply of air, as in a draft, for a fire to continue burning. The fire-box, then, in a stove could not be air-tight. The air coming in the door below the fire ordinarily passes out directly through the stove-pipe. The check draft in the stove-pipe may, at will, be left wide open, or turned so that it nearly closes the pipe. Besides these two means of controlling the supply of air, there is a third way. The upper door into the fire-box or a lid on top of the stove may be left open. This allows the cold air to blow across the top of the fire and cool it so that it will burn much more slowly.

A fire merely built beside an oven would heat it unequally, so arrangements are made to allow the hot gases from the fire to pass entirely around the oven when it is desired to heat it. This is accomplished by shifting the oven damper. This closes the direct opening into the stovepipe and so forces the gases to pass around the oven before escaping.



COAL STOVE

The arrows show circulation of air through A, directly to smoke-pipe, and through B, indirectly around oven.

Notice that there is a handle which may be fitted on a bar from the grate. By turning the handle the grate may be rocked back and forth to shake down the ashes. The fire-box itself is lined with fire-proof material to protect the iron as much as possible from gradually burning out. The top of the stove cannot be so protected, so care must be taken to keep the fire low down in the fire-box. This means a saving of coal, too, and generally gives as efficient a fire.

Anything spilled on a stove should be wiped off immediately with soft paper or cotton waste. If necessary, soap and water or sapolio can be used later, or, when cold, the top may be cleaned by rubbing with a few drops of kerosene. In order to protect the iron from rusting, it is necessary to keep it well covered. Blacking is usually used for this purpose. The blacking is rubbed on while the stove is cold and polished when it is warm. A stove that is to be out of use for some time is still better protected by covering it with a thin coating of oil or grease.

It is interesting to consider why heating a portion of the air causes a draft. This is because the heated air expands so that the amount present in any given space is less than it was before. It is therefore lighter. But this light air is surrounded by cold air, which is heavier and so is pulled down harder by the attraction of gravitation which pulls everything toward the earth. The cold air, being pulled harder, naturally displaces the warm air and so pushes it up. It is often said that hot air rises, but this is not strictly true, because it would not rise at all if it were not for the colder, heavier air around it.

In the ventilation of rooms advantage is taken of the fact that the circulation of air is caused by differences in temperature. Hoods are often installed over stoves to carry off the odors of cooking. These work in the manner indicated above, the hot air over the stove being pushed up into the exit pipe by the colder air around. The hood itself acts merely by confining the warm air and preventing it from scattering.

References

U. S. Dept. of Commerce. Bureau of Standards, Circular No. 55, sections on Amount of Heat used in Cooking and Some Other Household Operations, Regulation of Stoves, Ranges, and Other Heating Appliances, and on Oven Thermometers.

Questions

1. Why does a match go out if it is blown or shaken too hard?
2. Why does a fire burn more brightly if it is blown with a bellows? Why does it not go out?
3. Explain why, in building a coal fire, paper and wood are also used. Why is the paper twisted and crumpled and the wood laid criss-cross?
4. How is an oven heated, and how is the temperature of an oven controlled?
5. What difficulty occurs if the ash pan is allowed to get too full?
6. Why should ashes and soot be frequently removed from the flues back of and under the oven?
7. Why is a fire lighted at the bottom and not at the top?
8. How would you arrange to keep a fire over night? Give the reason for each act.
9. What is the danger in allowing coal gas to escape?

XX

FLAME AND GAS STOVES

Chocolate Bread Pudding

A. Prepare Chocolate Bread Pudding.

Melt one-fourth of a square of chocolate over hot water, add half a cup of scalded milk, a quarter of a cup of bread crumbs, quarter of an egg beaten, one tablespoon of sugar, a pinch of salt, and a few drops of vanilla. Bake in a buttered dish set in water until firm. Serve with milk or cream.

B. **Class Experiments.** CARE OF A GAS STOVE.

1. Take a gas stove apart for cleaning.
2. Blacken the stove.
3. Examine a Bunsen burner. Light it, and alternately open and close the holes at the base. Hold a cold saucepan for a moment in the clear flame. When it is again cold hold it in the yellow flame. What effect on the flame has the admission of air to the gas? See whether air is admitted to the burners in a gas stove.
4. When the burners beneath the oven of a gas stove are to be lighted, it is always safer to open the oven door, or, at least, set it ajar. Try the following experiments to see why:
   a. Pour a scant teaspoon of gasoline (Warning: No light must be in the room while inflammable substances such as this are being poured. Why?) into a dry, wide-mouthed bottle, stir with a hot glass rod for a moment, then hold a lighted stick or long splinter in the mouth of the bottle.
   b. Pour the same amount of gasoline into a small shallow dish (the top of a small tin can will do) and light immediately. Explain the difference in action in the two experiments. When might there be danger of an explosion in a gas oven? What difference does opening the door make?

GAS STOVES

A flame is burning gas, but the flame may be colorless or yellow. For illuminating purposes a yellow flame is desirable, because the glowing particles of carbon in the flame give off light. But for cooking, a flame as nearly colorless as may be, is best. This is not only because such a flame is hotter, but because the other flame will deposit soot; and unburned soot on the saucepans means wasted fuel as well as extra trouble in washing. Air admitted to the gas furnishes an amount of oxygen sufficient to burn up the soot. When a gas stove is first installed, the plumber making the connection regulates, by means of a small valve in each, the amount of air necessary for each burner. This may need to be changed later if conditions change; but usually any change in the flame, particularly a sudden one, means that the burner has become clogged, perhaps by something spilled over it. In this case, if it does not readily burn clear again, the burner should be detached and boiled out in a weak solution of washing soda.

One of the greatest difficulties experienced may be in the striking back of the flame. By this is meant the catching fire of the gas in the mixer; the gas burns with a roaring sound and gives off a disagreeable odor and the flame is small and yellow. This can be remedied only by turning the gas off completely and, if the burner is hot, giving it time to cool before relighting. The striking back may occur if an attempt is made to light the gas too soon after it is turned on, if the gas is turned too low so that there is not sufficient pressure, or if the flame is blown by a sudden draft. A stove in a bad position between windows and doors may give much trouble in this way, but, usually, the difficulty may be overcome by devising a screen to cut off the draft.

Besides remembering to open the door of the oven before lighting, one must also be careful, when the gas is turned low in the oven, that the flame has not actually gone out, leaving a little gas flowing. A habit should be formed of always looking to see if the gas is still lighted under these circumstances.

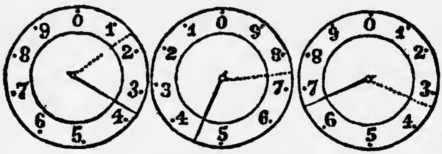
The heat of a gas stove is much more easily regulated than is that of a coal stove, and care should be taken not to waste gas by lighting it ahead of time, by leaving it lighted when it is not in use, or by using more flame than is necessary. Water that is just boiling is just as hot as water that is boiling rapidly, and we cannot cook any faster with one than the other.

Gas is a convenient fuel to use, because there are no coals to carry and no ashes to take care of. The products of combustion are supposed to be pushed through the pipe at the back of the stove. Probably, however, this carries off more from the oven than from the upper burners, and a hood over the whole is much more effective, because it carries off the odors of cooking as well.

A stop-cock is frequently put in the pipe connecting the stove with the main gas pipe. As most burners leak a very little, even with the best of care, this is a good practice, making it possible to turn off the gas completely whenever the stove is not to be used for some time. In case of a serious leak, its use is obvious.

Gas is metered, or measured, by the cubic foot. It generally costs from eighty cents to a dollar and a half for a thousand cubic feet of gas. The meter is ordinarily read every month and the reading of the month before subtracted from the present reading, in order to determine how much has been used. In some places there is a minimum charge per month which must be paid even if no gas has been used. In still other places there are slot meters which allow gas to pass after a certain coin, usually a quarter, has been inserted, the gas flowing until the amount paid for has been used. These are used mostly in tenement houses where bills are hard to collect and the frequent sending of a man to turn the gas on and off is expensive.

Reading a gas meter is a simple matter, and in case of disagreement over bills is a useful accomplishment. A gas meter shows three dials; the hand on each dial turning in a direction opposite to the one next it, in order to help obviate mistakes in reading.



Each division of this dial denotes 10,000 feet. | Each division of this dial denotes 1000 feet. | Each division of this dial denotes 100 feet.

HOW TO READ A GAS METER.[1]

Read from left-hand dial to right, always taking the figures which the hands *have passed*. The dials above, for example, register 3, 4, 6, and, adding two ciphers for the hundreds, show 34,600 feet registered. To ascertain the amount of gas used, deduct the previous register as indicated on the above dials by dotted hands, 1, 7, 3, from the present register, 3, 4, 6, as follows:

Register by dials shown above	3.4.6.00
Registered by previous statement, indicated by the dotted hands	1.7.3.00
Number of feet used between readings	17,300 ft.

If you wish to know how much gas is being used, you need only watch the dial at the right hand, each figure of which means 100 feet.

[1] By courtesy of the Newton and Watertown Gas Light Co.

The hand on this dial passes from 1, 2, 3, 4, 5, 6, 7, 8, 9, to 0, and a complete revolution shows a consumption of 1000 feet, which appears on the dial next to it on the left as 1.

The average burner at the top of a range, when turned on full force, burns about two cubic feet of gas an hour, while the oven burner consumes from thirty to forty cubic feet. From these figures the advantage can readily be seen of using a small portable oven placed over a top burner, instead of the large oven. An oven of this sort, costing from one to two dollars, soon pays for itself, especially in a small family, although the saving is not the full difference between these figures, for the burners in either case are not left on full after the oven is once hot.

The consumer is responsible for leaks which occur in the gas pipes on his side of the meter, and it is for his advantage to have these attended to promptly, not only because of the danger, but because the escaping gas passes through the meter and is registered against him. Leaks on the other side of the meter are, of course, not so registered, and, since they represent loss to the gas company, are attended to by the company.

References

U. S. Dept. of Commerce. Bureau of Standards, Circular No. 55, sections on Gas and Electricity.

Questions

1. Discuss the advantages of a gas over a coal range.
2. What may be the result of letting milk and the like boil over on a gas stove?
3. Should the flame in a gas stove appear yellow?
4. Why should a gas burner in a stove be turned on fully before attempting to light it? Explain.
5. What would you consider wasteful use of gas in a stove?

6. Explain the best methods of extinguishing if the following catch fire:
   a. clothing
   b. kerosene or gasoline
   c. alcohol or wood
7. What is the best treatment for burns or scalds?
8. Learn to read an electric meter.

XXI

RADIATION AND CONDUCTION OF HEAT

Scrambled Eggs on Toast

A. **Class Experiments.**

How Heat passes from One Place to Another.

1. Radiation of heat.
   a. Stand in front of a hot stove or fire and notice the heat. Then hold a screen between your face and the fire. Do you feel the heat on your face as before? Yet the air that surrounds you is still warm. Heat that passes in straight lines directly from one object to another at a distance is called radiant heat. The heat is said to pass by radiation.
   b. Determine whether a bright, clean surface or a dull, rough one radiates heat more easily. Take two cheap tin cups, one that is bright and new and polished as highly as possible, the other that has been held in a flame until it is rough and dull and sooty. Have both cups at room temperature and fill each with equal amounts of boiling water. Test with thermometers to see which cools first. Is it economical of heat to keep the sides of a saucepan smooth and clean?

2. Conduction of heat.
   a. Hold one end of a long piece of wire, or an iron poker, in a flame, while you hold the other end in your hand. Feel how the heat is led along or conducted from one part of the metal to another.
   b. Are all substances equally good conductors of heat? Repeat (*a*) with a glass rod or a long splinter of wood, instead of the wire. Does the other end grow as hot? Hold a test tube two-thirds full of water in a flame, but at an angle so that the water at the top is directly heated. Can you get the water at the top hot while the water at the bottom is still cool? Is water a good conductor of heat? Is air?
   c. Test the relative conductivity of two saucepans by taking two of different materials (as for example, one of aluminum and one of granite). Pour into them equal amounts of cold water, and place them over two flames which are equally hot, or heat first one and then the other. Determine which boils in the shorter time.

B. Scramble an Egg.

Serve on a slice of toast. Decide how the heat has been transmitted to each in the cooking.

Scrambled Egg.

Beat an egg slightly, add a tablespoon of milk, and season with pepper and salt. Pour into a pan in which a teaspoon of butter has been melted, and cook, scraping the mixture from the pan as it sets, until all is creamy.

Fireless Cookers

There is an old story of a man who was held to be a wizard because he could blow both hot and cold; he blew on his hands to warm them and on his soup to cool it. But fireless cookers can do just as seemingly contrary things, since they can keep hot things hot and cool things cool. All that is necessary is that they be constructed in such a way that little heat can pass in or out of them.

The simplest form of fireless cooker is the hay box; literally a box stuffed with hay which, with the air spaces between, makes a non-conductor of heat. Usually, the hay is kept from scattering by covering it with stout cloth. Whatever is to be cooked is placed in water in a saucepan or pail, heated to boiling, tightly covered, and placed in the center of the hay. The difficulty with this type of cooker is that some steam with the odor of the food escapes from the cooking vessel and is absorbed by the hay, which gradually becomes musty and must be replaced. More efficient cookers are lined with non-absorbing material, such as enameled metal, which can be washed if desired. The metal, being a fairly good conductor of heat, even when enameled, must be made double with an air space between. Further insulation can be put between these two layers. This type is commonly furnished with soapstones, which can be heated as hot as desired and placed inside to increase the heat and make even baking possible.

Of course, none of these cookers is so constructed that no heat can escape, and, gradually, the material inside becomes cold. The efficiency of different cookers is measured by the heat that is retained after some hours of standing. To test, equal amounts of boiling water are put in different cookers, and the temperature of water is taken after a given number of hours.

There is now on the market a combination of a gas stove and a fireless cooker which is convenient. The range can always be used as an ordinary gas stove, but over some of the top burners are hung cylinders which may be lowered at will to cover the kettle which has been heating over the burner. At the same time, the flame is extinguished by the automatic turning off of the gas. The oven, too, is exceptionally well insulated and may be used as a fireless cooker also. While the first cost of these stoves is more than that of the ordinary types of ranges, they are undoubtedly great savers of gas.

A thermos bottle uses the same principle as a fireless cooker. Since heat cannot pass in any more readily than it can pass out, both may be used to keep cold drinks cold by protecting them from the heat of the air. Thermos bottles are made with a vacuum between the inner and outer layers, and are more resistent to the passage of heat than the ordinary cookers.

Ice-boxes and refrigerators, too, are efficient in the measure in which they are non-conductors of heat, this depending on the kind and number of layers of material used for "packing." Some people recommend the wrapping of the ice in the ice-box in paper of some heavy material to keep it from melting so fast by protecting it from the heat of the air inside the box. This must not be done if it checks the melting too much, for it is the melting of the ice which causes the low temperature in the box, and the lowering of the temperature is in proportion to the melting, the heat of the air being rendered latent as the ice changes to water.

References

Any good school textbook in Physics on heat.

U. S. Dept. of Agriculture. Farmers' Bulletin No. 298, "The Fireless Cooker."

U. S. Dept. of Commerce. Bureau of Standards, Circular No. 55, sections on Radiation, Refrigeration, and Ice.

Questions

1. Is the iron used for the top of stoves a good or bad conductor of heat? Does this matter in cooking?
2. Why can you hold your hand for a few moments in an oven whose temperature is above that of boiling water?
3. How are steam and hot water radiators usually finished? Why?
4. Which boils more quickly, a new tin kettle or one which is dull on the bottom?
5. Describe different types of fireless cookers.
6. Why are the metal bails on cooking vessels often made with wooden handles?
7. What was the old-fashioned tea cosey and how did it work?
8. What are the materials commonly used in making ice-boxes?
9. Why is the ice compartment at the top instead of the bottom of an ice-chest?
10. How may the weight of a piece of ice be determined by its measurements in inches?

XXII

CONVECTION OF HEAT

Broiled Bacon

Potato Salad

A. How Heat Passes from One Place to Another.

1. Convection of heat.
   Put cocoa shells or sawdust into water and heat — in a glass beaker if you have it. Notice the movement of the particles. Does this indicate movement of the water also?

B. Prepare Potato Salad.

Use one potato. Serve with a crisp slice of bacon.

Explain carefully exactly how the heat in cooking passes from the fire to the potato: to the bacon.

Potato Salad.

Cut a boiled potato into half-inch cubes. Season with salt and pepper, mix with a very little chopped onion and parsley, add two teaspoons of oil, and one teaspoon of vinegar.

Broiled Bacon.

Lay in a frying pan a thin slice of bacon with the rind cut off. When one side is brown turn the slice.

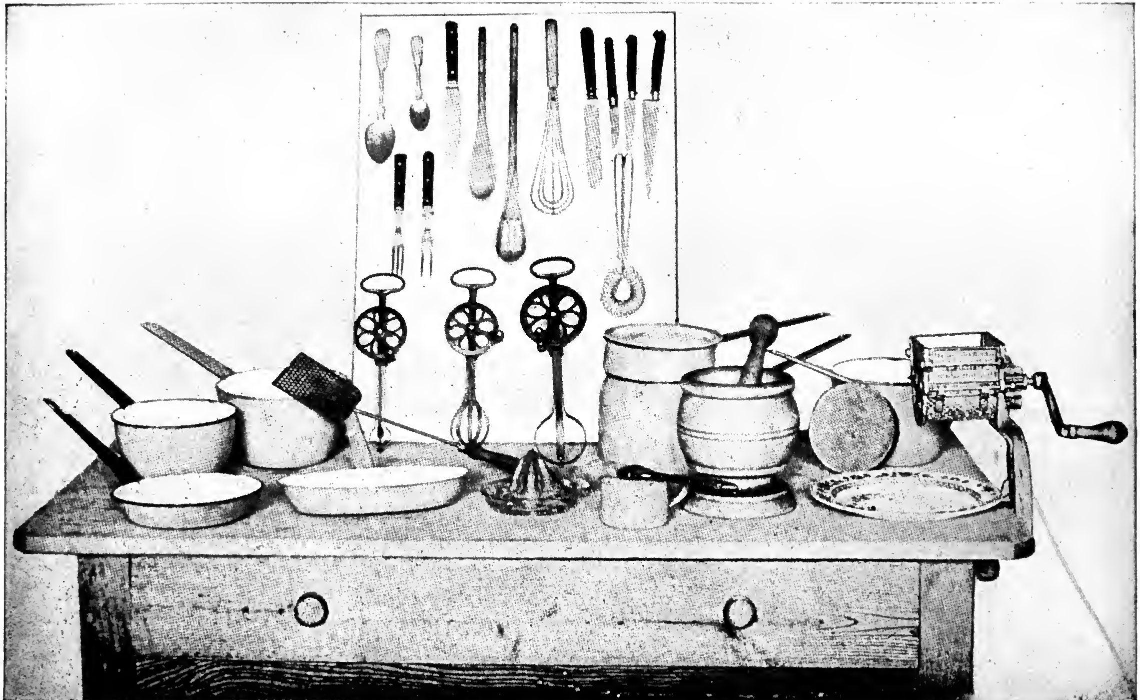
Hot-Water Systems

In some ways the passing of heat by convection is harder to understand than the two other methods of transfer. In conduction, heat is said to be passed on from one particle to the next. Water is known to be a poor conductor, although nobody knows why this is so. In the experiment in which water with sawdust in it was heated in a beaker, the water would not readily pass the heat from one particle to the next. Instead, the water at the bottom of the beaker became heated by contact, and heat has exactly the same effect on water that it has on air. The water which is heated expands and so becomes lighter. Then it is pushed up by the colder water above, which is pulled down harder by gravity, to become heated in its turn. The whole of the water becomes hot, not by the passage of heat from one particle to the next, but by the movements of the particles themselves, carrying the heat with them. Thus a circulation of the water is started, the hottest water rising to the top. So a water boiler, when it is heating, first becomes warm at the top. This can easily be felt by placing a hand on the outside of the boiler.

Boilers and hot-water pipes lose heat through radiation and contact with air, and, to decrease the loss, are sometimes jacketed with asbestos. Asbestos is a mineral substance, finely shredded and pressed into a sheet. It is not only a poor conductor of heat, but is fire-proof as well. It is fairly expensive.

The Selection of Kitchen Ware

In choosing utensils for the kitchen many things must be taken into consideration. First of all, the probable number of people to be cooked for will govern the size of many of the utensils. Moreover, the style of living will affect the kinds and number of them. In general, for the sake of storage room and convenience of access, the number of utensils should be kept as small as possible. Utensils which can be used for many purposes should be selected rather than those that fit a single need, unless that need is frequent. In nearly any kitchen are to be found a number of utensils that are good, but are so seldom needed that they are never used, because it is too much trouble to find and wash them for the occasion. Beside these considerations, convenience in handling, ease in cleaning, and durability must all be taken into account. There are saucepans which upset easily; and saucepans with handles with sharp edges or which grow hot too quickly; saucepans and skillets with lips on only one side, and that the wrong one, so that if one tries to pour from them and stir at the same time, the stirring must be done with the left hand. Ease of cleaning demands that the utensils be smooth, with rounded sides and no seams or corners, and that they should be wide enough to permit easy access for cleaning.



A Group of Kitchen Utensils

Meat grinders differ markedly in this respect, some being almost impossible to get clean at all. With larger kettles, weight must be taken into consideration.

Durability depends partly on make and partly on the material used. Saucepans are usually of aluminum, enamel or granite ware, or tin. The so-called tin utensil is steel, or sometimes wrought iron or copper, covered with tin. It is the least expensive of the three types and also the least durable. Cheap grades are easily attacked by the weak acids in fruits and vegetables, and even the better grades are not proof against these acids when hot; but tin vessels are light and good conductors of heat. Since tin is sufficiently soft to scratch easily and to wear off it is better suited for baking pans and bread and cake-boxes than for saucepans.

Granite and enamel ware is made by coating an iron or steel foundation with a glaze which is not unlike glass in its nature. The quality depends upon the character of the foundation, upon the ingredients of the glaze, and the number of coatings, as well as on the success with which every particle of the metal is covered. The durability is greatly affected by the care that is exercised in using it. Sudden heating or cooling, too vigorous scouring, and dropping, all tend to make it crack and chip off, exposing the metal beneath.

Aluminum is light, and also an excellent conductor of heat. It darkens if any alkaline substances are used in cleaning it, and should be scoured inside with fine steel wool, not soaked in washing powders. It is affected slightly by acids, but the experts tell us that the amount dissolved is insufficient to harm us. It warps if subjected to too much heat. However, it makes a durable saucepan and probably justifies its cost.

References

Clark. "Care of the House."
U. S. Dept. of Commerce. Bureau of Standards, Circular No. 55, section on Water.

Questions

1. Examine a coal range and see whether it has a water-back or a water-front. What makes the water pass from this container into the boiler?
2. Make a diagram of the hot-water system in your school or in a house, and explain the circulation through the pipes.
3. Of what material is the boiler made? What other materials may be used? Is it always wise to use the water from the hot-water faucet for cooking or drinking?
4. Has your boiler a faucet connected with the lower part of the boiler? What is its use?
5. What is the water rate in your town? If meters are installed in the houses, learn to read one.

XXIII

REVIEW LESSON

Second Breakfast — Omelets, Fried Mush and Syrup

A. Prepare and Serve a Breakfast.

Calculate the cost per individual. Suggested menu:

Fruit, fresh, or stewed dried fruit
Omelet
Fried mush with syrup
Tea, coffee, or cocoa

1. Omelets.

a. French omelet.

Use the same proportions as in scrambled eggs. Have the bottom and sides of a frying pan well-buttered. Do not stir, but as the mixture sets, draw in the edges with a knife and tip the pan so that the liquid portion runs into the bottom of the pan. When brown on the bottom, fold and turn upside down on a hot platter.

b. Fluffy omelet.

Beat the yolk and seasoning with the milk and fold in the egg white, stiffly beaten. When it is brown on the bottom, place in an oven or under a gas broiler to dry out the top before folding.

Since it requires some skill to make omelets and since large ones are more difficult to handle than smaller ones, it might be well here, for practice, to have one-egg omelets made for each person to be served.

2. Fried Mush.

Pack mush made of hominy or other breakfast cereal into a wet pan, until cold. Cut into slices; if moist dip into flour, and brown on both sides in a little fat in a frying pan.

3. Syrup.

Boil half a cup of brown sugar, three tablespoons of water, and half a teaspoon of butter. When moderately thick, cool and flavor with a few drops of vanilla.

Table Manners

It is commonly said, and surely with much truth, that it is easy to judge of a person's training by his ability to write a correct letter and his manners at table. While such manners are partly convention, in most cases there is a reason underlying the convention. For example, if chairs are close together and two people start to sit down from the space between adjacent chairs, confusion results. Therefore, convention says, sit down and get up from the left-hand side of the chair. If the chairs are placed at the table so that the front edge of the chair is in line with the hanging edge of the table cloth, there will be little if any adjustment and much noise will be avoided. Unless there are place cards with the names of guests the hostess indicates where each is to be seated. The guest of honor, if a man, is placed to the right of the hostess; if a woman, to the right of the host. Host and hostess are seated at opposite ends of the table. If there is a waitress, the hostess enters the dining room last and sits at the end nearest the entrance door, but if there is no waitress she places herself at the opposite end in order to facilitate serving. As far as possible men and women are arranged alternately, at a formal dinner coming out in couples. A hostess shows her social skill in placing congenial people together. All stand until the hostess is ready to sit down.

Silver, as explained in the directions for table setting, should be so placed that there is no difficulty in telling which article should be used at any time, but convention says the hostess should begin to eat first and anybody in doubt has only to follow her lead. A child often grasps the handle of his spoon with the back of his hand up. When he raises it to his mouth, this throws his arm up with his elbow out where it is almost certain to interfere with his neighbor. Instead, he should be instructed to hold it as he would a pen; then it will be raised with a wrist movement and with his elbow down. The soup spoon is dipped into the soup away from the person, so that the edge which is covered by the soup will be the higher edge as the soup is eaten and there will be less tendency to drip. Soup is eaten from the side instead of from the point of the spoon, because the spoon is too large to go into the mouth and one is less likely to put it in too far from the side. Bread and crackers are not broken into soup, because this is apt to scatter crumbs. If croutons or oyster crackers are served, these are already prepared and may be dropped into the soup without difficulty.

The hands are placed as far up on the handles of knives and forks as possible, so the fingers will not come in contact with the soiled parts. The fork may be used either in the right hand, as the spoon is, with the tines up, or it may be used in the left with the tines down. It is not good form in cutting meat to hold the fork in an upright position, grasping it around the middle of the handle by the fingers. Perhaps the reason for this is that it is not nearly so secure a hold as by the other method. The knife is never put into the mouth, because of the suggestion of cutting the lips or tongue. Since it is not used in the mouth, the knife should be used instead of the fork for taking butter from one's own butter plate.

Only such food is eaten with the fingers as will not soil them. When in doubt, do not use them. It is not etiquette to cut up all the meat before beginning to eat, as we do for children. There should be time between bites for the necessary preparation of the next mouthful. A whole slice of bread should not be spread at a time, partly for the same reason but mainly because of the difficulty. Spreading it on the left hand gives too much contact to be dainty.

Plates should not be shifted as one finishes with them,—that is the duty of the waitress; to do so looks as if the person concerned were in too great a hurry. Nor should they be piled together. In passing a plate for a second serving the knife and fork should be left on the plate because there is no other place to put them. They should be placed neatly together so that there shall be room on the plate to place the food and in such a position that there shall be as little danger as possible of their falling off. When the main course at dinner is finished, the knife and fork should again be arranged so that there is no danger of disturbing them in lifting the plate. At no time during a meal should the knife and fork be laid with the handles on the cloth and the other ends on the plate. This may cause liquids to run up toward the handles, beside implying that the plate is too full.

Salad and pie are eaten with a fork. If cut with a knife it implies that the salad is not crisp or the pie is not tender. There is a fashion, not always followed, of eating ice cream with a fork instead of a spoon. Perhaps this is to show that the cream is frozen hard enough not to drip. A spoon should not be left in a cup, because that makes it easy to tip the cup over.

The napkin should be placed on the lap with one fold left in it and should not be crumpled up. Dainty people sometimes contend that only a corner of the inside of the fold should be used to wipe the mouth so that the soiled part shall be kept inside. But perhaps one should not have such a soiled mouth as to make this necessary. Care must be taken to wipe the lips before drinking if there is danger of making a greasy mark on the glass, and after drinking if the lips are at all wet. This is especially necessary after drinking milk, but, with care, there is no need to dip much of the upper lip in the milk.

Noiselessness in eating means special care in eating soup not to suck in the breath. This is a common fault, and there are many jokes about the man who will make his fortune by inventing a noiseless soup spoon. For the same reason, the lips must be kept closed in chewing and only small mouthfuls should be taken. One should eat slowly, so as not to appear too hungry, and with sufficient deliberation to appear to be enjoying and appreciating what is served.

When asked to express a preference in regard to food, do so promptly even if you have no strong feeling. In offering second servings, it is better to say "May I give you some meat" instead of "some *more* meat." "Yes, please" or "Yes, thank you" are correct forms of accepting; "No more, thank you" of refusing. "No, thank you, I would not care for any" is awkward.

If at table articles are passed around by the people seated, then thoughtfulness in seeing that others are served with what they wish is necessary. Serving one's self without passing the dish shows selfishness. If it is necessary to ask to have something passed to you, do not address your request to the table in general, but to the one who is nearest the dish. Then the others are not unnecessarily troubled to discover who can pass it. At most formal dinners, however, guests are relieved of all passing by a waitress or butler, and then to pass a dish implies a reflection on the service.

During the meal one should sit erect, alertly attending to what is going on. Lolling or leaning back in the chair implies one is fatigued or bored. Elbows off the table is a good rule. Most of our movements are habits and the only way to acquire table manners is by constant practice. We cannot be careless every day and then expect to go through a formal occasion without a slip. We shall find ourselves automatically doing the thing we intended to avoid.

Remarks on the food are usually considered in bad taste. It should be taken for granted that it will be delicious, and appreciation can be shown in other ways than in words. Unpleasant and too intimate topics of conversation should be avoided. At a small table the conversation is usually general, at a larger party where a general conversation can hardly be heard, conversation alternately with those immediately around is the rule.

The handkerchief should not be in evidence at table and, if possible, should not be used. Picking the teeth or putting the fingers in the mouth, touching the hair, or even the face, should all be avoided.

The hostess knows when the meal is concluded, and so she is the one to give the signal for leaving the table. At some dinners the ladies go first, leaving the men to smoke. Everyone rises, however, while the ladies pass out. If one is not to be present at the next meal at the same place, it is not necessary to fold the napkin. It should be placed on the table as compactly as possible and not spread out, so that it is in danger of coming into contact with soiled dishes. If the napkin is folded, this should not be done on the table.

A dinner invitation necessitates a call afterward as an acknowledgment of the courtesy.

Questions

1. What points must be taken into consideration in determining the character of the breakfast to be served to a given family?
2. List as many points as possible that seem to you necessary to make breakfast a comfortable meal.

XXIV

MEDIUM WHITE SAUCE

Creamed Chipped Beef

A. **Class Experiments.** Starch.

1. Boil a pinch of starch with about a tablespoon of water; cool and add a drop of iodine. Recall the test on potato. Repeat, using flour instead of starch.

2. Methods of mixing starch and hot liquids.
   a. Stir a teaspoon of cornstarch or flour into half a cup of boiling water and note results. Break a lump and examine the inside.
   b. Pour half a cup of boiling water on a teaspoon of starch or flour. Does it still lump?
   c. Mix a teaspoon of flour or starch with a teaspoon of sugar, then pour on half a cup of boiling water. Result?
   d. Mix a teaspoon of starch or flour with a little cold water, making a smooth paste, and pour this into half a cup of boiling water, stirring. Result?
   e. Melt a teaspoon of fat, add a teaspoon of flour or starch, stir thoroughly, and then pour in gradually half a cup of boiling water, stirring as you pour.

   In what ways could you successfully mix flour, butter, and hot milk, to make a white sauce?

B. WHITE SAUCE.

To find out how much flour is used to thicken a cup of milk to the consistency of a white sauce.

Melt a tablespoon of butter in a saucepan on a fire, add a tablespoon of flour, and then pour in hot milk, stirring and adding it gradually until you obtain the consistency you think proper for a white sauce. Be sure to keep track of the amount of milk used. Calculate how much flour would be needed for a cup of liquid. Ordinarily a fourth teaspoon of salt to a cup of liquid would be added. Why is it unnecessary, considering the use to be made of the white sauce in (*C*)?

C. Prepare Chipped Beef on Toast.

Shred the beef into pieces, cover with hot water and let stand a minute to remove some of the salt. Then drain, and reheat the beef in the sauce made in (*B*). Add salt, if needed.

Wheat

In this country wheat is of greater importance as a food for man than is corn or any other of the cereals. Rice is so largely used in eastern countries, China, Japan, and India, that possibly more rice is used as food, taking the world at large. In England, Hutchison estimates, the people consume wheat at the rate of six bushels for each inhabitant; in America, Sherman concludes that the amount used is even greater, as high as six and a half bushels per person. As America has not only the proper conditions of climate, but the necessary acres on which to grow it, wheat is an important agricultural product, the United States exporting it in large quantities. More corn is actually grown, it is true, but more of this is used on the farms for cattle food, so that the wheat crop is first in commercial importance.

Wheat is classified as "hard" or "soft," according as its gluten content is high or low; as "winter" or "spring," according to the season in which it is planted. In localities where the winter is not too severe, wheat is planted in the fall and allowed to winter in the ground, maturing early in the summer. Spring wheat is not planted until the winter is over and, consequently, matures later in the season. The character of the wheat differs with the variety and the locality where it is grown, but, in general, winter wheat contains more starch and is "softer" than spring wheat, which is usually preferred for making bread flour.

The percentage of gluten is not, however, the only thing to be considered, for the quality of the gluten is of even greater importance than the amount.

Durum wheat, a very "hard" variety, is used for the manufacture of macaroni, spaghetti, or vermicelli. These are manufactured by forcing the flour, mixed with water to form a stiff dough, through holes in the cover of a steam-heated cylinder. In Italy, the shaped paste is hung on rods to dry, sometimes in the air, sometimes in ovens. It is claimed that in America greater care is taken during the drying process to protect the paste from dust. Good macaroni should be cream white, should break without splitting, should not lose its shape and should swell to about three times its bulk when cooked.

References

U. S. Dept. of Agriculture. Exp. Sta. Bulletin No. 200. "Courses in Cereal Foods."

Questions

1. Why do we cook starch?
2. What are the proportions for making an ordinary white sauce? These are used so often they should be learned thoroughly.
3. Review the different ways in which white sauce can be successfully put together. Give instances in which you think it would be advantageous to use each of these methods.
4. If you are making a small amount of white sauce by the melted-butter method, cold liquid may be added. If you are making large amounts it is wiser to use hot liquid. Account for the difference.

XXV

THICK WHITE SAUCE

Salmon Croquettes
Cheese Soufflé

A. Prepare Salmon Croquettes.

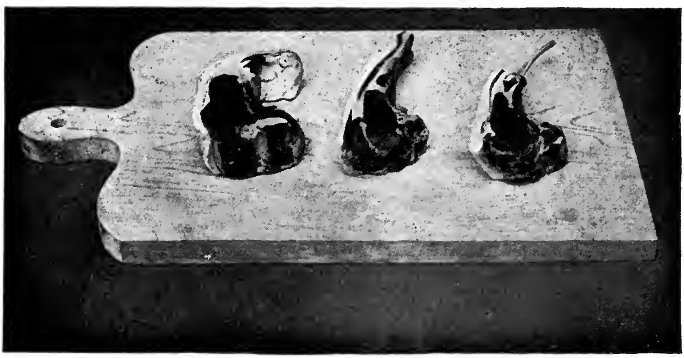
Make a third of a cup of thick white sauce, using the proportions of four tablespoons of flour, and two tablespoons of butter, to one cup of milk. Add one-fourth of a teaspoon of salt.

Use half of the white sauce to prepare salmon croquettes, using about twice as much fish (flaked) as sauce. Season with lemon, salt, and paprika. Spread on a plate to cool, shape, then dip in crumbs, in egg (beat an egg slightly with a fork, add two tablespoons of water), and in crumbs again. Fry in deep fat. When fat will turn a piece of bread a golden brown in forty seconds, it is the right temperature for frying food that is already cooked. Find out, with a thermometer, what temperature this is. (Be careful to wipe off the thermometer, but do not wash until cool for fear of breaking.) Drain the croquettes on absorbent paper, and do not pile on top of one another while hot.

B. Prepare Cheese Soufflé.

Use the rest of the white sauce to prepare cheese soufflé. Add to the white sauce one and a half tablespoons of grated cheese, a little paprika, and half the beaten yolk of an egg. Then fold in half the stiffly-beaten white of an egg. Bake in a buttered earthenware dish placed in a pan of water. Serve at once.

Frying Croquettes

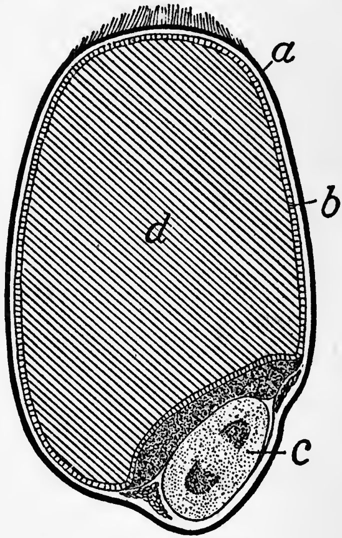


Kidney Rib French

Lamb Chops

BREAD FLOUR AND ITS MANUFACTURE

The wheat kernel consists of a number of different parts. The outside layer is known as bran and is removed in the process of making white flour. This bran consists of cellulose and mineral matter, with a higher percentage of nitrogen than is found in wheat flour. But this nitrogen is found largely in the aleurone or inner layer of the bran, and is enclosed in cells which are so thick-walled that probably not much of it could be digested if eaten. The germ is rejected, because it contains so large a percentage of fat that flour containing it would be less likely to keep. The portion of the kernel, after the bran is removed and without the germ, is known as the endosperm. This endosperm is the portion which is ground to make white flour. It constitutes about eighty per cent of the whole kernel and contains a large percentage of starch, — about seventy-five per cent — besides nearly twelve per cent protein, about one per cent fat, and half of one per cent of mineral matter. It is curious to note that even so dry a substance has about thirteen per cent of water present.



GRAIN OF WHEAT

Diagram of section: *a*, bran; *b*, aleurone layer; *c*, germ or embryo; *d*, endosperm.

The length of the process of making flour varies in the different mills. In the old process, the wheat kernels were ground between millstones, the crushed product was sifted first through coarser material to remove the bran, next through bolting cloth to remove the material of intermediate size which was called middlings. What went through the bolting cloth was flour. Now, after the wheat has been screened to remove foreign substances and cleaned, it is put between corrugated rollers which flatten and partially crush the kernel, producing a small amount of flour. This is known as the first break. After the flour has been sifted out, the rest is again crushed between rollers which are this time a little closer together. These processes are repeated, some mills using so many rollers and sieves that there may be forty different "streams" of flour from the grinding. These "streams" are finally mixed together to form the various grades of flour desired. In the higher grades of flour, the gluten is more elastic and better for bread-making.

References

Booklets sent out free by well-known flour mills.

Questions

1. Consult various cook books, and then make a table showing the kinds of fat, starch, liquid, and seasoning, which may be used in preparing sauces for vegetables, fish, meat, and puddings that have a white sauce basis.
2. How many pounds are there in a barrel of flour? In a bag?
3. What does the same grade of flour cost by the pound, the bag, and the barrel?
4. What are the trade names of some of the best-known, high grade flours?

XXVI

STARCH

Cornstarch Mold
Macaroni and Tomato Sauce

A. **Class Experiments.**

Mix half a tablespoon of cornstarch with quarter of a cup of cold water, and cook, stirring and adding measured amounts of water until you obtain the same consistency as a medium white sauce. What is the comparative thickening power of flour and cornstarch?

B. Cornstarch Mold.

Make a cornstarch mold, using a cup of milk, one tablespoon of sugar, a saltspoon of salt, and as much cornstarch as would give the consistency of the thick white sauce used in the last lesson. How will you combine the ingredients? Cook five minutes over the fire, stirring constantly; then cook covered, over water, until the "raw" taste has disappeared. This will take at least fifteen minutes.[1] Remove from the fire, add a few drops of vanilla and pour into a wet mold, and let stand until cold. Serve with chocolate sauce.

Chocolate Sauce.

Melt a quarter of a square of chocolate with a quarter of a teaspoon of butter. Add three tablespoons of water, a half cup of sugar and a few grains of salt. Boil until moderately thick; cool, and flavor with a few drops of vanilla.

[1] In cooking so small a quantity so long a time, it may be necessary to allow for the increased loss by evaporation.

C. Prepare Macaroni and Tomato Sauce.

Boil until tender a quarter of a cup of macaroni broken into inch pieces in a pint of boiling water with half a teaspoon of salt. Drain and pour some cold water over it to prevent the pieces from sticking together. Reheat in an equal amount of tomato sauce. Make this as you would white sauce, but use the juice from canned tomato for the liquid. Since macaroni is starchy, use a proportion of flour that will make a sauce between thin and medium.

Cornstarch

The manufacture of cornstarch is interesting because so many other products are made at the same time. The outline of the process is as follows.

After the corn is cleaned, it is soaked or steeped in warm water for a couple of days. In order to prevent its spoiling, a little sulphurous acid is added. When the corn is sufficiently swollen, it is ground coarsely so as to break up the kernel without breaking the germ. The germ is so rich in both protein and fat that it is most easily taken care of by itself. All that is necessary to separate it after the grinding is to run the ground mass into separators, when at a certain density of the liquid the germ, light on account of its oil content, floats on top of the water, while the ground hulls and starch settle and are drawn off from the bottom. The next problem is the separation of the starch from the hulls. It is necessary to grind the mass up much more finely than before, then the semi-liquid is passed over sieves of bolting cloth with a 200 mesh, which is shaken mechanically so that the particles of the hull are sifted out, the starch itself passing through. The hulls are separated, re-ground, and re-sifted, and sprayed with water during the process, in order to get out all the starch possible. The starch and water that goes through the sieve, however, is still mixed with protein. This liquor, at just the right density, is passed over long tanks with slightly inclined bottoms. As it flows, the starch settles and rolls along the inclined surface, thus washing itself.

The water containing the protein is usually mixed with the hulls and the dried product is used for feed for cattle. The separated germ is pressed to extract some of the oil. Corn oil is used as food only to a small extent, but it is used for making soap and in other industrial processes. The germ with the oil partly expressed is mostly exported to Europe as oil-cake, and is used for feeding stock.

After all the processes the starch has gone through, it is still crude. It may, at this stage, be used to make corn syrup and glucose, but otherwise it must be still further refined. Too much protein remains in it, so that it is further washed, sometimes with water alone, sometimes with dilute alkali. Often the plant which separates all the direct products of corn also manufactures dextrine as well as corn syrup and glucose.

Cornstarch is less difficult to mix with liquids than is flour, because it does not contain the gluten which flour does. When hot water is poured over starch, it gelatinizes the starch with which it comes into contact. The starchy grains form a mass which is impervious to water and so prevents the water reaching all of the starch grains. This can be prevented by mixing some other substance with the starch before pouring on the water, because the other substance separates the grains and gives them room to swell without sticking together. As raw starch is both less digestible and much less palatable than cooked, prevention of lumping is important.

In spite of all the purifications cornstarch has undergone in its manufacture it has a characteristic flavor which everyone readily recognizes and which must be due to some other substance mixed with the starch. Only after long cooking does this flavor disappear.

Questions

1. Give two reasons why, in making the pudding, the cornstarch is covered during the long cooking?

2. Why does cornstarch require so much longer cooking than flour?

3. If you were to make a large amount of cornstarch pudding why would you not mix the cornstarch with all of the cold milk? How would you proceed?

4. What ways can you think of to vary cornstarch pudding, besides serving it with different sauces? Consult cook books.

5. How do macaroni, spaghetti, and vermicelli differ? What do the names mean?

6. Study the cost of various macaronis to be found in your markets. Do cost and quality correspond?

7. Consult cook books and make a list of ways in which macaroni may be served.

8. How does a sauce thickened with cornstarch differ in appearance from one thickened with flour?

9. Since sauces are not cooked a long time, would you choose cornstarch to thicken a sauce which was not highly flavored? Why?

10. How does laundry starch differ from the cornstarch used for cooking?

11. Why is laundry starch in Europe manufactured from potatoes and not from corn?

XXVII

CREAMED VEGETABLES

Peas and Carrots

A. **Class Experiments.**

The Effect of Moist Heat on Starch.

1. Mix half a teaspoon of starch with a third of a cup of water. Let it stand. Does the starch settle out? Pour the mixture through a filter paper placed in a funnel. Test the water which passes through for starch. Is starch soluble; that is, does it dissolve in cold water?
2. Examine a few grains of corn starch under a microscope. Of wheat starch (flour). Compare them with the microscopic appearance of potato starch.
3. Mix a teaspoon of starch with two-thirds of a cup of water. Heat to 180° F., using a thermometer to determine the temperature. Pour off a part, and heat the remainder to boiling. Taste each. Cool, and examine under a microscope the starch in both stages of cooking.

B. Creamed Peas and Carrots in Toast Boxes.

Wash and scrape a carrot, and boil it in salted water until tender. If the carrot is very large, it may be necessary to cut it up in order to have it cook in a short time, but this is not the ordinary practice. While the carrot is cooking, make a white sauce, using the same proportions as in the last lesson, but mix as follows: cream the butter and flour together, add the hot milk slowly, stirring hard. Add equal amounts of diced carrots and canned peas. Serve in toast boxes. These are made by cutting a cube of the desired size, say three inches, out of the crumb of a stale loaf of bread, hollowing it from one side, and browning it in the oven.

Canned Vegetables

Vegetables are much more difficult to can at home than fruits. This is possibly because of the greater amount of acid present in fruits. Tomatoes, in common parlance called a vegetable although they are really the fruit of the tomato plant, are, like the fruits, easy to can. The difficulty in canning vegetables is caused by the spore-forming bacteria. Intermittent sterilization may be resorted to, and the cans of vegetables boiled for an hour on three successive days; or very long boiling may be tried, perhaps for five hours, on a single day. This really overcooks the vegetable, so that a better product is obtained by heating for a shorter time under pressure, when the temperature is higher than that of boiling water.

In the commercial process the latter method is used. The cans are filled with the vegetables, the caps are soldered on, leaving only a small hole for the escape of steam. The can is then "processed", as it is called, either by cooking it in steam under pressure or in a solution of a substance like calcium chloride or rock salt, which boils at a higher temperature than water alone. This higher outside temperature makes the contents of the can itself boil. The length of time this process is carried on depends upon the particular vegetable and how long it has stood after picking, before being canned. When perfect sterilization is probably effected, the tiny hole in the can is soldered. Some modern factories leave more than one hole to be soldered, and the old rule that more than one hole means that the cans have started to spoil and been re-sterilized no longer holds. After sealing, the cans are inverted to detect possible leaks. The cans are usually labeled upside down, and the contents of cans of some sorts of material are more easily removed if opened at the bottom.

All canned goods are better for being opened half an hour or so before using and allowed to air. If the can is tin, the contents should be poured out as soon as it is opened, because there is a chance of any acid in them acting on the tin in the presence of air. Such canned goods as peas and beans have a better flavor if drained from the liquid in which they are packed, and washed by having fresh water poured over them. To prevent waste of material, the liquid may be added to soup.

References

Olsen. "Pure Foods."
U. S. Dept. of Agriculture.
Farmers' Bulletin No. 359. "Canning Vegetables in the Home."
Farmers' Bulletin No. 73. Exp. Sta. Work, Vol. IV, p. 3. "Swells in Canned Vegetables."

Questions

1. What should be the price of cans of different kinds of vegetables?
2. If one has storeroom for them, is there advantage in buying canned goods in quantity?
3. How much do the ordinary-sized cans of different vegetables contain?
4. What differences are there between the different grades of the same canned vegetables?
5. What is the best use to make of the cheaper grades?
6. Suggest vegetables which would be good creamed.

XXVIII

THIN WHITE SAUCE

Cream Soups:
Celery and Potato

A. Make Croutons in the Oven.

B. The Principle of Cream Soups.

Wash and scrape some celery, and cut it into half-inch pieces. (Often only outside stalks and leaves are used, while the white, crisp pieces are kept to serve uncooked.) Cook about half a cup of celery, to which a small piece of onion may be added if desired, in boiling salted water. When soft, rub through a sieve. Make a white sauce using one tablespoon each of butter and flour, and exactly half a cup of celery water. Thin with milk, measuring the amount used, until you obtain the right consistency for a cream soup. Adding the amounts of water and milk used, what do you determine is the usual proportion of flour to liquid needed to thicken a soup?

C. Prepare Potato Soup.

To two tablespoons of mashed potato, add half a cup of thin white sauce. Add milk, measuring the amount, to make a soup of the right consistency. Serve with croutons. How much milk was used all together? Why is more needed here in proportion to the flour than in celery soup? To make the soup richer, part cream may be used, or white stock instead of water, or a spoon of well-beaten egg white or of whipped cream may be placed in the serving dish before the soup is poured into it.

Classification of Vegetables

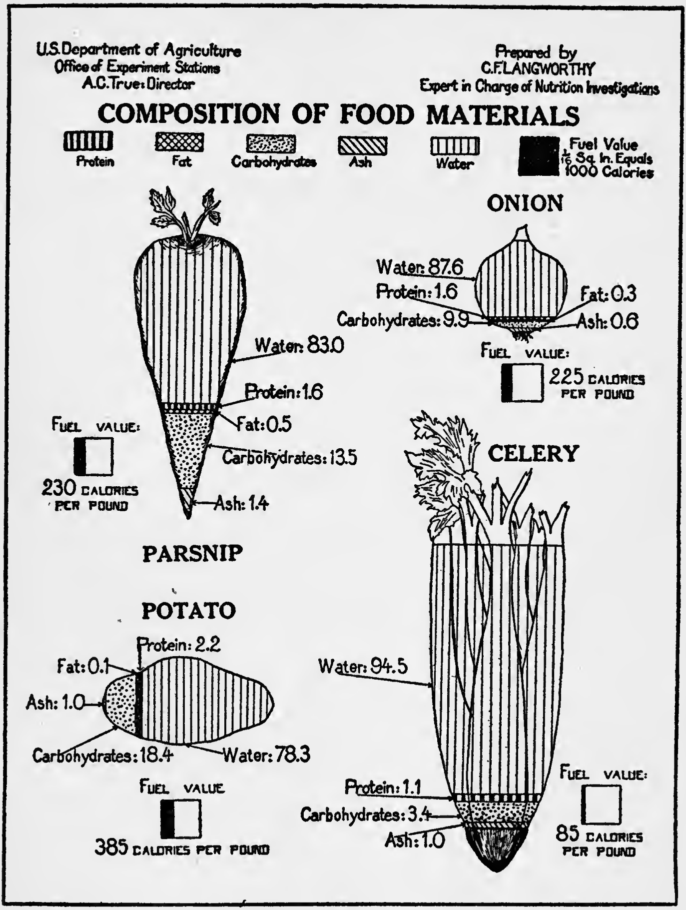
The term vegetable, as it is commonly used, includes many foods which botanically would be classed elsewhere. Rice, macaroni, French chestnuts, and even tomatoes and cucumbers are all examples of such foods. At least, it will be admitted that if they are not vegetables they are used as such.

Classifications of vegetables are many. One is made according to the part of the plant from which they come. For example:

Bulbs: garlic, onions.
Fruits: cucumber, egg plant, squash, tomato.
Leaves: Brussels sprouts, cabbage, lettuce, spinach.
Roots: beets, carrots, oyster plant, sweet potato, turnips.
Seeds: beans, corn, lentils, peas, rice.
Stems: asparagus, celery, chives.
Tubers: Jerusalem artichokes, white potato.

Although this is of interest, it is not much help to us from the food standpoint.

Another classification, made according to food value, gives us succulent, or watery, as opposed to starchy vegetables. This is sometimes misleading, if one concludes from it that watery vegetables have little or no food value. Not only do they contain valuable mineral salts, but, as Sherman, in his book on Food Products, justly says, "Even those fruits and green vegetables that are eaten for flavor with little thought of food value, and which are often thought of as luxuries because of their high water content, will often be found to furnish energy at no greater cost than many of the familiar cuts of meat, when account is taken of the extent to which the fat of the meat is usually rejected or lost in cooking or at the table." This



COMPOSITION OF VEGETABLES

classification, however, is suggestive, especially in menu-making. It is much better to serve a variety of vegetables together, rather than too many from one class. Rice, potatoes, and macaroni are much better substituted for one another than served at the same time.

An old classification as to season shows, at least, how times have changed, for with greater facilities for transportation from both North and South, together with hothouse vegetables, the display in a market no longer follows the old list. Celery, for example, was given as a fall and winter vegetable, whereas it is now to be found most of the year.

The classification which helps most in cooking is undoubtedly that into mild- and strong-flavored vegetables. In the first, every effort should be made to retain as much of the flavor as possible. In the latter case, the result may be improved if some of the strong taste is removed.

References

U. S. Dept. of Agriculture. Farmer's Bulletin No. 256. "Preparation of Vegetables for the Table."

Questions

1. Make a list of as many of the common vegetables as you can that would contain sufficient starch to have a thickening effect in making soup.
2. Make a list of succulent vegetables which you think would make good soup. How would a recipe for making cream soup from these differ from one for making soup with starchy vegetables?
3. How could the materials for making a cream soup be combined otherwise than by mixing the flour with the melted butter? If you were making a larger quantity of soup, say a quart, which method would seem to you easiest?
4. Using a cook book, make a list of seasonings which are desirable to use in soups.

XXIX

SCALLOPED VEGETABLES

Cabbage or Onion

A. **Class Experiment.** Mineral Ash in Vegetables.

Put a piece of vegetable about as big as an inch cube into an evaporating dish and heat until the residue is quite white. The process may be hastened by moistening with a drop of nitric acid, and if a blast lamp is available, use it. Note the amount of ash obtained.

B. Cooking Strong-flavored Vegetables.

Boil pieces of cabbage or onion.

1. In very little water (*a*) covered
   (*b*) uncovered
2. In much water (*a*) covered
   (*b*) uncovered

Compare the odor given off while cooking, and the flavor of the vegetable at the end. Which is the best method of cooking strong-flavored vegetables? Save the water used, as well as the vegetable.

C. Prepare Scalloped Cabbage or Onion.

Place the vegetable cooked in (*B*) in a buttered baking-dish, mix with medium white sauce, and sprinkle with buttered crumbs.

Buttered crumbs are easily prepared by melting the butter in a saucepan, stirring in the bread crumbs and seasoning with salt, and pepper if desired. Allow about half a teaspoon of butter for a tablespoon of crumbs.

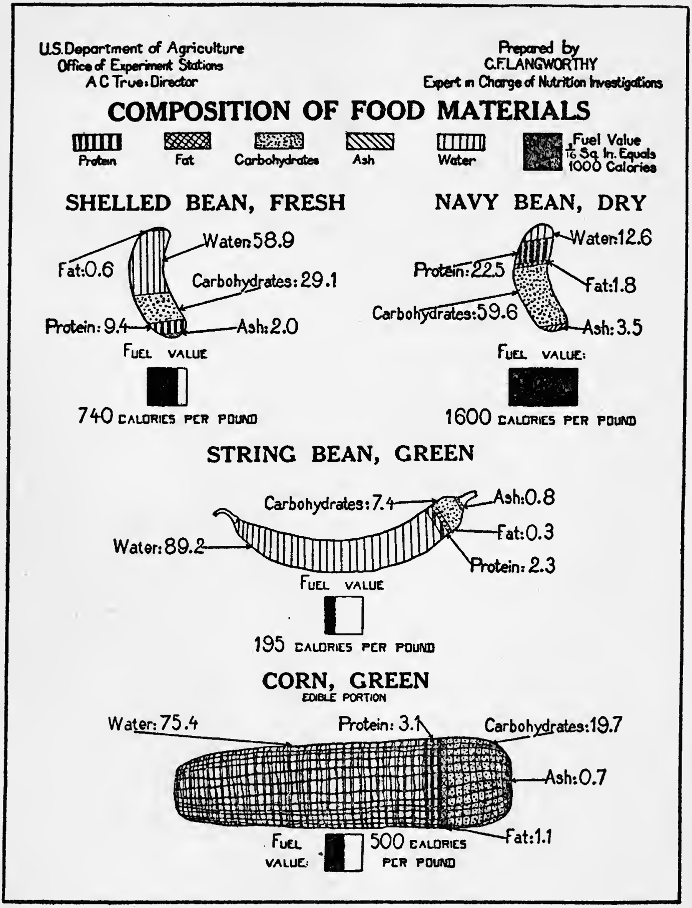
D. Prepare Cream Soup.

Use the water in which the vegetables were cooked. Make your own recipe.

Vegetables

In buying vegetables it is wisest to buy those which are in season, rather than imported or hot-house vegetables. The latter are seldom equal in flavor or texture and are usually much more costly. It is easy to blunt our relish for a vegetable by eating poor specimens out of season. Even when vegetables are in season, there is much choice to be exercised in their selection. Some vegetables, when kept, do not retain their sweet flavor. This is especially true of green peas and corn, in only less measure of string beans and asparagus. Such vegetables must be fresh, and freshness is told chiefly by crispness. Asparagus can be judged partly by seeing whether the stems have been cut recently. In corn, not only should the silk be brown, but the ear filled with well-developed kernels. The kernel, when cut, should be tender and juicy. String beans should have a brittle pod with tender strings, and the beans should be small. Some varieties of peas are large; unless of such a variety, young peas are small. Pods should be crisp and green and, for the sake of economy, full. Fresh spinach, celery, lettuce, cucumber, radishes, summer squash, and tomatoes are not difficult to select. Lettuce and celery should be tender as well as fresh and crisp. The freshness of young carrots and beets can be told by their leaves. With older ones, in the winter market, smaller vegetables are not only more tender, but, if bought by measure, give more for the money.

If wilted vegetables must be used, they should be soaked in cool water to freshen them as much as possible. The effect is much the same as with wilted flowers. Vegetables do not, however, keep well standing in water. The water becomes full of bacteria, just as does the water in which flowers stand, and, if the vegetables are cut, some of the



Composition of Legumes and Corn

soluble constituents are soaked out. Dried vegetables, too, must be soaked, but only for a limited time, to restore the water which has been lost in drying.

Although vegetables differ greatly in regard to their composition, they are all valuable for their mineral salts. But unless care is taken, these valuable constituents, as well as much soluble protein and sugar, will be lost in the preparation. For this reason steaming is better than boiling unless the water in which they are cooked is to be used. For the same reason vegetables are better cooked whole or cut in as large pieces as possible. Recent experiments [1] have shown, for example, that while spinach and cabbage lose very little when steamed, over thirty per cent more of the total solids are lost when the same vegetables are boiled. Baking is an ideal method for vegetables that can be so prepared.

In general, vegetables are put on to boil in hot water. The exception should be made with peas and beans, which are less tough if started in cold water. As a general rule, vegetables are greatly over-cooked, losing much flavor in this way. They should be removed from the water as soon as they are sufficiently tender. This is especially true of mild-flavored vegetables, but it is true, too, of cabbage, which becomes slimy and quite different in texture and flavor as a result of long cooking.

Vegetables may be prepared deliciously in a fireless cooker. With strong-flavored vegetables, the heat is not sufficient to develop the objectionable strong flavor.

Winter vegetables to be stored should be kept cool, dark, dry, and piled up, to keep out as much air as possible. Squashes are an exception and should be spread out in a warm, dry place.

[1] *Journal of Home Economics*, Dec. 1912, "Losses in Cooking Vegetables."

References

U. S. Dept. of Agriculture.
Farmers' Bulletin No. 256. "The Preparation of Vegetables for the Table."
Farmers' Bulletin No. 73, pp. 23–27: "Cooking Vegetables."
Farmers' Bulletin No. 342, pp. 29–30: "Cooking Beans and other Vegetables."
U. S. Dept. of Agriculture.
Office of Exp. Sta. Bulletin No. 245. "Courses in the Use and Preparation of Vegetable Foods."

Questions

1. Make a list of strong, and of sweet or mild-flavored vegetables.
2. Are vegetables which contain little starch cheap or dear food compared with the amount of nutrients they contain?
3. How is their use justified?
4. Suggest uses for the water in which vegetables have been cooked.
5. Why is it unwise to buy vegetables, fruit, and meat by telephone?

XXX

GREEN VEGETABLES

Spinach

Lettuce

A. Class Experiments.

The Freshening of Green Vegetables.

1. Soak lettuce in ice water for half an hour.
2. Soak lettuce in ice water over night.
3. Wash lettuce and put it in an air-tight can or jar on ice in an ice-box; allow it to remain an hour or longer.
4. Wash lettuce, wrap in a damp cloth, and place on ice in an ice-box; allow it to remain an hour or longer.

5. Wash lettuce, wrap it in a damp cloth, and hang in the wind.
6. Pour a little French dressing (see below) over a lettuce leaf, and let it stand awhile.

How would you recommend keeping lettuce? How freshen it quickly? When should it be dressed?

B. Cooking Greens.

Pick over and wash very carefully in several waters spinach or other greens.

1. Cook for ten minutes in a saucepan without the addition of more water than remains from the washing, tossing frequently to prevent burning. Chop. Continue simmering until tender.
2. Cook uncovered in a large amount of salted water until tender.

Compare the flavor and color obtained by the different methods of cooking.

Season part of the spinach with salt, pepper, and butter, and serve with slices of hard-cooked eggs.

Pack the rest into a mold to cool. Serve as salad with one of the following dressings.

French Dressing.

Use one-third to one-half as much vinegar or lemon juice as oil, and a quarter of a teaspoon of salt for each tablespoon of oil. Add a little pepper or paprika. Beat with a spoon till well blended.

Sour Cream Dressing.

Beat half a teaspoon of powdered sugar into a tablespoon of thick, sour cream, and season with salt, pepper, and lemon juice or vinegar to taste.

The Amount of Food Necessary

The nutrients in food are summed up into five groups called food principles or foodstuffs: water, mineral matter, proteins, carbohydrates, and fats.

Water is found in nearly all foods. Its specific uses in the body have already been mentioned in the discussion of water.

Mineral matter, too, has been discussed, so that all that need be said here is to point out the fact that it is found generally in all foods. The kinds, as well as the amounts, differ greatly, and it is a difficult matter to try to supply definite amounts of all the different kinds. In general, however, those foods which contain large amounts of mineral matter should be eaten in abundant quantity. Meat, fats, and sugar, show so little ash that if too much of them is eaten the diet may easily fail to furnish a sufficient supply of mineral substances. The value of fruits and vegetables on account of their salts has already been emphasized.

The proteins get their name from a word which means "first" or "chief." They received this name because they are the only foodstuffs which contain nitrogen and so are essential for building and repairing body tissue, for this also contains nitrogen. Besides nitrogen, they contain oxygen, hydrogen, and carbon, as well as other elements, such as sulphur and phosphorus, in smaller quantities. Meats, eggs and milk provide us with large amounts of animal protein. Protein is also found in our vegetable foods, — most of the nuts, some of the grains, and a few vegetables containing appreciable amounts.

The carbohydrate group receives its name because all the compounds in this class are composed of carbon, and of hydrogen and oxygen which are usually in the same proportion as in water. Starch, cellulose, and sugar, as well as pectin and dextrine, are all members of this group.

The fats contain only the three elements which are found in the carbohydrates, but they are present in quite different proportions. Oils are merely fats which are liquid at ordinary temperatures instead of solid.

As has already been said, the last three classes of foods act as fuels in the body, supplying it with energy. The energy which is thus supplied is the sole source of the energy of the body. It is used not only for maintaining the temperature, but for all muscular movement as well. It is, then, a matter of great moment, not only that the body should be supplied with enough protein for building material, but that it should also be supplied with enough energy. At first thought it might seem as if proteins could be used entirely for both these purposes and fats and carbohydrates omitted from the diet, but there is every reason to believe that the results would be bad, for a number of causes, one of which is that this would furnish the body with a great excess of nitrogen.

It is easy to see that enough energy must be furnished, but what is "enough" and how is the amount to be determined? This can be done by measuring the energy needed by the body, and the amount of energy supplied by various foodstuffs.

While energy may be measured in a variety of ways, for example, as work, measured in foot-pounds, or as light, measured in candle power, the energy value of foods is measured as heat in calories. The unit of measurement, the calorie, is the amount of heat necessary to raise the temperature of a kilogram (about a quart) of water one degree Centigrade, or it may be expressed as about the amount of heat that would raise the temperature of a pound of water four degrees Fahrenheit.

To determine the energy value of a foodstuff all that is necessary is to burn a given amount of it in such a way that all the heat given off shall be taken up by water. Then, knowing the amount of water and the rise in temperature, the number of calories given off can be calculated. Such an apparatus is called a calorimeter, from the word *meter*, or measure, and *calor*, a Latin word meaning heat. A hollow metal cylinder, containing the material to be burned and a supply of oxygen, is immersed in an insulated tank containing a measured amount of water. Combustion is started by sending an electric spark through the foodstuff. The heat given off passes through the metal cylinder into the water. The rise in temperature is very accurately determined by means of thermometers, and corrections are made for any unavoidable escape of heat.

All the carbohydrates and fats which are digested and burned in the body give off, so far as is known, the same amounts of energy under these circumstances that they do in the calorimeter. Proteins, however, are not completely oxidized in the body, and so furnish it with a somewhat smaller amount of heat than the calorimeter would indicate. Allowing for losses in digestion, it has been determined that every ounce of either protein or carbohydrate eaten supplies the body with 113 calories of heat; fats have greater fuel value and give 255 calories for every ounce.

The total amount of energy which must be supplied per person per day is, obviously, affected by the size of the person whose temperature must be maintained, as well as by the amount of energy used up in work. Atwater, for the United States Department of Agriculture, determined the following amounts as necessary for the man or woman of average size. The woman is allowed less because she averages less in weight.

Man with hard muscular work	4150 calories
Man with moderately active work	3400 calories
Man at sedentary or the woman with moderately active work	2700 calories
Man without muscular exercise or the woman at light to moderate work	2450 calories

How much protein is necessary daily is still a matter of controversy, but it is well established that the old notion that much meat or protein is necessary for strength is false. Some put the figure higher than others, but 300 to 400 calories a day from protein is probably a safe amount for the average person.

In stating the composition of food, sometimes the percentages of the various ingredients are given. Another way of expressing it is to state the number of calories of heat given by the carbohydrates, fats, and proteins in an amount of food which furnishes a total of one hundred calories of energy. This amount is known as the "standard portion." The second method is perhaps less confusing, especially when comparisons between foods are to be made.

For example, suppose a boiled potato and white flour are to be compared. The percentage composition of the two is as follows:

	Water	Protein	Fat	Carbohydrate
Boiled potato	75.5%	2.5%	.1%	20.9%
Wheat flour	12.8%	10.8%	1.1%	74.8%

With this great difference in the percentage of water present, it is evident that the percentages of the other ingredients cannot be compared directly.

Compare this with the number of calories furnished by the ingredients in the hundred-calorie portions.

	Weight of 100-Calorie Portion	Calories from		
		Protein	Fat	Carbohydrate
Boiled potato . .	$3\frac{2}{3}$ oz.	11	1	88
Wheat flour . .	1 oz.	12	3	85

It is at once evident that they are not so unlike in their nutritive elements, but that about four times as much weight of potato must be had to provide the same amount of energy.

If potatoes cost five cents for three pounds ($1\frac{2}{3}$ ¢ per pound) and flour is five cents a pound, it is easy to calculate that four pounds of potatoes would cost six and two-thirds cents, while a pound of white flour would furnish the same amount of fuel value for five cents.

Compare milk with flour.

	Water	Protein	Fat	Carbo-hydrate
Flour	12.8 %	10.8 %	1.1 %	74.8 %
Milk	87.0 %	3.3 %	4.0 %	5.0 %

The difference in the percentage of water present in the two makes it hard to decide which really furnishes the more protein, or fat, or carbohydrate.

	Weight of 100-Calorie Portion	Calories from		
		Protein	Fat	Carbohydrate
Flour	1 oz.	12	3	85
Milk	5+ oz.	19	52	29

It may be seen at once, by the second table, that over five times as much milk is necessary to equal the total calories in flour, but that the milk will furnish almost twice as many calories from protein. If milk costs four cents a pint (about a pound), it is evidently much more expensive both as a source of energy and as a source of protein.

Such comparisons are of great interest, for food value and cost, curiously, have no connection with each other. Some of the government pamphlets show by graphs the amount of fuel value which can be purchased in different foods for a given amount of money, but the price of foods changes so rapidly that these quickly become antiquated.

In addition to the recognized food principles, there seems to be another class of substances present in foods, which are known as vitamines. These are present in natural foodstuffs in only small amounts, but they seem necessary, some for nutrition and others for growth. Fruits, vegetables, and milk are our best sources for these substances, so far as is known at present. The whole subject of vitamines is under investigation, and it is to be hoped that before long we shall be able to speak more definitely concerning them. However, they furnish an excellent additional reason for the inclusion of fruits and vegetables in our diet.

In all these discussions, it should be remembered, no account has been taken of mineral matter. Sherman says that of the mineral elements, only calcium, iron, and phosphorus need to be considered, if the diet be sufficient and balanced. (See the Appendix.)

Since many of our servings of food are about a hundred-calorie portion or bear a simple relation to it, it is convenient to use such a table in estimating the fuel value of a meal. A table of this kind will be found in the Appendix.

References

U. S. Dept. of Agriculture. Office of Exp. Sta. Bulletin No. 28. "The Chemical Composition of American Food Materials."

Questions

1. Describe Swiss chard. Why is it not commonly found in the market?
2. List leaves which may be substituted for spinach as "greens."
3. Can the outer leaves of lettuce, not desirable for salad, be used in this way?
4. If you had peas that you were not going to use for a couple of days, would they keep better cooked or raw? How about potatoes?
5. Why must all green vegetables be washed before using, even though they look clean?
6. Make a list of vegetables classified as to composition.
7. What vegetables and fruits contain more water than milk does?

XXXI

SWEET-FLAVORED VEGETABLES

Squash

Buttered Beets

A. Squash.

Prepare squash, boiled, steamed, and baked. Compare the time of cooking, the texture, and the flavor.

Boiled Squash.

Cut the squash in pieces, pare, and remove seeds and strings. Cook in boiling, salted water, until soft. Drain, mash, and season with salt, pepper, and butter.

Steamed Squash.

Follow directions under boiled squash, except that, instead of boiling the squash, you should cook it in a strainer over boiling water.

Baked Squash.

Prepare squash by cutting in squares and removing seeds and strings, but do not pare. Bake until soft.

B. 1. Wash a beet and cut the top off close. Cook in hot water until tender.

2. Wash a beet as before, but take pains not to break the skin, retain the root and at least an inch of the top. Cook as before. Compare results. When should beets be peeled, before or after cooking? To serve, peel, and cut beets in half-inch slices and reheat in a little butter; season with salt, and pepper if desired.

C. **Class Experiment.** Sugar Test.

Very dilute copper sulphate and potassium hydroxide solutions are used in testing for sugar.

1. Boil together a little of the two solutions, and note the color obtained when no sugar is present.
2. To a few drops of glucose, add a little of the two solutions and boil. (Corn syrup may be used.) What is the color when sugar is present?
3. See if you can obtain this color by using granulated sugar in place of the glucose.
4. Boil a little granulated sugar with some acid in the water. (Cream of tartar or vinegar may be used.) Now try the sugar test, but before boiling, be sure to add enough of the hydroxide to color the solution blue and not green.
5. Boil small pieces of vegetables or fruit, such as beet, onion, sweet potato, grape, apple, prune, or date, with water, and then test the water for sugar. If the test is not obtained at once, try boiling first with acid, and then making the test.

Cane and Beet Sugar

Sucrose is the chemical name of the sugar used as lump, granulated, or powdered sugar. It occurs in large amounts in sugar cane and in the sugar palm, as well as in sugar beets. In the manufacture of sugar from sugar cane, the cane is crushed and the juice squeezed out by passing between a series of rollers while the pulp is sprayed with water. This gives what is called raw juice. The separation and refining of the sugar is sometimes carried out by one process, sometimes by another. Lime is often used to neutralize the acidity of the juice, impurities are filtered off or allowed to settle out, and the residue is boiled repeatedly, sugar crystallizing out after each boiling. In modern factories, this last process is accomplished in vacuum pans. The raw or brown sugar which is obtained requires still further purification. It is washed with sugar syrup, dissolved in hot water, clarified, and filtered first through cotton bags, then through bone-black filters, to remove as much of the color as possible, and again crystallized in vacuum pans. During the last process, the sugar is often "blued" to make it appear whiter. When we study in detail all the processes which sugar goes through, and all the machinery which is used in its manufacture, it seems marvelous that sugar can be sold for a few cents a pound.

Sugar from beets is manufactured by similar processes, but the juice is soaked out instead of being crushed out of the beet. As found on the market, the crystals of sugar from the one source are usually coarser than from the other, but the two are equally valuable. The United States produces sugar in large quantities, but more from cane than from beets. Europe, on the other hand, makes beet sugar.

Refined sugar could also be manufactured from the sap of the sugar maple, although not very profitably, for the amount of sugar present is small; but because the taste of the raw sugar is agreeable, maple sugar, as such, is put upon the market and obtains a good price.

The amount of sugar used yearly is large. In this country, about eighty-five pounds per person is consumed, but of course some of this is used in industrial processes. It is only recently that sugar has been used freely, and it is still an open question whether such extensive use is desirable. Sugar not only lacks mineral salts, as has already been pointed out, but it shows some tendency to cause indigestion. In too great concentration, it abstracts water from the the mucous membrane. Sherman suggests that this effect is easily illustrated by holding a piece of hard candy in one side of the mouth for some time, without moving it. Then, too, sugar readily ferments in the stomach, and forms irritating acids. On the other hand, sugar is quickly digested and furnishes an immediate source of energy.

In the household use of sugar, it should be remembered that the best time to eat sugar or candy is after meals. If taken with staple food, it often causes more to be eaten than is needed, or by cloying the appetite, produces the opposite effect. Taken between meals, it may upset the normal appetite. It is less likely to irritate the stomach, if taken with other food. Liberal amounts of water also tend to lessen the irritation.

Sugar is a hearty food and can undoubtedly be used in larger quantities by very active people, hard laborers, and children, than by sedentary people, if it does not produce digestive disturbances. It is often carried by soldiers or mountain climbers because it is a concentrated food.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 93. "Sugar as Food" or Farmers' Bulletin, No. 535. "Sugar and Its Value as Food."

Journal of Home Economics. Vol. VII, p. 544. "The Consumption of Sugar."

Questions

1. Make a list of common vegetables, giving season, amount needed for a family of four, and the probable cost of that amount when in season. (The work on this table may well be divided between the different members of the class.)

2. Make a list of the cheaper vegetables, and give as many ways of preparing each as you can find. Consult cook books.

XXXII

CANDIES

A. Class Experiment.

The Stages in Sugar Cookery.

Boil ½ c. sugar in ¼ c. water. Test by dropping product into cold water at the following stages. Feel the ball in 2, 3, 4, and 5. Note color in last.

1. 233 degrees Fahrenheit — "Hair" or "Thread" stage.
2. 236–242 degrees Fahrenheit — Soft ball stage.
3. 254 degrees Fahrenheit — Hard stage.
4. 260–275 degrees Fahrenheit — Crack stage.
5. 290–350 degrees Fahrenheit — Caramel stage.
6. 290 degrees Fahrenheit — Hard crack stage.

Syrup at the thread stage is used in making frosting.

Prepare peanut brittle by pouring the syrup at caramel stage over chopped nuts spread on a buttered pan. Mark in squares as it cools.

B. **Class Experiment.** CRYSTALLIZATION OF SUGARS.

Dissolve $\frac{2}{3}$ c. sugar in $\frac{1}{4}$ c. water. Divide into 3 portions.

1. Boil first portion to hard crack stage, and set aside to cool.
2. To the second portion add $\frac{1}{2}$ tsp. vinegar or lemon juice or a pinch of cream of tartar. Boil to hard crack stage and set aside to cool.
3. To the third portion add one-fourth the volume of glucose. Boil to hard crack stage and set aside to cool.

Why is acid or glucose added in making many candies?

C. CANDIES.

Make such candies as time and circumstances warrant. Cook to:

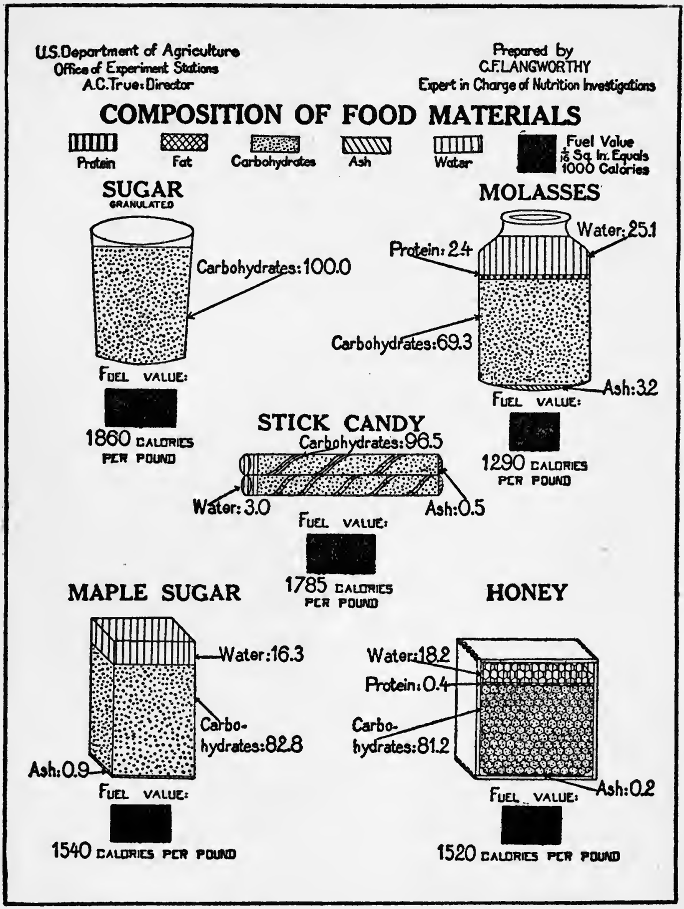
1. Soft ball stage (238°) Panochi, Fudge (Chocolate cream candy), Cocoanut Cream Candy, Fondant.
2. Hard ball stage (254°) Chocolate Caramels, Plantation Drops, Butter Cups.
3. Crack stage (270°) Molasses Candy, Ice Cream Candy, Vinegar Candy, Popcorn Balls, Butterscotch.
4. Hard crack stage (290°) Glacé-Fruit, and Nuts.

For recipes see cook-books.

CARBOHYDRATES

Carbohydrates are sugars, and substances like cellulose, starch and pectin which may be changed into sugars either by boiling with acids or by ferment action.

The carbohydrates are divided into three groups according to their complexity, and are called mono-, di-, and poly- saccharides. The chief members of the groups are as follows:



Composition of Foods containing Sugar

Monosaccharides	Disaccharides	Polysaccharides
Glucose or dextrose	Sucrose or "sugar"	Starch
Fructose or levulose	Milk sugar or lactose	Dextrine
Galactose	Malt sugar or maltose	Cellulose
		Glycogen
		Pectin

All the members of the first and second group are sugars, and all are soluble in water and more or less sweet in taste. The two groups are sometimes called single and double sugars. A plant probably manufactures a single sugar out of carbon dioxide and water, and then changes the single sugar into either double sugar or polysaccharides. When polysaccharides or disaccharides are digested, or boiled with water and acid, the plant-manufacturing process is reversed and the substances are finally broken down into single sugars. To prove this, chew a bit of cracker, being careful not to swallow it before the sweet taste of the sugar is evident. The breaking down process also goes on in the plant when stored starch or sugar is used for further growth, as, for example, in a potato when it sprouts.

Glucose and fructose occur in many fruits and vegetables and are present in large quantities in honey. Glucose is used so extensively for food that it is also manufactured from cornstarch by boiling the starch with acid. The chief points to be remembered about these two sugars are that they do not need to undergo any process of digestion before being absorbed, that they do not crystallize so readily as cane sugar, and that they give the sugar test. Galactose is a digestive product of milk sugar and is not found as such in foods.

Of the disaccharides, sucrose and lactose are the more important in our foods. Lactose is found in milk. It ferments in the stomach less readily than sucrose and so is probably much better for babies. Accordingly, modified milk and other baby foods are often prepared by the addition of lactose. It is also used as a basis for sugar pills. It is manufactured commercially by separating it from milk. When sucrose is boiled with an acid in the presence of water it changes into equal parts of glucose and fructose. Glucose is far less sweet than sucrose, but fructose is much sweeter. Consequently the mixture, "invert" sugar as it is called, is not very different in sweetness from the original sucrose, but the latter is probably a little sweeter. Some recipes call for the addition of sugar to acid fruits after boiling, so that this change will not take place as a result of the cooking. The saving is probably so small as not to be appreciable. On the other hand, this change is deliberately sought after in making candies like fondant and fudge which must be smooth and velvety, not granular, and in candies like butter-scotch which must not "sugar."

The single sugars crystallize with much more difficulty than sucrose, and the presence of even small amounts of them makes the candy less liable to "grain" or "sugar." Sometimes, instead of bringing about the change by boiling with acid, a little glucose syrup is added to produce the same result.

During digestion all the carbohydrates are broken down into single sugars and are then absorbed and carried to the liver. Here and in the muscles any sugar in excess of that needed in the blood is stored as glycogen, or animal starch. At need, the process is reversed, the stored glycogen is again broken down into sugar to keep the supply of it constant in the blood.

Saccharin is a chemical substance with a sweet taste and is entirely unlike the carbohydrates. It has no food value, and as, in too large amounts, it interferes with digestion, its use in food sold in interstate commerce has been forbidden by the United States government.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 93, "Sugar as Food", or Farmers' Bulletin No. 535, "Sugar and its Value as Food."

Commercial Geographies and Atlases.

Questions

1. Compare sugar and starch in appearance, in taste, in their behavior in cold and hot water, and in their tendency to crystallize.

2. Compare the cost of a pound of cornstarch, of flour, of sugar.

3. What other reasons besides the economic one can you give why it would be unwise to omit all starch from our diet and replace it with sugar?

4. What are brown sugar, molasses, powdered sugar, lump sugar?

5. Why can candy with brown sugar, molasses, or glucose, be easily made with the addition of acids?

6. Grind some granulated sugar in a mortar and taste it. If powdered sugar tastes less sweet than granulated, is this a proof that it is adulterated?

7. If sugar were adulterated with either sand or starch, how would these manifest themselves?

8. What different kinds of "lump" sugar are there and what is the difference between them?

9. Which costs most by the pound, granulated or lump sugar? Why do many people consider it less expensive to serve lump sugar on the table?

10. Where is sugar produced? Do we export or import sugar? Do we use more cane or beet sugar?

11. How is glucose manufactured? Is it healthful? Why has there been a prejudice against it?

XXXIII

MEAT CAKES WITH CREAMED TURNIPS

A. **Class Experiment.** Tests with Meat.

Soak some ground meat for a few moments in a little cold water. Pour off the liquid and divide it into two parts.

1. Test one part by boiling it with a few drops of nitric acid, and then cooling it and adding ammonia. Test, in the same way, a bit of the meat fiber from which the juice has been soaked out. Recall and compare with the experiment on egg white.
2. Heat the other portion to simmering and observe. Then boil it. Compare with the experiment on egg white.

B. **Class Experiment.** The Structure of Meat.

1. Scrape a small piece of raw beef in the same direction as the fiber with a dull knife, and notice the structure. Can you see any fat among the fibers?
2. Draw a muscle fiber as it appears under the microscope.

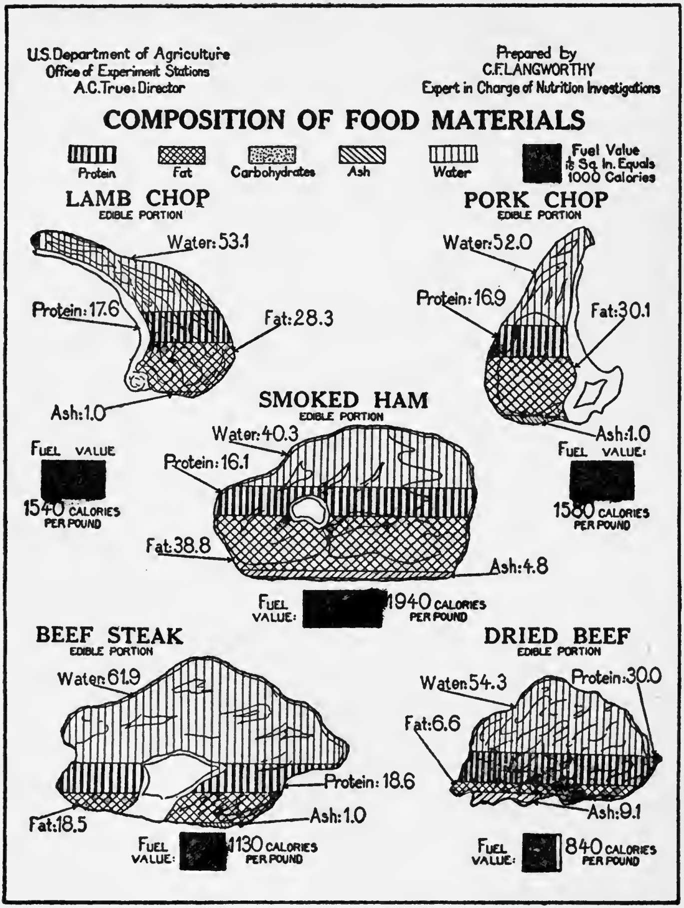
C. Prepare Broiled Meat Cakes.

1. Grind the beef, season with salt, and pepper if desired, and shape lightly into small flat cakes. Grease a frying pan lightly (a piece of the meat fat may be rubbed over the hot pan), and broil the cakes. Serve with creamed turnips.

MEAT

Structure and Composition

Meat is made up of fibers which are embedded in and held together by connective tissue. The connective tissue



COMPOSITION OF MEAT

is composed of two proteins, collagen and elastin. The collagen, when boiled with water, forms gelatine. The fibers are hollow with walls composed of the protein substance called elastin. This is like collagen in some of its properties, but it will not dissolve on boiling with water. The content of the fibers is called muscle juice. It is composed of water in which are proteins, coloring matter, salts, and extractives. Besides this, there is fat deposited in varying amounts, mainly in the connective tissue. In beef, the fat is usually in sufficiently thick layers to be seen readily; in pork, the fat surrounds the fibers in such small particles as not to be visible, although present in a generous amount. The proteins of the muscle juice are mainly myosin and albumin, and both coagulate with heat. The extractives, so named because they can be extracted from the meat by boiling it in water, are of value because they give the meat its flavor. Although they contain nitrogen, they have practically no food value, since they cannot build tissue nor furnish heat to the body. They are stimulants, however, and cause a flow of digestive juices in the stomach, which aids in the digestion of food. Lean meat shows about the following composition:

Edible Meat

Water	75.0 % to 77.0 %
Mineral matter	0.8 % to 1.8 %
Fat	0.5 % to 3.0 %
Muscle fibre	13.0 % to 18.0 %
Connective tissue	2.0 % to 5.0 %
Extractives	0.5 %

Shortly after an animal is slaughtered a condition known as rigor mortis sets in, during which the muscles are very stiff. Meat must be eaten either before this begins, or after the meat has hung for a while. In hanging, acids develop which perhaps aid in softening the meat again, and certainly add to its flavor.

The cuts of meat which are tender usually command the highest price. They come from the parts of the animal which are least toughened by exercise, but there is considerable difference in tenderness in the "better cuts," breed, age, size, and the manner in which the animal has been fattened, all affecting the result. The length of the fibers seems to be another factor in the question of toughness. Loin steaks and rib roasts are good examples of choice cuts. It is interesting to know, however, that many of the cheaper cuts contain more extractives and less water, so that they are both better flavored and more nutritious. Waste, too, must be taken into account. Instructive data on this subject can be obtained in Bulletin 158, of the Illinois Agricultural Experiment Station.

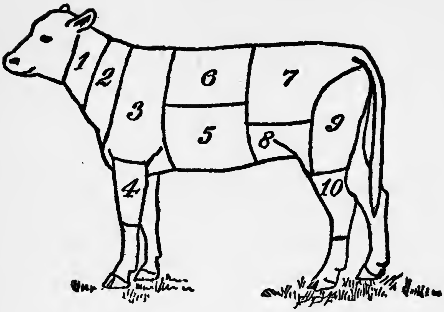
Experience is needful before one can recognize good meats in the market. This can best be acquired by getting a butcher to show different grades of meat, and to explain why one is better than another. Here are some of the chief points to be noted.

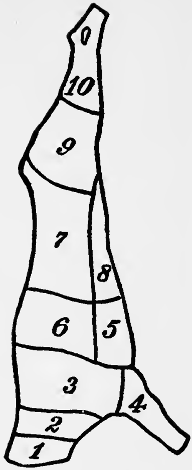
Beef

The meat should be bright red after standing, but it will be purplish red if recently cut. It should be fine-grained, firm, and the lean well-mottled with fat. Coarse, flabby, dark beef is poor meat; if it lacks fat, it is underfed or old.

Veal

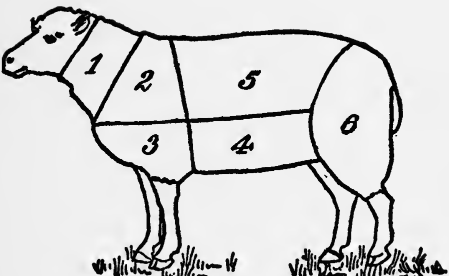
Young veal is generally excluded from market; that from an animal about two months old is considered best. The meat is much paler than beef, and shows no mottling of the lean with fat. It should be pinkish and fine-grained.

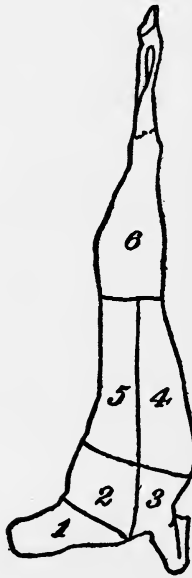




1. Neck.
2. Chuck.
3. Shoulder.
4. Fore shank.
5. Breast.
6. Ribs.
7. Loin.
8. Flank.
9. Leg.
10. Hind shank.

CUTS OF VEAL





1. Neck.
2. Chuck.
3. Shoulder.
4. Flank.
5. Loin.
6. Leg.

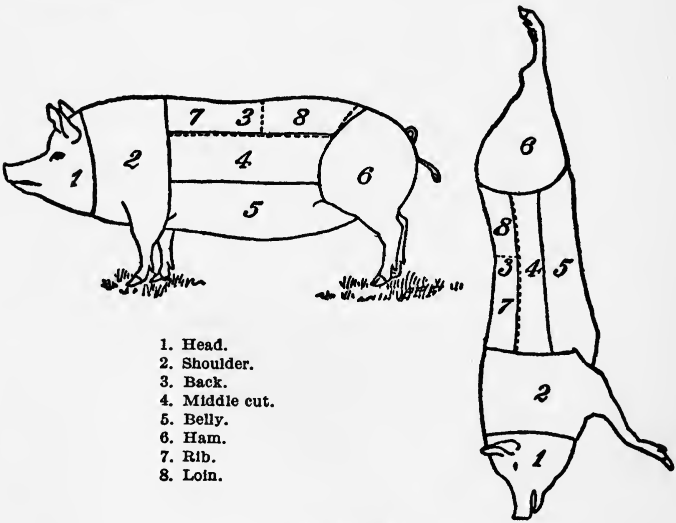
CUTS OF MUTTON AND LAMB

Mutton

This is from sheep at least three years old. It should be fine-grained and pinkish red with hard white fat.

Lamb

Spring lamb is from an animal eight weeks to three months old. All lamb is less than a year old. The meat differs in color from mutton, but the two are more easily distinguished by the bone. In lamb, this is pinker and ridged or saw-like at the joint of the leg. In mutton, the bone is whiter and smoother and less ridged.



Cuts of Pork

Pork

The meat should be fine-grained and firm, and the fat should not be soft. The meat is very pale.

All meat requires constant care, as it spoils easily. It should be kept in a cool place and not left wrapped in paper. If placed directly on the ice, much juice is lost.

Meat which has become slightly tainted may be washed with water in which a little cooking soda has been dissolved.

References

U. S. Dept. of Agriculture.

Farmers' Bulletin No. 39. "Economical Use of Meat in the Home."
Farmers' Bulletin No. 34. "Meats: Composition and Cooking."
Farmers' Bulletin No. 162. "Experiment Station Work," pp. 9–10.

Questions

1. Account for the yellow stain nitric acid leaves, if you spill it on your hands.
2. Does tender or tough meat contain more connective tissue?
3. If much-used muscle is tougher, which parts of a steer or sheep would you expect to find tough? Which tender?
4. Is tender or tough meat likely to be the more juicy?
5. For what reasons should meat be unwrapped before putting it away when it comes from market?
6. Why, before cooking, should meat be wiped with a damp cloth rather than washed?
7. Which food principle is practically absent in meat? Mention foods served with meat, which would be particularly adapted to make good the deficiency.

XXXIV

TENDER MEAT

Roast Beef

Broiled Beefsteak and Corn Pudding

A. Prepare Roast Beef.[1]

Weigh the beef before and after cooking. Wipe beef and, if necessary, skewer into shape. Dredge all sides with salt, pepper, and flour (Why is this added?). Insert a thermometer with the bulb in the center of the roast. Place fat side up, in a hot oven at 428° F. for fifteen minutes, then reduce the heat to 342° F. and cook until the inner temperature of the meat as shown by the thermometer reaches, if rare is desired, 131° to 149° F.; if medium, 149° to 158° F.; if well-done, 158° to 176° F. If meat is quite lean, it may be necessary to add fat to the pan. If very dry, add a little water. This is undesirable, as it may give the beef a "stewed" flavor.

Let the thermometer remain in for some time after the meat has been removed from the oven. Explain the change in temperature which takes place.

Calculate the length of time necessary for each pound of meat roasted rare, medium, or well-done. Why is the meat put into a very hot oven at first? Why is the temperature lowered later?

B. **Class Experiment.** Cooking Meat.

1. Sprinkle a bit of raw meat with salt. What effect does the salt have upon the juices of the meat?

[1] The roast can be cooked rare and used for left-over meat.

2. Take two small pieces of meat.
   a. Put one in a cold frying pan and cook it, heating slowly at first.
   b. Put the other in a hot frying pan.

   Explain why the juices flow in one case and not in the other.

C. PREPARE BROILED BEEFSTEAK. When will you salt it? Serve with corn pudding.

CORN PUDDING (CORN À LA SOUTHERN).

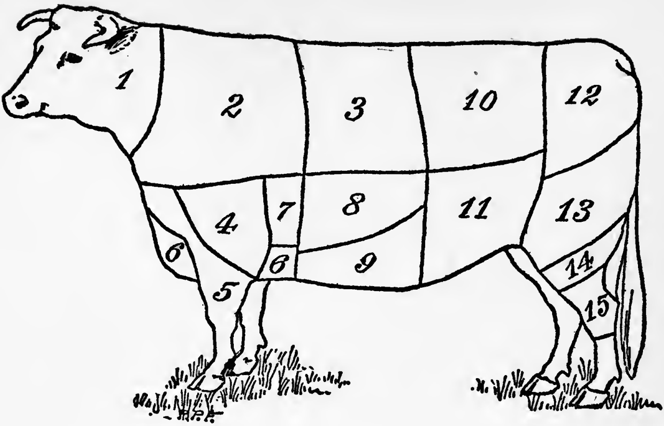
To one can chopped corn, add two eggs slightly beaten, one teaspoon of salt, one-eighth teaspoon pepper, one and one-half tablespoons melted butter, and one pint scalded milk; turn into a buttered pudding-dish and bake in slow oven until firm.

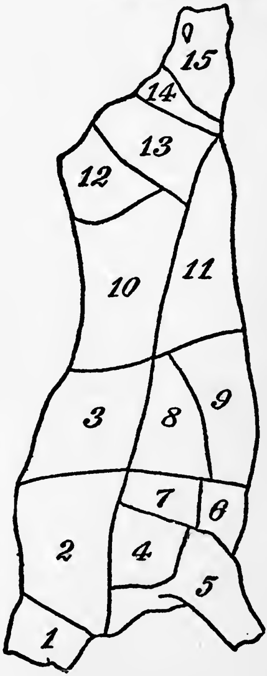
From the "Boston Cooking-School Cook Book." By FANNIE M. FARMER.

CUTS OF BEEF AND PRINCIPLES OF COOKING MEAT

Beef is not always cut up in exactly the same way. In general, the carcass is first split into two "sides" of beef, then divided into the fore and hind quarters. From the fore quarter are cut rib roasts and chuck. The first ribs cut off are the best, known as "prime." The chuck ribs may also be used for roasts or steaks. Brisket, shoulder, clod, cross-ribs, plate and navel are all used for corned beef; while they, as well as the neck and shank, are used for stews, ground meat, or soup meat. The shank is used for soups.

The hind quarter consists of loin, rump, round, flank, and hind shank. The loin furnishes the choicer steaks, club, porterhouse, and sirloin, which are cooked by broiling, or cut into roasts. The rump is used for steaks and roasts,





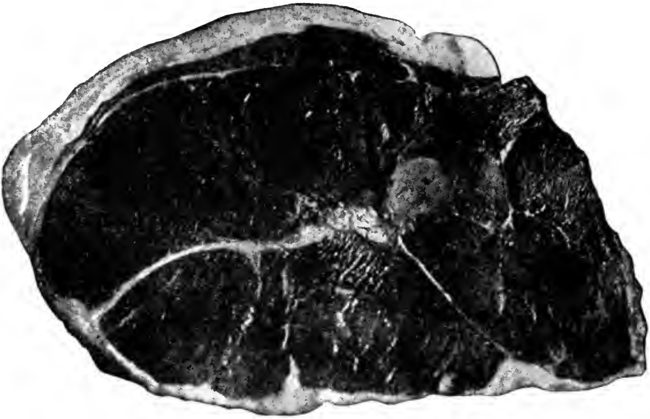
1. Neck.
2. Chuck.
3. Rib.
4. Shoulder cled.
5. Fore shank.
6. Brisket.
7. Cross ribs.
8. Plate.
9. Navel.
10. Loin.
11. Flank.
12. Rump.
13. Round.
14. Second cut round.
15. Hind shank.

Cuts of Beef

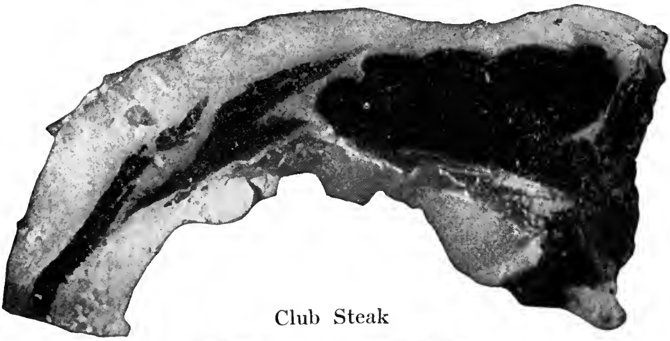
but is not considered so choice as rib and loin. It furnishes much edible meat for the price paid; however, it is somewhat coarse. The round is divided into parts called "top" and "bottom", as the meat lies on the butcher's table in being cut. "Inside" and "outside" would mean more in locating the cut. The top is much the tenderer of the two and is sometimes used for steaks and roasts, while the bottom of the round serves for stews and Hamburg steak. The flank is sometimes sold as flank steak, but needs to be cut and pounded to make it tender. It is more often used for stewing or corning.

The other parts of beef also used for eating are the heart, liver, kidneys, brains, tongue, tail, and tripe (the lining of the stomach).

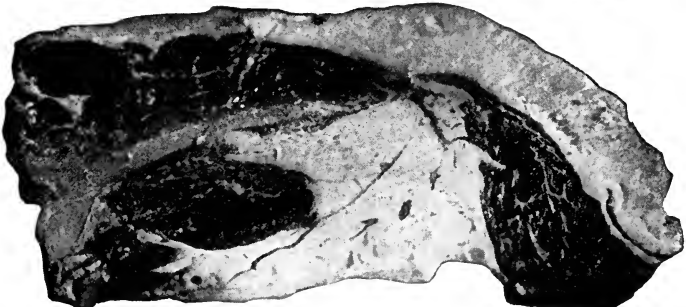
It will be noticed that the more tender meat is reserved for roasting and broiling. This means for the bulk of the meat the use of a low temperature. Notice that, even in a well-done roast of beef, the internal temperature is below the simmering point of water. The surface, to be sure, is exposed to very high temperatures and is correspondingly toughened, but this small sacrifice is in order to furnish flavor, also in order to coagulate the proteins near the outside and so confine the juices. Stewing or boiling, and pot-roasting or braising (which is really steaming and stewing) are the methods employed in cooking tough meat. In all these, the meat is exposed to a much higher temperature than is used in cooking tender meat. Muscle fiber is such a poor conductor of heat that in roasting and broiling only the outside is much heated. But in the other methods, the water or steam penetrates into the meat, carrying heat with it. This gives a temperature high enough, with time, to soften connective tissue or even gelatinize it. The fibers, however, are not dissolved and are always tougher than in more tender meat; but, on the whole, the general effect



Round Steak



Club Steak



Porter-house Steak

TYPICAL CUTS OF STEAK

is better than can be obtained by treating such meat as a better cut.

Since heat toughens meat, special care needs to be exercised in the preparation of left-over meats. If the meat is tender and already well cooked, it should be reheated but not recooked; if tough or insufficiently cooked, it should be simmered until tender.

Since tenderness is such a desirable characteristic that it is the one on which price is based, great pains should be taken not to toughen choice cuts of meat in cooking, and to prepare the tougher cuts so that they may be as desirable as possible. Many cooks woefully fail in this respect.

References

As in last lesson. (Farmer's Bulletins, No. 39, 34 and 162.)

Questions

1. Would you need a hotter or a cooler oven to roast two pieces of beef to the same degree, if one piece were very large and the other very small?
2. How thick should steak be cut?
3. If you wish steak well done, will you merely cook it longer?
4. To what is the loss in weight due in roasting beef?
5. Which cuts of beef furnish the most lean meat for the price paid?

XXXV

BEEF STEW

Dumplings

A. **Class Experiments.** Cooking Meat.

1. Sear a small piece of meat in a frying pan. Pour half a cup of cold water over it and simmer for half an hour.

2. Repeat with a piece of meat of the same size and shape, but omit the searing.

Compare the appearance and taste of the resulting broths. Cut the meat open and see whether one tastes or appears different from the other.

B. Prepare Beef Stew.

Cut lean beef into small cubes. Season each piece highly, dredge with flour, and brown on all sides in a frying pan with a little suet. Add enough water to cover meat (reserving one piece for the next experiment), let it come rapidly to the boiling point, then simmer or finish the cooking in a double boiler until tender. At least two hours is necessary. Before the stew is finished, diced vegetables may be added, and twenty minutes allowed for them to cook. If the gravy is not thick enough, a little flour and water may be added. This should be done before cooking the dumplings. If left-over roast beef is used, will it be necessary to brown? Should the left-over gravy be added?

C. Serve the Stew with Dumplings.

Sift together one cup of flour, two teaspoons of baking-powder, and a quarter of a teaspoon of salt; then stir in enough milk to make a soft dough, about a third of a cup.

1. Drop a spoon of the mixture into the stew, covering it with the gravy.
2. Drop the rest by spoonfuls over the meat in the stew in such a way that the dumpling is held well out of the water.

In which case is the dumpling soggy?

D. **Class Experiment.** Keeping Meat Tender.

To show why meat is simmered instead of boiled. Boil the cube of meat reserved from (*B*) for an hour, and then compare it with a piece of meat from the stew which has been cooked the same length of time.

Meat Inspection

Not only is the slaughtering and packing of meat the largest manufacturing process in the United States, but our consumption of meat is very great. Reports for the United States Department of Agriculture estimated the per capita consumption of beef, lamb, mutton, pork, and veal in 1900 as 178.75 lbs. while that of Great Britain was only 122 lbs., Germany 99 lbs., and France 80 lbs. Moreover, about a third of all the expenditure for food materials is spent for meat. When this is realized, as well as the fact that meat is one of the foods "most subject to conditions rendering it unwholesome or even dangerous", it is no wonder that the Federal government yearly appropriates a large sum of money for meat inspection and makes the penalties for violation of the meat-inspection law much more severe than for violation of the other food laws.

Meat may be dangerous, first, because animal parasites may be present, such as trichina in pork; or, second, because bacteria may be present. The latter may be dangerous for two reasons. They may be bacteria causing diseases which are capable of being communicated through the eating of the flesh, or they may be bacteria which produce poisons or ptomains in the meat, which, if eaten, may cause illness or even death.

Federal inspection excludes from interstate commerce and exportation all meat found unfit for food, and allows only meat to be sold which is considered as coming from healthy animals, slaughtered under sanitary conditions. Since meat is an ideal culture medium for bacteria, it is necessary not only to see that it is from healthy animals but that it is not infected afterwards. Such infection could easily take place if flies and dust were allowed, or if the meat were handled by men with unclean and infected hands. What infection may mean is evident from recent studies made on Hamburg steak, which report as high as 525,000,000 bacteria to a gram of meat, even average samples showing about 10,000,000. Fortunately these are not usually bacteria which cause disease or produce ptomains.

As they know of this government inspection, many people have an unwarranted feeling of safety in buying meat. Too often it is not realized that the Federal government can control only those slaughter houses which send meat into interstate commerce. Smaller houses, selling in one state only, are not under federal jurisdiction at all. Hence, state and city inspection laws are also necessary.

References

U. S. Dept. of Agriculture. Bureau of Animal Industry, Circular 125. "The Federal Meat-Inspection Service."

Commercial Geographies.

Questions

1. What advantages are there in serving meat cooked, instead of raw?
2. What methods of preserving meat are allowed by the Federal law?
3. Is there any limit to the time meat may be kept in cold storage before being sold?
4. What are the causes of the increased cost of meat?
5. What trade in meat has the United States with other countries?
6. How much Hamburg steak would you buy to serve four people? How much tenderloin steak? How large a roast of beef? How heavy a leg of lamb?

XXXVI

LEFT–OVERS

Southern Spoon Bread

A. Left-overs. Each student is to come to class ready to prepare some dish from "left-over" meat.

B. Spoon Bread. Serve the dish prepared in (*A*) with Southern Spoon Bread. Use two tablespoons of cornmeal and other ingredients in proportion.

Southern Spoon Bread.

Place two cups of cornmeal mixed with a quarter of a cup of flour in a strainer and pour boiling water over it. Let the mixture drain. Add

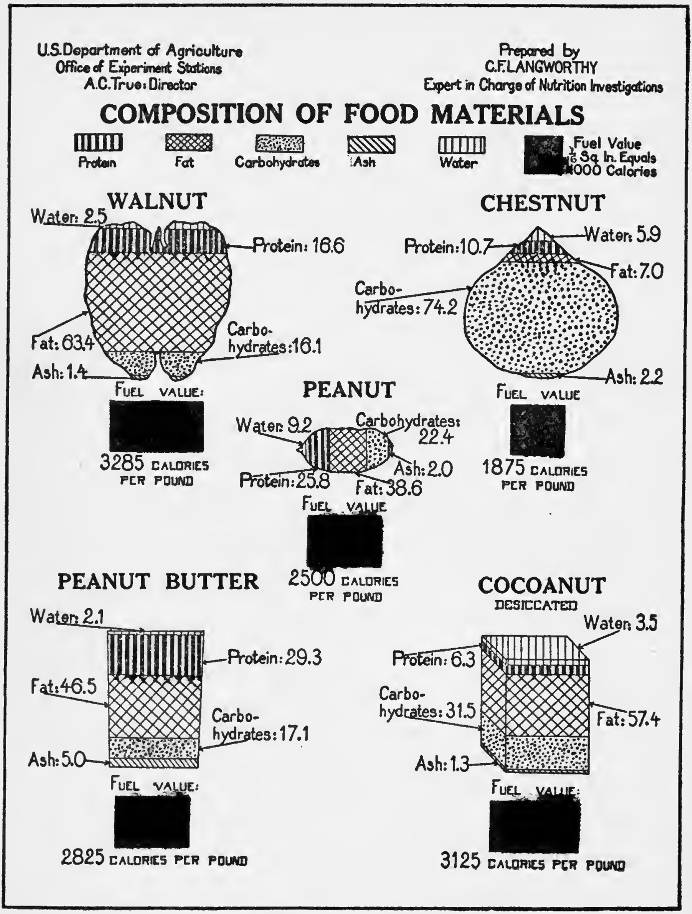
1 tsp. salt
1 tbsp. melted fat
2⅛ c. sour milk or buttermilk
1 egg, beaten slightly
1 tsp. soda

Bake in a buttered dish until of the consistency of a firm mush. Serve with gravy or jelly.

Proteins

Much has been said about proteins, but to understand their relative value and the place in the diet, it is necessary to know more about them. American physiologists are using the classification of which a simplified form is given here. The proteins are divided into three main classes:

I. Simple proteins, which are found as such.
    a. Albumins — as found in egg white, in meat, in wheat, in milk, and in many other protein foods.



Composition of Nuts

b. Globulins — of which the myosin of meat is a good example. It is also present in small quantities in egg white and in wheat, as well as in many other foods.

c. Glutelins.
d. Alcohol-soluble proteins.

{ Gluten from wheat is made up of two proteins, glutenin which belongs to group (*c*) and gliadin which is an alcohol-soluble protein.

e. Albuminoids — of which collagen, elastin, and ossein of bone are examples.

II. Conjugated proteins — which are proteins linked with some other substance. Casein, which is protein linked with a phosphorus compound and is the chief protein of milk, is one example. Haemoglobin, which is protein linked with the coloring matter of blood, is another.

III. Derived proteins. These are formed or derived from the others. For example, in digestion proteins are changed first into meta-proteins, then into proteoses, and peptones; these last three are all derived proteins. When protein is coagulated, as egg white when it is cooked, it becomes a derived protein.

All these proteins can be still further broken down into amino acids. This action is probably largely carried out in digestion, and then these amino acids are afterwards combined and built up into body proteins if they are used to repair tissue. But analysis shows that not all proteins contain the same amino acids, and even where the same acids are present, they vary greatly in amount. This would make us suspect that the different proteins might have different food values, and experiments have shown this to be true. Certain proteins when used alone seem insufficient. While some will perfectly support life and growth, others will support life, but not growth, and still others will not support life at all. Casein is a good example of the first, while it has been known for a long while that gelatine had the characteristics of the third class. For a while gelatine was not called a protein at all. Now it is known by analysis that the difficulty with gelatine is that certain of the amino acids found in casein are absent. This does not make the acids which are present of no value, but means that gelatine is incomplete by itself and needs to be supplemented by proteins which contain the missing amino acids.

As the body proteins are many, and also varied in the kinds and amounts of amino acids they contain, it will easily be seen why it is so difficult to state an exact amount of protein which is needed daily in the diet. It undoubtedly makes a difference what the proteins are that are eaten. Since so little really is known about the whole matter, we have here one of the best arguments for variety in diet, that all the needed substances may be present. Until more is known, it will be impossible to settle the question whether a vegetarian diet is superior to one which contains animal protein. Many people who argue for vegetarianism are advocates of it only in its modified form, that is, they believe in the use of milk and eggs, but not in the use of meat and fish which involves the sacrifice of life.

So far as is known, there is no essential difference between proteins from vegetable sources, and from animal sources, but it is true that because of the way they are combined, the latter are often much more completely absorbed and, perhaps, are more quickly digested as well.

Vegetarians are apparently proving that meat-eating is not essential to life. Still it is true that people like meat, and that the dominating races of the world are meat eaters, although we are not sure whether that is true because of, or in spite of, that fact. On the other hand, there is little evidence that the vegetarians are really any better off physically than the meat eaters. There is some evidence that endurance is better in those who eat less protein than in those who eat much, but this is entirely aside from the source of the protein. Fisher, at Yale University, has tried experiments in which people who ate less protein showed much greater ability to carry on given exercises than did those who habitually used more protein. Such tests as deep knee-bending, leg-raising, and holding the arms out horizontally, were tried. Not only could the low-protein consumers hold out longer, but they were less exhausted afterwards and suffered less from sore muscles. Whether this effect is due to the lack of alkaline salts in meat, or to some other cause, is not known. However, considering all the evidence, it would seem as if Americans at least would do well to lessen the amount of meat they habitually consume. As we are the greatest meat eaters among the civilized nations, it would seem that this could be done with perfect safety and possible benefit.

References

As in previous chapter.

Also U. S. Dept. of Agriculture. Farmers' Bulletin No. 526. "Mutton and Its Value in the Diet."

Questions

1. Why is casserole cookery especially adapted to the preparation of tough meat?
2. List good ways of preparing different left-over meats.

3. Make a table showing the cost per pound of the best, of a fairly desirable, and of a cheap cut of beef, veal, mutton, lamb, and pork. Also show the cost of liver, kidney, tripe, heart, sweetbreads, tongue, brains, ham, and sausage.

4. Read up on the subject and debate the question of vegetarianism.

XXXVII

MEAT SOUPS

A. **Class Experiment.**

The Soluble Constituents of Meat.

1. Place a two-inch cube of beef in a third of a cup of cold water. Let it soak half an hour, then heat slowly to boiling, noting (1) the temperature at which coagulation takes place and (2) that at which the color changes. Continue heating ten minutes.
2. Cook a second cube of exactly the same size as in (1), but do not soak it.
3. Take a third cube like the others, grind or chop it into very small pieces, and cook as in (1).

Compare the resulting broths.

B. Prepare Soup.

Allow a pint and a half of water for each pound of meat and bone. Remove the fat by passing a small piece of ice, wrapped in a cloth, around on the surface of the soup. Divide into two portions.

1. Clear the first portion with the white of an egg. Beat the egg slightly and crush the shell, allowing one egg white and shell to each two quarts of soup. Add to the soup, bring slowly to the boiling point, and skim, or strain through cloth.

2. Serve the second portion with vegetables, or rice, macaroni, or barley.

C. **Class Experiment.** THE USE OF BONES IN SOUP.

Examine the structure of a piece of bone. Put two pieces as nearly alike as possible to soak, one in dilute hydrochloric acid, the other in water. Let them stand in a cool place for several days. Compare the results. On what has the acid acted? Examine the ossein which is left. Now cook each bone separately in just enough water to cover and until the water is boiled down to one-half the amount. Let cool. Compare the consistency.

MEAT SOUPS

Liebig, who is sometimes called the father of organic chemistry, taught that protein was the sole source of muscular energy, and that meat extracts were of great nutritive value. Even Liebig afterwards realized that this last was wrong, that the meat extract was a stimulant instead of a food. But notwithstanding, the notion was held in popular opinion for a long time, and some people to-day still believe the meat extract gives strength to invalids. True meat extracts are mainly composed of the flavoring matter of meat with some mineral salts. Practically no fat, no gelatine, or other proteins are present. We can see readily that this means no real food value. The extracts may have their place, however, as stimulants. They are often fed to invalids under special conditions, or used to flavor soups or sauces.

Only slightly more nutritious are the home-made meat broths and beef tea. They contain some protein, partly gelatine, and a little fat, but are, after all, mostly water. A pint of beef broth made from a pound of beef and a half pound of veal bone shows less than one and a half per cent of protein, and about one and a half per cent of fat, and although a strong soup, it contains over ninety-five per cent of water. As soups may contain even ninety-eight per cent of water, it is quite evident that anyone fed on beef broth would not be getting much food.

Meat juices, both home-made and preserved, contain more nutriment. The home-made juices differ according to the cut of beef used and the method of extraction. They average about five per cent of coagulable protein. But Hutchison calculates that about three pints of such juice would be necessary to feed an invalid for a day. While the commercial beef juices run higher in protein than those extracted at home, their cost is very great. Hutchison suggests, therefore, the substitution of egg white with water flavored with beef extract, when beef juice is especially called for.

It is evident that meat broths, extract, tea, and the like, are all low in food value. Nevertheless they may have a place in the diet. They are used sometimes with other food to stimulate the flow of the digestive juices and to act as appetizers. This is their logical use at the beginning of a dinner. Because they are really light food, they are better before a hearty meal than a thickened cream soup, or a purée. Sometimes they are used when it is better for the patient not to have much to eat, to satisfy his desire for food. Suppose, for example, that a person has broken a leg and is laid up for a while. It is difficult to make such a person, not sick and with a normal appetite, realize that he is better off with less food than he needs when he is more active. Here, broths and soups and beverages are an aid in adding bulk to the diet, without furnishing too much food.

If meat broths contain so little nutriment, evidently the meat used to make them is almost as nutritious as before it was used. It has lost flavor and needs to be made palatable, but with proper treatment is still valuable as food.

References

U. S. Dept. of Agriculture. Bulletin No. 27. "Bouillon Cubes: Their Contents and Food Value Compared with Meat Extracts and Home-made Preparations of Meat."

Questions

1. Why is bone added to soup? Should it be split into pieces?
2. Consult cook books and make lists of herbs and of vegetables which may be used in meat soups.
3. Would you allow more water to meat in making soup with vegetables than without?
4. Devise ways for utilizing the meat which has been used in soup making. Is such use worth while?

XXXVIII

GELATINE DISHES

Lemon Jelly

Snow Pudding

Bavarian Cream

A. **Class Experiments.** Gelatine.

1. Soak a fourth of a teaspoon of gelatine in a tablespoon of cold water for five minutes. Does it dissolve? What has happened? Add two tablespoons of boiling water. Compare the result of putting two tablespoons of boiling water directly on a quarter of a teaspoon of

gelatine not been soaked in cold water. Which method will you use in preparing gelatine?

2. Measure the number of tablespoons of gelatine in a box. How much does a tablespoon of gelatine weigh? How much jelly will it make? See directions with the box.
3. Compare the cost, the net weight, and the amount of jelly supposed to be made from packages of at least three different well-known gelatines.

B. Prepare Gelatine Dishes.

Dissolve one tablespoon of gelatine in nine tablespoons of water. Divide into three portions. How much more liquid can you add to each and obtain the proper consistency for jelly?

1. Make the first portion into a plain jelly, using lemon or orange juice for the additional liquid. For the amount of flavoring and sweetening follow the recipes supplied with the box.
2. Make the second portion into a sponge. Follow the recipe for snow pudding.
3. Make the third into a Bavarian cream.

Different flavors may be used, or a single flavor, — as, for example, coffee may be used in all three.

Place each in a wet mold, put in a cool place to harden. If you wish to use them at once, surround the molds with crushed ice and salt.

Gelatine

Gelatine for commerce is made from the skin, ligaments, and bones of animals. It is put on the market in a number of forms. Of these, sheet gelatine is possibly the cheapest, but pulverized gelatine is the most convenient.

As a gelatine jelly usually contains only about two per cent of gelatine, such dishes evidently are not very hearty. For this reason, they make excellent light desserts to use after a substantial meal, or as a hot-weather dish. Since they are also easily digested and absorbed, they are valuable, too, in invalid diets. But, combined with much cream and sugar, a gelatine dish may be made very nutritious.

A word of warning must be given in regard to the use of pineapple and gelatine. This fruit contains a ferment which is capable of liquefying the gelatine, so that if the fruit is used raw, the jelly fails to set. If the pineapple is heated, this ferment is destroyed; so that pineapple jelly may be made with either canned pineapple, or fresh pineapple which has been stewed for a few moments.

In making meat soups, gelatine is formed from the bone and connective tissue which are present in the meat. Since the bones of young animals contain more gelatine-making material than is found in the bones of older animals, while, on the other hand, the meat of older animals has most connective tissue, this explains why veal bones are so often used with beef in soup making. Hutchison quotes experiments which show that the buying of bones to obtain gelatine is much more expensive than adding commercial gelatine to soup, and suggests that the bones themselves should be used only in order to utilize what would otherwise be waste material.

Agar-agar, a Japanese sea-weed, is sometimes used instead of gelatine, especially by vegetarians. It passes through the body without being digested, and so has no food value. It has the advantage of not being so easily liquefied as gelatine and can be made without ice in warm weather. The vegetable gelatines on the market are usually agar-agar preparations.

Irish moss is another seaweed sold in a dried form. It has a peculiar flavor which is greatly relished by some people. Like agar-agar, it is probably not nutritious. When made into a jelly with milk, it may, however, furnish a pleasing variety, and is at least as nourishing as the milk alone.

Questions

1. Compare the cost of a plain fruit gelatine with the cost of the same dish made with a "ready-to-mix" preparation.
2. What advantage have the pulverized gelatines over the sheet form?
3. How many classes of gelatine desserts are there? Consult cook books.
4. What relation is there between gelatine and glue?

XXXIX

REVIEW LESSON

Dinner

Split Pea Soup

Spanish Cream

Prepare and Serve a Dinner.

Suggested menu:

Soup — Split pea soup.
Meat — Pork chops.
Vegetables —
  Creamed string beans (canned), or
  Creamed turnips.
  Mashed potatoes.
Dessert — Spanish cream.

Split Pea Soup.

Soak a cup of peas for an hour or so, then drain, add a quart of cold water, and a slice or two of onion, and simmer until the peas are soft. This will take at least two hours. Rub through a strainer, and reheat, thinning with milk until the consistency of soup. Thicken with flour as in potato soup. A tablespoon of butter will improve the flavor, or a piece of fat salt pork may be simmered with the peas.

Spanish Cream.

¼ box gelatine or	Yolks 3 eggs
1 tbsp. granulated gelatine	½ c. sugar (scant)
3 c. milk	¼ tsp. salt
Whites 3 eggs	1 tsp. vanilla

Scald milk with gelatine, add sugar, pour slowly on yolks of eggs slightly beaten. Return to double boiler and cook until thickened, stirring constantly; remove from range, add salt, flavoring, and whites of eggs beaten stiff. Turn into individual molds, first dipped in cold water, and chill; serve with cream. More gelatine will be required if large molds are used.

From the "Boston Cooking-School Cook Book." By Fannie M. Farmer.

Styles of Serving

There are two styles of serving meals — the English and the Russian.

According to the English style, everything is served at the table, — soup from a tureen, meat from a platter placed in front of the host, the dishes being passed either by a maid or by those seated at table. According to the general custom, the hostess serves the soup, salad, and dessert; the host, the meat, fish, and the vegetables to be placed on the plate, while other members of the family serve the butter and such vegetables as are eaten from side dishes. In modern practice the latter are eliminated as far as possible, for only vegetables which cannot be eaten with a fork are served in separate dishes.

In the Russian style, serving dishes are not placed on the table; either the portion of food on a plate is placed before the individual to be served, or the serving dishes are passed in turn to each person and returned to the serving table. The latter is the usual formal style of service and cannot be carried out without a maid.

In common practice these two styles are often combined. Soup, nowadays, is almost always served in the Russian style, whether a maid is present or not. With a maid, the vegetables are frequently served in the Russian style, while the roast is carved on the table and served in the English style. In this case, the maid places an empty plate before the host and, while he is filling it, she takes another plate in her right hand; then, from the left of the host, having taken up the filled plate in her left hand, she puts the empty plate in its place. The filled plate is placed before the individual for whom it is intended, from his right. Then, with another empty plate, the waitress returns to the left of the host for the next filled plate. Dishes from which an individual is to serve himself are, of course, passed to the left, and all serving may be carried on from that side, but the placing of plates and cups from the right is considered the better form. Hot plates and vegetables may be held on a folded napkin; a tray is used for creamer and sugar bowl, or small dishes of jelly and the like, also for silver.

Strict Russian service requires a plate always before each individual except when all are changed for the

Table Set for a Home Dinner

dessert. The empty plate is removed with one hand, as the filled plate is placed with the other hand.

Much more thought must be put into the serving when no maid is present, for continual rising from the table is disturbing to all. A maid can go to the pantry for a forgotten utensil without calling attention to the oversight, but the omission is extremely noticeable if some one must rise from the table. Extra care must be taken, then, to see that the serving has been thought through in detail and that everything which will be needed has been placed near at hand. A wheeled tray or serving table beside the hostess makes it possible to arrange for many things to be within reach without crowding the table. Food must be selected which will not spoil by standing from the beginning of the meal until the appropriate time for serving it. If there are children in the family who are capable of doing so, it is better to have them remove the courses than to have the hostess leave the table.

It is an art to accomplish the clearing of the table successfully, avoiding noise and the piling of dishes, yet with sufficient rapidity. Formal service, which calls for the removal of one plate at a time, is often too slow, even when a plate is taken in each hand. If plates must be piled, remove the plate from the left and, holding it out of sight as far away from the table as possible, take up the side dishes, one by one, with the other hand, and pile them on the plate held in the left hand. It is much better, however, to use as few side dishes as possible and to remove them on a tray, after the main plates have been carried away. After the individual dishes, the serving dishes are removed, then any other dishes, salt and pepper holders and the like. Crumbs are removed before dessert, either with a tray and scraper, or, better, a plate and folded napkin. With doilies, the latter method must be used.

When there is no maid, the removal of crumbs from the table may be omitted.

References

Allen. "Table Service."
Books on letter writing.

Questions

1. Write a note inviting a friend to dinner (*a*) informally, (*b*) formally.
2. Write notes accepting or declining these invitations.
3. What are the duties of a hostess?
4. What are the points to be made in training a waitress concerning her appearance, conduct, and duties?

XL

POULTRY

Roast Chicken — Fried Chicken

A. **Class Work.** Chicken.

1. Weigh a chicken. Compare with weight after it is cleaned and dressed, but not stuffed.
2. Clean and dress a chicken and truss as for roasting. If the head and feet have not been removed, cut them off. Remove pin feathers, using a small knife and being careful not to break the skin. Turn back the skin at the neck so as to cut off the neck close to the body, and pull out the windpipe and the crop. Starting just below the breastbone, make a lengthwise incision just large enough to admit the hand and remove the entrails, gently, so as not to break the gall bladder. Save the gizzard, heart, and liver, but discard the gall bladder. Remove the lungs and the kidneys, saving the latter. With a knife remove the

oil bag from the tail. Singe the chicken over a flame, and wash it inside and out. With a knife slit the gizzard all around to the inner lining and pull off the flesh. Trim the heart. The neck and giblets are simmered, and the broth with the meat finely chopped is used in making gravy.

To truss fowl:

Draw thighs close to body and hold by inserting a steel skewer under middle joint, running it through the body, coming out under middle joint on other side. Cut piece three-fourths inch wide from neck skin, and with it fasten legs together at ends; or cross drumsticks, tie securely with a long string and fasten to tail. Place the wings close to the body and hold them by inserting a second skewer through the wing, body, and wing on opposite side. Draw the neck skin under back and fasten with a small wooden skewer. Turn bird on its breast. Cross string attached to tail piece and draw it around each end of lower skewer; again cross string and draw around each end of upper skewer; fasten string in a knot and cut off ends. In birds that are not stuffed, legs are often passed through incisions cut in body under bones near tail.

From the "Boston Cooking-School Cook Book." By Fannie M. Farmer.

3. Instead of roasting the chicken, cut it up and prepare as fried chicken.

If the chicken is tender, sprinkle the pieces with flour and salt and sauté them in hot fat in a frying pan. When brown, lower the heat, cover, and cook slowly for a few moments. If meat is tough, parboil until tender, then sauté, as before, until brown. In this case, the broth is used to make the gravy, and the flour is browned; in the first way, milk is used as the liquid and the flour is not browned. In either case, use the fat in which the chicken has been cooked.

Poultry

While in its broader sense the term meat includes the flesh of all animals, in its narrow sense it includes only beef, veal, mutton, lamb, and pork. These are sometimes spoken of as "butcher's meat." Poultry is the name given to all domestic birds suitable for food. Pigeon and squab, together with all birds and animals which are hunted, are known as game.

With modern methods of cold storage and incubator hatching, there is no longer much need of considering season in connection with chicken. It is always found in market. Young chickens weighing about a pound and a half are often called broilers. In selecting chicken, it is necessary to know the signs of age. The chicken is known by its smooth feet and skin, and abundance of pin feathers, and the soft cartilage at the end of the breastbone. Long hairs and hard, scaly feet are signs of an older bird. A good turkey is plump with smooth, dark legs, and also shows soft cartilage at the end of the breastbone. Young geese, like young chickens, have an abundance of pin feathers.

The United States Department of Agriculture recommends that poultry be shipped without the removal of the entrails. In order to ship for long distances, poultry, after killing, must be kept in a temperature of about 32° F. While below 30° F. the flesh becomes "frosted", at 35° F. it deteriorates too rapidly for good results. It is customary to thaw frozen poultry before it is sold. This gives opportunity for deterioration to take place, and it would be much better if customers would demand such poultry still frozen.

The Digestibility of Meat

The fibers in the meat of chicken and turkey are shorter than in beef and mutton. This makes them tender. The white meat of chicken is especially tender on account of the tender fibers and the small amount of connective tissue. Not much is really known, however, in regard to the comparative digestibility of different kinds of meat. Many books quote experiments which have determined the length of time meat remains in the stomach. Undoubtedly this time is affected by the toughness, the method of cooking, the amount of fat present, and the degree to which it has been ground up by the teeth, as well as by the kind of meat eaten. It is well proved that much fat means that the meat stays a longer time in the stomach.

Tables have been made from these results, in regard to ease and lack of discomfort in digestion, which agree pretty well with popular opinions. In general, the rarer the meat and the less fat present, the more quickly it passes from the stomach. But as little is known regarding intestinal digestion, this is only part of the story. It has been shown, however, that differences in digestibility are not at all marked if determined by the test of the total amount which is digested and absorbed. Then meat ranks with milk and eggs, being from ninety-seven to ninety-eight per cent digested and absorbed. As protein in general is not more than ninety-five per cent digested and absorbed, meat must be ranked as a food that is well utilized and fairly rapidly digested.

Opinions differ as to whether there is any essential difference in the amount and kinds of extractives present in "light" and "dark", or in "red" meat. That there are slight differences is indicated by the distinctive flavors of the different kinds, but that these are sufficient to warrant the allowing of some and the exclusion of others from the diet under different circumstances, seems hardly warranted.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 182. "Poultry as Food."

Questions

1. What kinds of game are found in your local market? When?
2. Is game brought into market usually cheap? Is rabbit?
3. Give a table showing seasons when chicken, fowl, turkey, geese, and ducks are best, and give price per pound.
4. Discuss good methods of preparing a tough bird.

XLI

FISH

Baked Fish — Boiled Fish with Egg Sauce
Scalloped Fish — Stewed Tomato

A. **Class Work.** Prepare Baked Fish.

Baked Haddock with Stuffing.

Clean a four-pound haddock, sprinkle with salt inside and out, stuff, and sew. Cut five diagonal gashes on each side of backbone and insert narrow strips of fat salt pork, having gashes on one side come between gashes on other side. Shape with skewers in form of letter S, and fasten skewers with small twine. Place on greased fish-sheet in a dripping-pan, sprinkle with salt and pepper, brush over with melted butter, dredge with flour, and place around fish small pieces of fat salt pork. Bake one hour in hot oven, basting as soon as fat is tried out, and continue basting every ten minutes.

From the "Boston Cooking-School Cook Book." By FANNIE M. FARMER.

B. THE EFFECT OF DIFFERENT WAYS OF "BOILING" FISH.

Notice in which ways the fish is toughest, and in which it is tender, but keeps its shape. What is the advantage of the cheesecloth? Formulate a rule for so-called "boiled" fish.

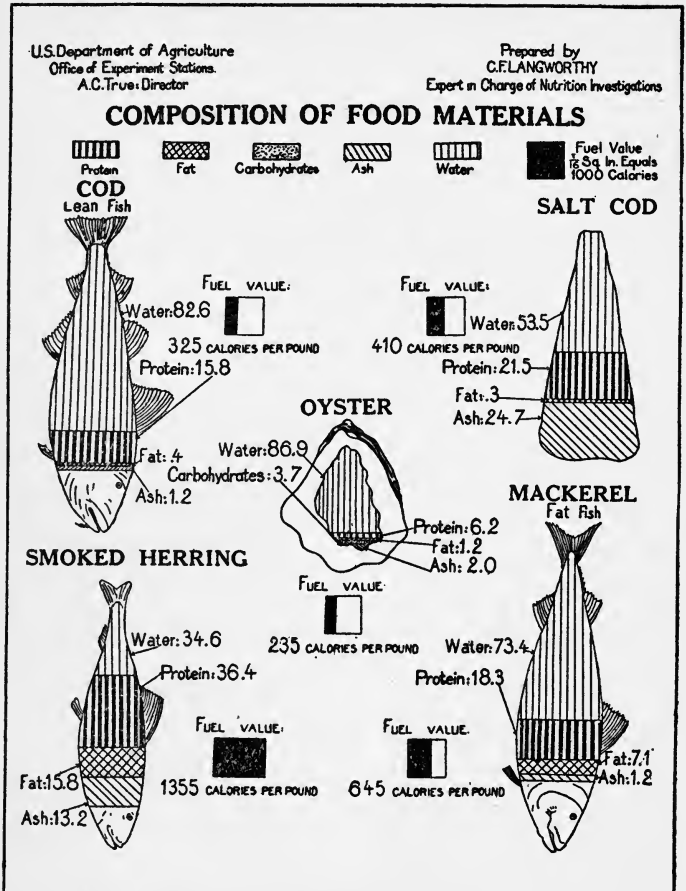
1. Place a small piece of fish (haddock or halibut cut in inch cubes) in a cup of boiling water, and boil rapidly for ten minutes.
2. Place a second piece of fish in a cup of boiling water, and simmer for ten minutes.
3. Repeat (2), but first wrap the fish in cheesecloth.
4. Repeat (2), but before putting in the fish add three-quarters of a teaspoon of vinegar or lemon and quarter of a teaspoon of salt.

Serve half of the fish with egg sauce. This is a medium white sauce made with water as the liquid, twice the usual amount of butter, and hard-cooked egg, either sliced or chopped. The sauce without the egg is known as drawn butter.

Scallop the rest of the fish. Soft bread crumbs may be added to the fish to increase the amount. Serve with stewed tomato.

FISH

The composition of fish is not unlike that of meat. In general, it is considered to be a somewhat lighter and less



Composition of Fish and Oysters

nourishing food than meat. Here is a comparison of the composition of two typical fish with beef.

	Round Beef *very lean*	Cod Steaks *edible portion*
Protein	22.6	18.7
Fat	2.8	0.5
Ash	1.3	1.2
Water	73.6	79.7

	Round Beef *all analyses*	Mackerel *edible portion*
Protein	20.9	18.7
Fat	10.6	7.1
Ash	1.1	1.2
Water	67.8	73.4

As fish contain less extractives and rather less protein also, it can well be substituted for meat in the dietaries of people who take little exercise.

Fish may be divided into groups according to the amount of fat the flesh contains, cod and whitefish being examples of lean fish, while salmon, mackerel, and bluefish are oily.

Fish spoils so readily that it is even more important to know how to select it than how to select meat. It is true that the flavor of fish is much better if it can be used as soon as caught. Since this is not possible with fish sold in market, such fish should be killed as soon as caught, and kept on ice. Notice that, in the market, fish exposed for sale is sprinkled with chopped ice. To be good, the flesh must be firm, not soft and flabby, and eyes and gills must be bright. With practice, the sense of smell is a great aid in determining freshness.

The amount of waste in head, bones, and skin is large, if fish are bought whole. Hutchison estimates that this may amount to seventy per cent as purchased, and even be as much as thirty-five per cent in fish as sent to the table. These facts must be taken into account in determining the actual cost of fish, as well as the real cost of canned fish free from waste. As usual with foods, the cost is no measure of the food value of the special kinds of fish bought. The fat fish are much more nutritious than lean fish on account of the fat present.

If fish have been cleaned at market, they should still be wiped inside and out with a damp cloth. Great care must be taken of fish after it has been bought. It should be kept cold, on ice if possible, but, unless the flesh is protected by skin, not directly on the ice itself. It must not stand long before being cooked.

The distinctive taste of fish is due partly to the fat present. Since the flavor — except in very oily varieties — is never strong, even greater care should be taken in cooking to preserve the extractives in fish than in meat. At least five per cent of the solid matter in fish may be lost in boiling. Acid, lemon juice, or vinegar, is often added to the water used in boiling fish in order to help coagulate the protein, and so keep the flesh white and firm.

In general, fish is about as digestible as meat, the kinds containing less fat digesting with greater ease than the more oily varieties. Salt, smoked, and pickled fish are all more difficult of digestion than fresh fish.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 85. "Fish as Food."

Bureau of Chemistry Bulletin No. 133. "The Preparation of Cod and other Salt Fish for Market."

Questions

1. Give a list of fish which would be classed as rich and oily, and of those which could be called dry. Which class usually has dark flesh? Which are considered more easily digested?
2. Why is pork or butter usually added in baking fish, but not in baking meat?
3. Find out what fish are commonly sold in your home market. Make a table showing season and price.
4. Give ways suitable for cooking different kinds of fish.
5. In boiling a large piece of fish, why would it be convenient to put the fish on a plate or rack, and wrap up together? Would strips of cheese cloth placed across under a fish to be baked help in lifting it when done?
6. How should a fish be cleaned? Scaled? Skinned?
7. Consult cook books for sauces and garnishes suitable to serve with fish.
8. Suggest combinations of vegetables which are good with fish.
9. Suggest ways of serving left-over fish.

XLII

OYSTER STEW — FISH CHOWDER

A. **Class Experiment.** Cooking Oysters.

Put an oyster in water and heat slowly to boiling. Observe all the changes which take place, and the temperatures which cause the changes. When are oysters done? What is the best temperature to use in cooking?

B. Prepare Oyster Stew.

Clean oysters by pouring a little cold water over them in a strainer. Add this water to the oyster liquor and strain through cheesecloth to remove any sand present. Feel each oyster to be sure no bits of shell remain. Season hot milk with salt, pepper, and butter, then add oyster liquor and oysters. How long will you cook it after the oysters are added? Allow about equal amounts of milk and oysters; and at least half a tablespoon of butter to each cup of milk. If thick stew is preferred, rolled crackers are sometimes cooked in the milk, or the whole thickened with flour.

C. Prepare Fish Chowder.

4 lb. cod or haddock	1 tbsp. salt
6 c. potatoes cut in $\frac{1}{4}$ inch slices or	$\frac{1}{8}$ tsp. pepper
4 c. potatoes cut in $\frac{3}{4}$ inch cubes	3 tbsp. butter
1 sliced onion	4 c. scalded milk
$1\frac{1}{2}$ inch cube fat salt pork	8 common crackers

Order the fish skinned, but head and tail left on. Cut off head and tail and remove fish from backbone. Cut fish in two-inch pieces and set aside. Put head, tail, and backbone broken in pieces, in stewpan; add two cups cold water and bring slowly to boiling point; cook twenty minutes. Cut salt pork in small pieces and try out, add onion, and fry five minutes; strain into stewpan. Parboil potatoes five minutes in boiling water to cover; drain, and add potatoes to fat; then add two cups boiling water and cook five minutes. Add liquor drained from bones, then add the fish; cover, and simmer ten minutes. Add milk, salt, pepper, butter, and crackers split and soaked in enough cold milk to moisten. Pilot bread is sometimes used in place of common crackers.

From the "Boston Cooking-School Cook Book." By Fannie M. Farmer.

Oysters

Oysters, the United States Deputy Commissioner of Fisheries tells us, are not only the most extensively eaten of all shellfish, but are also, with a single exception, the most valuable economically of all aquatic animals. The United States furnishes eighty-eight per cent of the total quantity of oysters produced, and has at least 150,000 men and women engaged in the industry. While all of the coast states but one deal in oysters, in fifteen of them this is the chief fishery product. However, the greatest number of oysters in this country come from Long Island Sound, Maryland, Virginia, Mississippi, Louisiana, Texas, and Washington. France produces the crop next largest to the United States. Japan and China are also oyster producing countries.

It is easy to see what a demand there must be for oysters. This is no doubt partly due to the fact that they are easily digested, but it is probably also because they can be used to furnish considerable variety to the diet, since they lend themselves to so many ways of preparation. They are almost universally used, appearing on the menus of the most exclusive as well as the cheapest restaurants.

Langworthy gives the following composition for oysters:

Water	88.3 per cent
Nitrogenous substances	6.1 per cent
Fat	1.4 per cent
Carbohydrates	3.3 per cent
Salts	1.9 per cent

The total solids are about equal in amount to those of milk, but a quart of shucked oysters costs from four to five times as much as a quart of milk. Oysters, like milk, are bulky for the amount of nourishment which they contain. The nitrogen present is probably not all in the form of protein; the carbohydrate is largely the glycogen stored in the liver of the animal. Milk and oysters are the two animal foods which are exceptional in furnishing large amounts of carbohydrate, although not in the same form. Eaten raw, oysters are an unusually digestible food; even cooked, they are still easily digested, although they are less so when fried than when cooked in any other way.

Long ago the demand for oysters outran the natural supply and oyster culture became an industry. Italy began their cultivation about a hundred years before the Christian era, and within the last century even those places where oysters were naturally most abundant have been forced to cultivate them. In order to understand what oyster farming means one must know something of the habits of the oyster. An oyster produces an incredible number of eggs, apparently to compensate for the fact that in natural life the percentage of those that will find suitable conditions for development is very small. Oyster farming consists in the preservation of as many of these eggs as possible. The newly-born young is not more than one one-hundred-and-fiftieth of an inch long, nearly transparent, has no shell, and swims freely. By the time it is large enough to be visible to the naked eye it can no longer move around. To survive, during the swimming period it must not only escape being eaten by adult oysters, fish, and other shellfish, but it must find a suitable place in which to develop. If it sinks on a muddy, soft sandy, or slimy bottom it cannot live. If, however, it attaches itself to clean shells it has a chance to survive. But the oyster has many enemies against which even the hard shell that surrounds it does not afford perfect protection. Certain mollusks drill minute holes through the shell and so get at the oyster's body, starfish may force the shell open and devour the contents, or it may be attacked by certain kinds of fish with jaws powerful enough to crush the shells; or barnacles, sponges, or mussels may grow so thickly on the shells as to cut off food and oxygen. Oyster culture consists mainly in providing suitable beds of shells for the young oysters and in protecting them from as many of their enemies as possible. Palisades are sometimes erected around the beds to keep off the large fish.

When ready for market, the oysters are dredged, freed from dirt and attached shells, and sorted according to size. Three sizes are usually recognized. The smallest, called "half shells", are usually eaten raw, the middle-sized, sometimes called "culls", are for general use, while the largest or "box" oysters are selected for frying. The difference in size is mainly a question of age, for, while there are many varieties of oysters, there is not much variation in size between the varieties. One peculiarity of the oyster is that it remains just as tender when old as it was when young. The fact that it takes no exercise may explain this. The names Blue Point, Rockaway, and the like, which used to indicate the locality from which the oyster came, now usually mean no more than size. For example, many small oysters are called Blue Points.

Oysters stand shipping well. If left in the shell, kept cool, and sprinkled occasionally with brackish water, they will live for weeks without any deterioration. Even when "shucked", if kept cool, they remain edible for eight to ten days, but they keep best if removed from the oyster liquor. Shucked oysters are usually washed carefully in a number of waters, and packed in air-tight receptacles surrounded by ice. Care must be taken not to let them become frozen. Formerly, they were shipped floated in a tub with a cake of ice. The objections to this practice were twofold. The ice often had to be replaced during the shipping, with the consequent danger of infection. Secondly, oysters lose salts and much flavor if soaked in fresh water, although they gain in size from the absorption of water. Consequently many states require the other method of shipment and specify that the oysters sold shall not contain more than ninety per cent water. Because they take up fresh water, oysters are sometimes "fattened" by placing them in the fresh water at the mouth of rivers. It is most necessary that such beds shall not be in water contaminated by sewage, lest the raw oyster become a carrier of typhoid germs, but, even at best, there seems to be no reason for allowing the practice.

The notion that oysters cannot be eaten during the months which contain no "r" in their names, May, June, July, and August, has no real foundation except that they are more liable to be contaminated by the bacteria in the water when it is warm. Oysters are not good when they are spawning, but this requires only from three to four weeks and takes place in different species at different seasons. Of course, if not properly kept cool, oysters spoil more quickly in hot than in cold weather.

Oysters occasionally appear unusually green. This is sometimes due merely to certain seaweeds or diatoms on which they have been feeding, and does not in any way impair the oyster as an edible product. Only rarely is it due to copper, and probably never in amounts sufficient to prove injurious.

References

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Questions

1. Compare the cost of oyster stew and a cream vegetable soup.
2. Compare the cost and taste of fish chowder made at home with a canned chowder of good brand.
3. Should the crabs frequently found in oysters be used?

4. Are oysters which are greenish good to eat?
5. In what months are oysters not used, and why?
6. If fresh lobsters and clams are obtainable in your market, compare the cost of these with oysters. If not, compare the cost of canned lobsters and clams.
7. Are shellfish expensive forms of nutriment?

XLIII

REVIEW LESSON

Dinner

Tomato Soup

Jellied Prunes

Prepare and Serve a Dinner.

Suggested menu:

Soup — Tomato.
Meat — Baked fish, with any suitable sauce.
Vegetables — Buttered beets.
Stuffed potatoes.
Salad — Lettuce with French dressing.
Dessert — Jellied prunes.

Tomato Soup.

Cook a can of tomatoes with a pint of water, a tablespoon of chopped onion, and three or four cloves, until the tomatoes are soft. Strain and thicken. Season to taste.

Jellied Prunes.

1/3 lb. prunes	1/2 box gelatine or
2 c. cold water	2 1/2 tbsp. granulated gelatine
Boiling water	1 c. sugar
1/2 c. cold water	1/4 c. lemon juice.

Pick over, wash, and soak prunes for several hours in two cups of cold water; cook in same water until soft; remove prunes; stone, and cut in quarters. To prune water add enough boiling water to make two cups. Soak gelatine in half cup cold water, dissolve in hot liquid, add sugar, lemon juice, then strain, add prunes, mold, and chill. Stir twice while cooling to prevent prunes from settling. Serve with sugar and cream.

From the "Boston Cooking-School Cook Book." By Fannie M. Farmer.

The Dining Room

The American woman has been accused in the past of great lack of taste in the furnishing and decoration of her house, although being second only to the French woman in her knowledge of how to dress. Fortunately, however, matters have been improving greatly in this respect, perhaps because the woman is beginning to understand that, while fashion complicates the problem, there really are fundamental laws to guide her. Honesty, simplicity, and use are the touchstones, and it is amusing that it is the artists, who have always been considered impractical in matters of everyday life, who are insisting that usefulness is the first test.

First, a thing should look like the thing it really is and not like something else. A salt shaker should look like a salt shaker and not be an owl with holes in its head. A pillow on a couch should be made to be a pillow, not ruffled or beaded, nor of some material which would either be easily spoiled or uncomfortable to use. Suitability, also, is being considered. The era of hanging gilded rolling pins with hooks across them for key holders, or gilded toasters for magazine racks has gone by. But man is still under the influence of the notion that we must have multitudes of things around us. Let us rather test every object in a room and decide if it is really useful or if it is really beautiful, and discard the rest. Let each object be as beautiful as possible. The use of ornament is shown everywhere about us, but much of the so-called ornament is meaningless, interferes with use, or greatly increases work. This is unsuitability.

With this in mind, it is easy to formulate the needs of the dining room. First, it must be a place not only really clean, but one that allows no suspicion in the matter. A well-lighted room with light colors is required rather than a dark one which might conceal dirt. Few objects should be around. Too many suggest subconsciously to the mind that since it is much work to dust, dust has probably been allowed to accumulate. The air must be fresh; no stale odors of food are welcome. Therefore, heavy materials to which odors cling are unsuitable for draperies or upholstering. Carpets are excluded, and rugs are admitted only because they deaden noise. Moreover, as one likes to be sure nothing has been spilled on the chair, evidently leather or cane seating is to be chosen instead of stuffed furniture. The height of table and chairs should be carefully adjusted for comfort. Chairs that are so high that the average person cannot touch the floor while sitting in them are disagreeable. Again, children often are seated at table so that their chins barely appear, or they are placed so high that they are sitting almost on a level with the table itself, and are reproved for spilling.

Since undoubtedly our state of mind affects our digestions, colors must be restful and harmonious, and the room must be light and cheerful. On the sideboard or table may be placed utensils which are appropriate and beautiful. But remember that it is almost impossible to have too few articles around, for things accumulate almost faster than they can be cared for; and that it is, consequently, very, very easy to have too many.

References

Pictures and articles on Dining Rooms in such magazines as "The House Beautiful," or in books on House Furnishing.

Questions

1. Calculate the cost per person of the dinner served and compare it with the following dinner:

Main course — Fish chowder.
Bread and butter.
Dessert — German toast with a pudding sauce.

2. Make a list of dishes, glass, silver, linen, and the like, which you would consider a moderate equipment for a dining room, and find out about what the cost would be.
3. Describe a dining room which you consider suitably furnished.
4. How would you rank a dining room, as a public, semi-public, or private room? What influence should this have on the choice of pictures for the room?

XLIV

POP-OVERS

A. Prepare Pop-overs.

Use one-fourth of the following proportions:

Liquid (Milk)	Flour (Bread flour sifted)	Egg	Fat (Butter)	Salt
1 c.	1 c.	1	1 tsp.	½ tsp.

Mix as follows:

1. Beat white and yolk separately. Add the milk to the beaten yolk and add to the flour and salt. Stir in the melted butter and finally fold in the beaten white.
2. Add the milk to the flour and salt. Add unbeaten egg and melted butter and beat with a Dover egg beater until there are no lumps.

Pour each pop-over batter into hot, buttered, earthen molds or iron muffin pans, but do not fill molds more than quarter full. Bake in a hot oven[1] (482° F.) until the pop-overs are puffed and beginning to brown, then reduce the heat and finish baking. Allow thirty to thirty-five minutes for the whole baking. Compare results.

B. **Class Experiments.** 1. Fill a cup with unsifted flour. Sift the flour and refill the cup, being careful not to pack the flour. Recipes always call for flour measured after one sifting. Why?

2. Drop a teaspoon of unbeaten white of egg into hot fat. What immediately happens to the water in the white of egg? What makes pop-overs pop? Why is so hot an oven used?

Flour Mixtures

Cream soup and white sauce are made with comparatively little flour for the liquid used, and without the use of eggs. Beginning with pop-overs come a series of thickened mixtures, usually with more or less egg. Of these the more liquid are termed batters. A mixture thin

[1] Test the heat of the oven at 482° F. with your hand. An "educated" hand is of the greatest help when trying to bake without a thermometer. Also test by putting a piece of white paper in the oven for five minutes.

enough to pour is called a "pour-batter"; it is about as thick as thin cream. Then comes a "drop-batter", thicker than a pour-batter but still liquid enough to drop from a spoon, "breaking" when it is poured. It has the consistency of thick cream. Thicker than this is "soft dough"; then, still thicker, is "dough." Obviously pop-overs are a pour-batter; so are griddle-cakes. Muffins are drop-batter, baking-powder biscuits are soft dough, and bread is dough. Cookies and pastry are still stiffer mixtures. But none of these terms are exact, because the proportions of flour and liquid in any one may vary a good deal. Also, it will readily be seen that eggs act as a liquid until they are cooked, and that fat is liquid while it is melted. All these things, therefore, must be taken into consideration. Then, one flour differs from another in its gluten content, so, therefore, in the amount of liquid it can absorb. But in spite of all this, quite accurate results can be obtained with definite proportions, until one comes to a mixture like bread which must be handled.

In considering the whole question of proportions, think of the liquid as fixed in amount, one cup, and then the proportion of flour used with it. In pop-overs equal amounts are used, one cup of each. Therefore, pop-over batter is said to be 1:1, — one cup of liquid to one cup of flour. As griddle-cakes, fritter-batter, muffins, and bread vary mainly in the amount of flour used, this is an easy way to remember proportions. Cake ordinarily contains so much fat or so many eggs that these must be taken into consideration in counting liquid.

The method of mixing depends upon the leavening agent and the result to be accomplished. If the leavening is steam, as in pop-overs, beating in air is evidently unnecessary. Therefore the separate beating of the egg, folding in the white, gives no better pop-overs than are obtained by the shorter method. Beating the flour with the liquid develops the gluten in it, which is necessary to retain the steam which expands and so makes the pop-overs hollow. Notice in each mixture exactly how you combine the ingredients and see the reasons in every case.

Baking is much easier if a thermometer can be used in the oven, because then the temperature can readily be measured and not guessed at. Many home ovens can quite easily have a hole bored, so that a thermometer can be inserted. The result is more accurate than the results obtained from oven thermometers. With gas ovens, it is possible to tell with a little practice how hot a given oven is by the length of time the gas has been lighted and the degree to which it is turned on. Many ovens bake unevenly. This is especially liable to be true of small ovens. In these, care must be taken not to put pans too near the sides. It is impossible to fill such an oven too full and get good results. A pan of water will help cool an oven; an asbestos mat placed under a pan will keep the bottom from baking as fast; paper put over the top will keep the top from browning as rapidly. But all these ought to be unnecessary with a good oven and sufficient skill in baking.

Questions

1. Is pour-batter an appropriate name for batters of the type of pop-overs?

2. Look up a recipe for cream puffs. Cream cakes. Eclairs. How do these compare in proportions with the pop-over recipe?

3. If you mixed cream puffs as pop-overs and attempted to bake them on a flat surface what would happen? Account, then, for the partial cooking of the flour during the mixing.

4. Compare the proportions of flour to liquid in cream soups, white sauces, and pop-overs. Also with the amount of flour you would have to substitute for cornstarch to make a mold. Compare the textures when cooked.

XLV

APPLE FRITTERS

A. **Class Experiments.** THE PRINCIPLE OF LEAVENING.

1. Tie a piece of rubber sheeting over the top of a test tube, cool the tube, then heat it slightly. Notice the effects on the rubber. What effect has heat and cold upon the volume of the air in the tube?
2. How is the gas held in the dough?
   Mix one teaspoon of flour with an equal amount of water. Repeat, using cornstarch instead of flour. Notice the difference in the result. To explain: mix $\frac{1}{4}$ c. flour with water (a teaspoon at a time) to make a very stiff dough. Wash, by kneading it gently in a bowl of cold water until the part left, the gluten, no longer gives a blue color with iodine. (What has been washed out?)
   a. Reserve a pinch of the gluten, divide the rest into two balls. Bake one in a hot oven, the other in a slow oven. Explain difference in results.
   b. With the piece reserved, determine if gluten is protein.

B. APPLE FRITTERS.

Prepare a pop-over batter, using $\frac{1}{4}$ c. liquid. Pare and core an apple and cut crossways into slices. Dip a slice into the batter. Is it thick enough to make a cover for the apple? Add enough flour to make a "cover-batter." Record proportions one would need for a cup of liquid. Fry in deep fat and serve with syrup.

Leavening

The term leavening means "making lighter." Bread is leavened and, instead of being a solid, heavy mass, is spongy, light, and porous. The process is supposed to improve not only the flavor but the digestibility of the mass.

The principle of all leavening is the expansion by heat of some gas which is thoroughly mixed through the batter or dough. In cooking, there are three agents which are commonly used in leavening doughs. The first of these is water vapor or steam. This, as in the pop-overs, is manufactured from the water present in the batter by the heat of the oven. Then further heat expands the steam still more. At the same time the heat hardens the expanded gluten, so that after a while no further stretching is possible. This explains why muffins and cake rise in the oven only at the beginning of the baking.

The second agent is air. This is mixed in a batter in two ways, — it may be entangled in the batter itself by beating rapidly, or it may be beaten into egg and then folded into the batter. Even snow may be folded in like egg and introduce some air into the mixture. When the batter full of tiny bubbles of air is heated, this air expands and, stretching the gluten by which it is held, it makes larger holes, thus leavening all the mass and making it rise.

Carbon dioxide is the third agent. This may be forced into the dough, a process, however, which is never used at home and rarely elsewhere. Carbon dioxide is, instead, manufactured in the dough itself. When yeast is put into bread, one is really starting a plant to grow. The plant feeds mainly on sugar. If cane sugar is present, it turns it first into glucose and fructose sugars and then breaks them up into carbon dioxide and alcohol. The heat of the oven acts on carbon dioxide exactly as it does on water vapor or steam, expanding it into larger bubbles. As alcohol is more easily turned into vapor than is water, it becomes a gas and, expanding, helps in the leavening process.

The other method of introducing carbon dioxide into doughs and batters will be shown in the next lesson.

Questions

1. What effect has heat on gluten?
2. What other proteins are hardened by heat?
3. After pop-overs are thoroughly baked, as they cool, what becomes of the steam? Why are they better eaten hot? Compare them to baked potatoes in this respect.
4. Why does an insufficiently cooked pop-over fall, when it is taken out of the oven?
5. Calculate the cost of pop-overs. How do they compare with the cost of the bread that they would replace in a meal?

XLVI

SOUR MILK GRIDDLECAKES

A. **Class Experiments.** Soda as a Leavening Agent.

1. To find out why soda makes cakes light.
   Add a teaspoon of vinegar to a pinch of soda in a test tube. Tip the tube and hold the mouth of this test tube just above another containing a teaspoon of lime water. After a moment, cover the mouth of the lime-water tube and shake it. What is present? What caused the bubbles in the first tube?

2. What kind of substances must be put with soda to produce this gas?
   a. Dip a piece of blue litmus paper into vinegar and note the effect on the paper. Hold it in the fumes of ammonia, an alkaline substance, and see the result.
   b. Now test the following and determine whether they are acid, alkaline, or neutral (neither acid nor alkaline):

      1 — water.
      2 — sour milk.
      3 — sweet milk.
      4 — molasses and water.
      5 — cream of tartar dissolved in hot water.
      6 — thin starch paste.
      7 — soda and water.

   c. Pour a few drops of soda and water into each of the tubes. Which cause effervescence?
3. Will bubbles of gas go on forming indefinitely? To a little soda and water add, successively, small amounts of vinegar. Do bubbles continue to form? Has all the gas in the soda been set free? Has soda an agreeable taste? What would be the difficulty, if there were more soda in bread or cake than the acid present could act on?
4. How much soda can be used with a given amount of acid?
   Dissolve a teaspoon of soda in quarter of a cup of water in a measuring cup. Then dilute half a cup of thick sour milk with about half a cup of water. Add, slowly, the soda solution to the

sour milk until it is neutral to both red and blue litmus paper.

Calculate the amount of soda to use with one cup of sour milk.

B. Prepare Sour Milk Griddlecakes

Use one-fourth of the following proportions:

Liquid (Thick, sour milk)	Flour	Egg	Fat (Melted butter)	Salt	Soda
1 c.	1 to 1¼ c.	1	1 tbsp.	1 tsp.	?

How will you combine the ingredients? Cook by dropping spoonfuls of the batter on a griddle or frying pan, using enough fat to keep the cakes from sticking. A soapstone griddle should not be greased. When the cake is full of bubbles and the under side is brown, turn the cakes over, using a spatula or a cake turner, and brown the other side also.

Soda

Soda has two chemical names: bicarbonate of soda, and acid sodium carbonate. In spite of the latter name, soda is alkaline to litmus and not acid in any of its properties. It is manufactured from common salt by a number of different processes.

Our grandmothers used saleratus in place of soda. This is bicarbonate of potash and, like soda, gives off carbon dioxide when it is combined with an acid. As this was originally manufactured it was not finely powdered, but in a more or less scaly mass which could by no means have been easily sifted with the flour in making use of it. In order, then, to get it properly mixed, it was necessary to dissolve it in the liquid used. This probably accounts for the many cooks who still dissolve the soda in the sour milk used with it, instead of sifting it with the flour. This is, obviously, a waste of soda, because all the gas which bubbles off is lost as leavening, since there is no gluten present to retain the gas.

Since definite amounts of acid act on definite amounts of soda, a question naturally arises in regard to the acidity of sour milk. Is it always uniformly acid? This must be answered in the negative for milk that has not clabbered. But after that stage has been reached, the acidity remains fairly constant, until changes take place in the milk which render it unfit for food. Therefore, the proportion of soda that can wisely be used with a cup of clabbered milk is a definite one. Many recipes, especially when enough other flavoring, such as chocolate or spice, is used to disguise the taste of an excess, call for a larger proportion of soda. The result is greatly improved if the soda is reduced to the correct amount, and if more leavening is needed the added amount is supplied by the addition of baking powder.

Great caution must be taken when molasses is used to act as the acid with soda. Modern molasses is entirely different in respect to its acidity, being always much less acid than of old. It is safer to allow not more than a quarter of a teaspoon of soda to a cup of molasses, if the molasses is bought in bulk. Use baking powder for the rest of the leavening. If the molasses is canned, it may have practically no acidity whatever, and baking powder should be used instead of any soda.

Questions

1. How does baking soda differ from washing soda?
2. What finally becomes of the carbon dioxide gas from the soda used in griddle-cakes?

3. Is carbon dioxide harmful?
4. What is soda water? How is it made?
5. Wherein lies the chief danger of drinking soda water at a public store if it is managed carelessly? Are there any laws in your town or city governing this?
6. Why is soda soothing to a burn? When should it not be used for this purpose?

XLVII

LEAVENING

Sweet Milk Griddlecakes

Sponge Cake

A. **Class Experiment.** Baking Powder.

1. Mix a little soda and cream of tartar. Does anything happen? Add water. What test with litmus paper was given by cream of tartar and water?
2. Pour a tablespoon of water on half a teaspoon of baking powder. Is gas given off? From this experiment what two substances do you suppose that baking powder contains?
3. Boil (2). When cool, add iodine. What third substance does this show is present?
4. Why starch is used.
   Stir together half a teaspoon of starch and half a teaspoon of water. What becomes of the water? What happens if the soda and acid in baking powder becomes moist? Why is starch added?
5. Weigh out one ounce of soda and two and a quarter ounces of cream of tartar. Add half an ounce of starch. Mix thoroughly and sift. Compare the cost of this with the cost of an

equal weight of purchased cream of tartar baking powder.

B. PREPARE SWEET MILK GRIDDLECAKES

Use one-fourth of the following proportions:

LIQUID (milk)	FLOUR	EGG	FAT	SALT	BAKING POWDER
1 c.	?	1	1 tbsp.	1 tsp.	?

The usual amount of baking powder is two teaspoons to a cup of flour. How does the amount of soda used in the sour milk griddlecake recipe compare with the amount of baking powder used here?

C. PREPARE SPONGE CAKE.

Use one-sixth of the following recipe. Bake in an oven at 338° F.

*Yolks 6 eggs
1 c. sugar
1 tbsp. lemon juice
Grated rind one-half lemon
*Whites 6 eggs
1 c. flour (pastry)
$\frac{1}{4}$ tsp. salt

Beat yolks until thick and lemon-colored, add sugar gradually, and continue beating, using Dover egg-beater. Add lemon juice, rind, and whites of eggs beaten until stiff and dry. When whites are partially mixed with yolks, remove beater, and carefully cut and fold in flour mixed and sifted with salt. Bake one hour in a slow oven, in an angel-cake pan or deep narrow pan.

From the "Boston Cooking-School Cook Book." By FANNIE M. FARMER.

*The eggs in this recipe may be reduced to four with good results.

Baking Powders

While baking powders are now practically all made with soda as the carbonate, many different substances are used for acid. There are three distinct types of powders, classified according to their composition. The oldest type is made with cream of tartar. This is a substance which is found abundantly in grape juice. If grape juice stands in wooden kegs, cream of tartar crystallizes out in masses on the inside. This crude substance, argol as it is called, is then purified by being dissolved in water, filtered, often through bone black, so as to remove the coloring matter of the grapes, and then re-crystallized and ground. It makes a good baking powder, because it is not easily soluble in water and does not need much "filler" to keep it dry. When it acts with the soda, besides the carbon dioxide another substance, known as Rochelle salts, is formed. This substance is used as a purgative in medicine, but so little of it results from the amount of baking powder ordinarily used in cooking that probably it has little effect on the human system.

Phosphate powders, a second type of baking powder, are usually made with acid calcium phosphate. These powders give a good deal of gas, but the gas is evolved very quickly. More filler is used because of this. The residue, like that of the tartrate powders, is also purgative, but probably no action is caused from the amount usually eaten.

The third class, alum powders, contains most commonly potash alum, that is, potassium aluminum sulphate, and, since alum is very soluble, even more filler is used than in the phosphate powders. In these powders the evolution of gas is much more continuous than in the phosphate types. Much objection has been made to these powders, because it was feared there might be injurious effects from the alum used. Repeated experiments do not seem, however, to show that the residues here are any more harmful than in the other cases. Manufacturers of tartrate powders have done their best to prove alum powders injurious because, as alum is much less expensive than cream of tartar, these last powders are naturally much cheaper.

Besides these three distinct types, there are mixed powders in which more than one acid is used. Alum is sometimes mixed with the phosphate powders to make the evolution of gas more continuous. Tartaric acid itself often takes the place of a part of the cream of tartar in a tartrate powder. Probably the truth of the matter is that too much of them is not good for digestion, but that, as ordinarily used, they are all harmless. Nor do we ordinarily make much account of the difference in ingredients in our actual use of baking powders.

Sometimes, instead of baking powder, cream of tartar and soda are used. For one teaspoon of soda two slightly rounded teaspoons of cream of tartar are allowed. This does not give such good results as are obtained with purchased baking powders, because the measuring of the soda and acid is not nearly so accurate, nor is the mixing so thorough. Some recipes for home-made powders call for as many as a dozen siftings and are, therefore, rather laborious to make.

Since over two parts of cream of tartar are used for one of soda, and since in tartrate baking powder there is also some filler present, ranging from seven to about twenty per cent, it will be seen that only about one-fourth of the baking powder is soda. If, therefore, we wish to substitute baking powder and sweet milk for soda and sour milk, about four times as much baking powder as soda must be used.

Questions

1. Find out the cost per pound of baking powders of the different types found on your market.

2. What are the regulations in regard to baking powders for sale in interstate commmerce?

3. Have you state or city regulations in regard to baking powders?

4. Correct the following recipe for sour-milk gingerbread by calculating the amount of soda to use with this amount of molasses, and with the amount of sour milk. Subtract the sum from the amount of soda given in the recipe. What is the amount of the extra soda? How much baking powder will you add to replace the extra amount?

1 c. molasses	$1\frac{3}{4}$ tsp. soda
1 c. sour milk	2 tsp. ginger
$2\frac{1}{2}$ c. flour	$\frac{1}{2}$ tsp. salt

$\frac{1}{4}$ c. melted butter

5. What is the leavening in sponge cake? Why does it need a cooler oven than ordinary cake?

XLVIII

MUFFINS

A. Prepare Muffins.

Use one-fourth of one of the following proportions:

	Liquid (Milk)	Flour	Egg	Fat (Butter)	Sugar	Salt	Baking Powder
1.	1 c.	2 c.	1	1	1 tbsp.	$\frac{1}{2}$ tsp.	?
2.	1 c.	2 c.	1	2	1 tbsp.	$\frac{1}{2}$ tsp.	?
3.	1 c.	2 c.	1	2	2 tbsp.	$\frac{1}{2}$ tsp.	?

What is the effect of fat as shown in (1) and (2)? Of sugar as shown by (2) and (3)?

B. **Class Experiment.** WEIGHT OF FLOURS.

Weigh a cup of each of the following:

1. Bread flour sifted once.
2. Whole wheat or graham flour. (Sift, but replace the bran.)
3. Corn meal.
4. Rye flour.

C. PREPARE MUFFINS. Follow the proportion given in (*A* 2), but use only one-half of the amount of flour. Use a weight of one of the other flours equal to the weight of the omitted flour.

KINDS OF FLOUR

More than one kind of flour is manufactured from wheat. The preparation of bread flour has already been described, and it will be remembered that in its manufacture all of the bran coatings are removed. When none of these outside layers is removed, but all are ground up together, true graham flour is produced. This flour was named after an American minister, Dr. Sylvester Graham, who invented the process. He advocated this, because of the supposed wastefulness of throwing away so much nutriment as chemical analysis showed remained in the discarded bran. Later, it was discovered that this nutriment, largely protein, was most abundant in the aleurone or inner layer of the bran. Therefore, it was argued, the outer coats could be discarded and only the inner layer ground with the kernel, producing a flour which would be less coarse, but would preserve the whole nutriment of the wheat. Accordingly, this received the somewhat misleading name of whole wheat flour, a name which would really much more accurately describe graham flour. For a while after this flour was put on the market, much was to be heard about the superior nutritive value of whole wheat bread, compared with bread made from white flour. Later work has shown that the cells containing the protein in the aleurone layer are so tough that few of them are broken in the grinding, and so the protein present is not digested easily. Moreover, the whole mass passes so much more rapidly through the digestive tract that experiment shows that rather less nutriment is actually absorbed from bread made from the coarser varieties of flour. These breads may have their place in the diet, however, because they contain more salts, and it is probably due to these that they possess their laxative effect.

Rye is the only flour besides wheat flour which contains sufficient gluten to make risen bread, and rye bread is much more moist and dense than white bread. Nearly all recipes, even for graham and whole wheat breads, call for the addition of some bread flour. In making corn-meal muffins, for example, from one-third to two-thirds of the flour as given in an ordinary recipe for muffins may be substituted with an equal weight of corn meal. The more flour used in proportion to the corn meal, the lighter the muffins, but, of course, there is also less and less flavor of corn meal.

Corn meal is made from different varieties of corn giving a white or a yellow meal. Southerners generally use white corn meal, and northerners yellow, each claiming a superiority for their product. There is an undoubted difference in flavor, but which is better is a matter of taste each individual must settle for himself.

Questions

1. Describe the wheat kernel.
2. How many pounds are there in a barrel of flour?

3. What does flour cost per pound? Per barrel?

4. Is there any advantage in buying a barrel of flour instead of a quarter-barrel sack?

5. What care should be taken in storing flour?

6. How does the nutritive value of a pound of flour compare with that of a pound of cornstarch? Of corn meal? Of beef (the round)? Compare the cost of a hundred-calorie portion of each, as well as the cost per pound.

7. How many muffins of average size can you make from two cups of flour?

XLIX

CAKE

A. Make a Plain Cake.

Use one-eighth of the following proportions:

Liquid (Milk or water)	Flour (Pastry)	Fat (Butter)	Sugar	Eggs	Baking Powder
1 c.	3 c.	½ c.	1½ c.	4	3 tsp.

Add a few grains of salt and a few drops of flavoring.

Half the class mix as in (1), the other half as in (2). Compare the appearance of batters before baking and of cakes after baking. Which method of mixing takes less time? Bake cake at 385° F, in greased pans only two-thirds full, until it shrinks away from the sides of the pan and springs back into place when gently pressed on top with the finger.

1. Cream the butter, adding the sugar gradually, until the two are as well mixed as possible. Add the beaten yolks of eggs, and then alternately liquid and

flour sifted with the baking powder. Finally, fold in the stiffly beaten whites.

2. Put the sugar in a bowl and pour in the liquid. Stir and let stand, while you separate and beat the eggs. Add the beaten yolks and the butter melted. Gradually stir in the flour sifted with the baking powder and finally fold in the stiffly beaten whites as before.

B. Frosting.

Frost cake with uncooked frosting, I or II, using one-fourth the amounts.

I	II
Without egg	With egg
1 c. powdered sugar	1 c. powdered sugar
2 tbsp. liquid { water, milk, cream, orange juice, etc.	1 egg white
	1 tsp. flavoring
1 tbsp. lemon juice	Beat with a spoon till mixture begins to thicken.

C. **Class Experiment.**

Bread Flour and Pastry Flour.

1. Compare bread flour and pastry flour:
   a. Color.
   b. Feeling.
   c. Packing in hand when pressed.
2. Weigh a cup of pastry flour (sifted once). Compare with the weight of a cup of bread flour determined in the last lesson. How much bread flour is equal in weight to a cup of pastry flour?
3. Fill a cup with pastry flour. Sift and remeasure. Continue sifting as long as there is any increase in volume. How many times is it worth while to sift flour for cake?

4. Wash out the gluten from equal weights of the two flours and compare the amounts obtained. (Add water gradually to make a dough ball which can be handled. Knead in the palm of the hand under running water or in a bowl, until all of the starch has been removed. How can this be tested? Bake a small portion in a hot oven as for pop-overs.)

Cake-Making

At first glance there seems to be an almost endless variety of recipes for cake. Even omitting flavorings as variations, there are still plain cakes, and rich cakes, differing in the amount of egg, sugar, and butter used, until one almost concludes that any proportions will do. But on further analysis certain fundamental facts can be distinguished.

Take, first, the proportion of liquid to flour. Whether the butter is melted in mixing or not, it melts in the oven and then counts as liquid. The fat, then, as well as the liquid, must be counted. If a richer cake is desired than the one made in the laboratory, the amount of butter can be increased if the amount of liquid is correspondingly decreased. For example, good cake can be made with three-quarters of a cup of butter and three-quarters of a cup of liquid, or with a cup of butter and a half of a cup of liquid. In any of these cases the sum of the two is still one and a half cups. In "pound cake" the whole amount is butter, and no liquid proper is used. Eggs, on the other hand, while they increase the liquid before baking, do not count as liquid after heat is applied. The sponge cake recipe would call for eighteen eggs to three cups of flour, with three tablespoons of lemon juice.

Notice the very large number of eggs necessary when so little liquid is used. In pound cake the proportions for three cups of flour would be only seven and a half eggs because of the butter used.

Sugar makes the cake more crumbly as more and more is added, and increases the size and the lightness, but, meanwhile, the crust becomes sticky and tough, and the cake sweeter and sweeter. The amount of sugar in the general recipe may be increased to two cups if one likes a sweeter cake. If chocolate is added, the larger amount of sugar is desirable.

The leavening in a cake of the type that is being discussed, is mainly the gas from the baking powder, and a skilled cakemaker can get good results without beating the egg separately. But in pound and sponge cake where no baking powder is used, great pains in folding in the egg must be taken, and one sees why nearly twice as many eggs for the same amount of flour are used.

If one is making a butter cake the great question is in regard to mixing. The problem seems to resolve itself into the easiest way to get the ingredients blended very thoroughly. Hard butter is difficult to mix, also unbeaten egg. If the butter and sugar are not well creamed, the grain of the cake is coarse. On the other hand, the butter may be melted and successfully combined. Since beating flour with liquid develops the gluten and so makes the cake tougher, this should be avoided as far as possible. For this reason the melted butter is better beaten in before adding the flour, instead of afterwards. Melting the butter saves much time. It is especially convenient in making chocolate cake, for the chocolate can be melted with the butter.

Questions

1. Why is pastry flour desirable in making cake?
2. Account for the rule: If bread flour is used in place of pastry flour take out two tablespoons for each cup of flour called for in the recipe.
3. In making cake what would be the effect of using bread flour mixed with a little cornstarch, say half a cup of cornstarch to two cups of flour?
4. What ingredients are changed in making a muffin mixture into a cake mixture?
5. Change various recipes for cake to a three-cups-of-flour basis, and see how the ingredients called for correspond to the general rule.

L

BAKING–POWDER BISCUITS
GINGERBREAD

A. Prepare Baking-powder Biscuits.

Use one-half of the following recipe:

Flour	Fat	Salt	Baking Powder	Milk
1 c.	1 tbsp.	½ tsp.	Usual proportion for 1 c. flour	?

Add milk (find out how much is needed) to make

(1) a stiff batter to be dropped from a spoon into muffin tins,

or (2) a very soft dough which can be rolled out from one-half to one inch thick and cut into biscuit, or cut into small pieces and patted into shape. The dough should be so soft that it is sticky. Bake in an oven at 425–435° F.

a. Bake one biscuit at once.

b. Bake another after letting it stand from fifteen minutes to a half an hour.

c. Bake a third biscuit in a slow oven.

d. Bake a fourth after kneading the dough or vigorously stirring the batter.

Compare the results and decide what precautions must be taken to make good biscuit.

B. Make Sour-milk Gingerbread.

Use corrected recipe in Question 4, Lesson XLVII.

Baking-powder Biscuits

There are two types of rolled baking-powder biscuits, one small and practically all crust, the other larger, lighter, and with comparatively little crust. To make the first, the biscuits are rolled thinner and baked farther apart than those of the second type which is, perhaps, the more conventional.

The biscuits, which are made so soft as to drop and which need the support of muffin tins to give them shape, are more crusty than the more usual rolled biscuit. They are often called "emergency biscuit", because they can be prepared so quickly.

After the liquid is added, any of these doughs should be worked as little as possible for, if they are, the gluten will be developed too much. This is the reason why the fat is worked in before the liquid. The fat can be cut in easily with two knives, or worked in with a fork, or rubbed in with the fingers. Since it is easier to combine the fat when it is cold, the first methods are to be preferred, especially in warm weather. With as stiff a mixture as this, there is no escape of gas from the dough and the biscuits can stand without harm for a time before they are baked.

In fact, standing for a moderate period is slightly advantageous, because it gives time for some of the gas to be evolved before the dough is baked too much to rise. With a batter such as is used in griddle-cakes, the gas evolved soon escapes, and if the batter is kept over until another meal more baking powder must be added before using.

Baking-powder biscuit dough, or a dough made with slight variations, is used in many ways. It is often used as a crust for meat pies, and sometimes for a deep fruit pie, in both cases there being no lower crust. It may also be used for fruit dumplings. Sometimes baking-powder biscuit dough is rolled out and sprinkled with maple sugar, or with sugar, cinnamon, raisins and currants or citron. The dough is then rolled up and cut off in pieces somewhat less than an inch thick, and baked as biscuit. This dough may have some sugar added in the making. Short-cake is only baking-powder biscuit dough with more fat, usually double the amount, and with some sugar added. Dutch apple cake may be made as a modification of the baking-powder biscuit recipe. To the dough made with one cup of liquid, an egg and two tablespoons of sugar are added. Sour milk or soda biscuit are made in exactly the same way as baking-powder biscuit, except that sour milk and soda replace the sweet milk and baking powder.

Questions

1. Write a recipe for soda biscuit.
2. Is the habitual use of hot breads to be recommended?
3. What is the advantage of patting baking-powder biscuit into shape, instead of rolling the dough?
4. If too much flour is used in shaping the biscuit, what is the result?
5. What is the difference in the result, if butter instead of lard is used as the fat? If half butter and half lard is used? What other fats may be used?

6. What is the effect on the texture of increasing the fat?

7. What is the effect on the texture of increasing the sugar?

8. How many average-sized biscuits will one cup of flour make? How much flour would you allow for biscuits for breakfast for a family of five?

LI

SUGAR COOKIES

Gingersnaps

A. **Class Experiments.** Yeast.

I. Blend a yeast cake with a cup of water in which a teaspoon of molasses has been mixed. Divide into four portions.

1. Freeze the first and then let it stand at room temperature.
2. Boil the second and let it cool to room temperature.
3. Heat the third to lukewarm.

In turn, fill a test tube with part of each of these three portions and invert in the remaining liquid, taking care not to admit bubbles of air into the tubes. Use cups or tumblers, if no beakers are at hand. While inverting, the test tubes may be covered with the thumb or a piece of stiff paper. Keep at room temperature, and note result after an hour or two.

4. Chill the fourth portion, fill a test tube with the mixture and invert as above, and place in an ice-box, or out of doors if it is cold weather. Compare the result with the others after the same length of time.

II. Examine under a microscope yeast from an actively fermenting liquid, and make a drawing of a "plant."

III. Observe the action of yeast with the following food materials and account for the results. Use $\frac{1}{8}$ yeast cake and $\frac{1}{4}$ c. liquid in each case. Invert in test tubes as before.

1. Water.
2. Water with $\frac{1}{2}$ tsp. flour.
3. Milk.
4. Water in which potatoes have been cooked.
5. Water and $\frac{1}{2}$ tsp. of starch.
6. Water and $\frac{1}{2}$ tsp. of sugar.

B. MAKE SUGAR COOKIES OR GINGERSNAPS.

SUGAR COOKIES.

2 tbsp. fat	$\frac{1}{2}$ ssp. soda
$\frac{1}{4}$ c. sugar	$\frac{1}{4}$ tsp. baking powder
$1\frac{1}{2}$ tbsp. egg	$\frac{1}{2}$ c. flour and amount necessary to roll
1 tbsp. sour milk	

A few drops of vanilla

GINGERSNAPS.

$\frac{1}{4}$ c. brown sugar	$\frac{1}{4}$ tbsp. cinnamon
$\frac{1}{4}$ c. molasses	1 tbsp. lemon juice
3 tbsp. fat	A little grated lemon rind
$\frac{1}{2}$ tbsp. ginger	1 c. flour

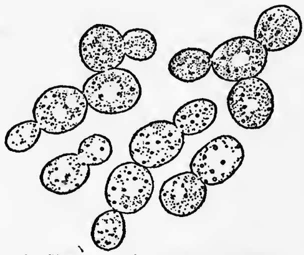
$\frac{1}{8}$ tsp. soda

Roll as thin as possible.

YEAST

The compressed and dried yeast cakes sold in stores are usually made from yeast obtained from distilleries. Here the yeast is grown by sowing it in "wort", as it is called, a mixture of crushed grain or mashed potatoes, warm water, and sprouted barley. Under these conditions the yeast plants multiply rapidly. The yeast which collects as a scum on top of the wort is preferred for bread yeast, although the yeast which settles out at the bottom is sometimes used. The yeast is freed from impurities as far as possible, pressed to remove the water, and then cut into cakes which are wrapped in tin foil. Starch may be mixed with the yeast before the pressing process takes place. A small percentage of starch helps to keep the yeast, especially in warm weather, as well as making it easier to mix with the flour in bread-making. As the amount of starch used varied from five to fifty per cent, the government recently has ruled that if starch is used in compressed yeast cakes, its presence must be stated on the label.

Compressed yeast cakes must be fresh to be in good condition, and this can be told readily on examination. The cakes should be creamy white, not dark; uniform in color, not streaked; a firm, even texture, not slimy; and there should be no disagreeable odor.



From Conn's "Bacteria, Yeasts, and Molds in the Home."

1. Yeast from a Dried Yeast Cake.

2. The Same Yeast after a few Hours' Growth.

Compressed yeast in good condition can usually be purchased in places of any size. In remote districts, however, it cannot always be obtained while it is sufficiently fresh for use. Such communities may use dried yeast cakes which are made from the same yeast as the compressed yeast cakes. After the yeast is mixed with starch or meal, it is partly dried, either in the sun or at a low temperature under pressure. Under these conditions some of the yeast cells die, while others pass into a resting stage. Thus the dried yeast is not so active as compressed yeast and it takes longer to start fermentation. Time must be allowed for dried yeast to become actively growing and multiplying.

Some housekeepers "make yeast" at home by using commercial yeast to start the growth. This is usually accomplished by adding a little dried yeast, or yeast from a previous growth, to potatoes which have been grated, mixed with water, and boiled and cooled. A small amount of sugar is also added.

Brewers sell yeast in a liquid form, but usually to bakeries rather than for use in private families, for such yeast must be used at once and is more trouble to transport than are yeast cakes.

There are many different varieties of yeast, and the one sold for bread-making has really been selected as best for making fermented liquors, rather than because it is known to be the best for bread-making. Wild yeasts are sometimes used in making the so-called salt-rising bread. Here, milk is mixed with a little flour and salt and set aside to ferment. The action is apparently not always due to the same cause. Sometimes wild yeasts are present, and at other times the action is entirely due to bacteria. Bread made in this way is much less uniform than that made with cultivated yeast.

It is interesting to know that although fermentation has been recognized and practised from very early times, nothing definite was known about the cause until Pasteur worked out the problem in the middle of the nineteenth century. The account of how he went to work to prove that yeast-cells really produced the changes and that they did not originate spontaneously, as was believed previously, is a fascinating story of scientific research.[1]

[1] "Life of Louis Pasteur," by Radot.

Reference

Conn. "Bacteria, Yeasts and Molds in the Home," section on Yeasts.

Questions

1. Compare the recipe for sugar cookies with the muffin recipe. What is the effect of the increase of fat and the addition of sugar? Why can cookies be rolled out without danger of toughening them?
2. Compare the recipe given for sugar cookies with one containing more fat, as, for example, Miss Farmer's recipe for rich cookies. What difference will you expect in the two kinds of cookies? Calculate the difference in cost.
3. Show what different flavors could be added to your recipes to make different varieties of cookies. Tell in each case how and when the new ingredient would be added.
4. What fats could be used in making sugar cookies? gingersnaps?

LII

BREAD-MAKING

A. Make Bread.

½ tsp. fat (lard)
½ tsp. sugar
¼ tsp. salt
¼ c. boiling liquid (water, or milk and water)

Pour the liquid over the other ingredients. Let them stand until lukewarm (98°). Add ¼ to ½ [1] yeast cake softened in ½ tbsp. lukewarm water. Sift in gradually ¾ c. flour, or as much as is needed to make a dough as soft as can be handled. Knead thoroughly but lightly, until

[1] This large amount of yeast is added to enable the process of bread-making to be carried through in a very short time. For ordinary home use the proportions would be one yeast cake to a pint of liquid. The bread in this lesson can be mixed and baked in two hours.

it is elastic and does not stick to the hands. Place over lukewarm water in the top of a double boiler which may be greased. Cover tightly. (Why?) The top of the dough may be brushed lightly with fat. (Why?) Maintain the lukewarm temperature until the dough has doubled in bulk.

Knead again until the bubbles have been evenly distributed, adding no more flour than is necessary to keep the dough from sticking. Shape into a loaf, first cutting off sufficient dough to make two biscuits.

Place the loaf in a greased tin, cover, and let rise until the loaf has doubled in size. Place in an oven at 450° F. for ten minutes, and finish baking at 365° to 385° F.

Knead a little extra fat into the biscuit dough, shape, and let rise as in the case of the loaf. The best temperature for baking rolls is 435° F.

B. **Class Work.** KNEADING.

One student should make a larger quantity of dough, and each student in turn should be taught the correct process of kneading with the larger amount.

BREAD-MIXING

The term "breads" or "breadstuffs" includes unleavened bread, as well as bread which is raised with yeast or with gas from soda. The term "bread" is usually confined to bread made with yeast, and it is so used here.

The essentials in bread-making are flour, liquid, salt, and yeast. Fat is usually added, and other ingredients may be.

Bread is made in two ways, and is known as short- and long-process bread. The method of making short-process bread is the more modern. This method became possible only with the availability of fresh yeast, such as is found in compressed yeast cakes. In short-process bread-making, the yeast is stirred with lukewarm water and mixed with sufficient flour and warm water to obtain a dough of the desired consistency. The combination may be made by stirring the water into the flour, or vice-versa. If fat is to be used, it is melted by pouring hot water over it and then allowed to cool to the proper temperature. The yeast is stirred with water to separate it, so that it can be mixed more readily with the other ingredients. The water should be warm, about 90° F., in order to hasten the growth of the yeast. This is desirable, because less time is given for the development of bacteria which may cause the dough to become sour. In order to maintain the suitable temperature after mixing, the dough is covered to prevent its cooling and also drying. The flour furnishes both protein and starch as food for the yeast plants. Pure yeast cannot act directly on starch.

Flour contains diastase, an enzyme not unlike the ptyalin found in saliva, which is capable of changing the starch into sugar. As soon as sugar is produced, the yeast begins to act upon it by means of the ferments which it contains. These break up the sugar present into carbon dioxide and alcohol. The carbon dioxide is a gas which cannot escape easily through the dough, since the gluten present holds it, much as the soap in soapsuds holds air when one blows into it.

Gluten in flour is developed by kneading, since this mixes water with the glutenin and gliadin, two proteins found in flour. Many people have an idea that bread must be kneaded with great force, but this is a mistake. The more lightly the dough is handled, the better the texture of the bread. As little flour as possible should be used, but, of course, enough must be added to enable the dough to be handled without sticking to the board or the fingers. Experience makes it possible to handle a very soft dough, and this is probably one of the ways in which skill counts in bread-making.

As the yeast grows and produces carbon dioxide, the dough is stretched by the gas until it is full of bubbles, and "rises." The action is allowed to go on, until the dough has doubled in bulk. At this stage, it could be baked, but it would give a bread of very uneven texture, for, with all the care in mixing, the bubbles of gas are unevenly distributed and some are very large. So, instead of being baked, the dough is kneaded again, this time to break up the larger bubbles and to distribute the gas as evenly as possible. Then the dough is shaped into loaves. It is again set in a warm place for the yeast to produce more gas, since some was lost in the kneading process. When the dough has doubled in bulk, it is ready for baking.

Fat is commonly added because the bread is "shorter", as it is called, that is, less tough. Sugar is sometimes added to hasten the starting of the yeast, as well as to make the bread more tender. Potatoes and potato water also seem to stimulate the yeast to quicker action, and to make the bread less dry after it is baked. Milk may be used as the liquid in place of part or of all of the water. It adds some fat as well as a little more food value to the bread and changes its flavor somewhat. If milk be used, it is first scalded to kill some of the bacteria present. There is always danger of the dough souring, because the yeast itself is not free from bacteria, and some kinds of bacteria act on the alcohol and produce acids which make the bread sour. In a short-process bread, there is less danger of sour dough, because the yeast usually acts too quickly to give the bacteria time to multiply sufficiently to produce enough acid to sour the dough.

The liquid must not be mixed with the yeast while it is too hot, or the yeast will be killed. Yeast plants cannot stand a temperature of 130° F.

The length of time necessary to make bread by the short process depends upon the amount of yeast used. If the first rising is to be overnight, usually from one-fourth to one-half of a yeast cake is used for each quart of liquid. To shorten the time of rising, the amount of yeast can be increased almost indefinitely. Even as many as five or six cakes of yeast can be used and, if they are perfectly fresh, they will not give a disagreeable flavor to the bread. But since they increase the cost of the bread unduly, usually not more than a cake to a quart of liquid is used.

Since neither yeast nor bacteria grow well in the cold, it is possible to check the rising of the dough by placing it in an ice-chest or some other cold place. This is sometimes done in order to keep the dough so that hot biscuits may be served at a special time.

Long-process bread is made by setting a sponge. This means that in the first mixing only about half the flour is used. The sponge, as it is called, is really a batter. This is allowed to stand until it is very light and foamy. Then the rest of the flour is mixed with it and the dough is then treated as if this were the first mixing in short-process bread. The advantage of this way of making bread is that dry yeast can be used, for the rising of the sponge gives time for it to become actively-growing yeast. Some cooks set a sponge when using compressed yeast, but there is no necessity for doing so, and as the long process means more work than the short process, the latter method should be preferred.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 389. "Bread and Bread-Making."

Questions

1. What will happen in bread-mixing:

   (*a*) if the weather is too warm?
   (*b*) if, in very cold water, the flour is not warmed?
   (*c*) if the bread is put to rise in too warm a place?
   (*d*) if the bread is put to rise in too cold a place?
   (*e*) if the bread is insufficiently kneaded before shaping into loaves?
   (*f*) if the bread is kneaded too heavily?
   (*g*) if too much flour is used?

2. What may happen if the liquid is not scalded?
3. When is it advantageous to use a bread mixer?
4. Why is a different temperature required in baking bread and rolls?

LIII

BREAD

Rolls

Graham and Oatmeal Bread

A. **Class Work.** Parker House Rolls.

Make Parker House rolls by the long process method of making bread.

Use:

2 c. scalded milk	$1\frac{1}{2}$ tsp. salt
3 tbsp. butter	1 yeast cake
2 tbsp. sugar	3 c. flour to make sponge

About 3 c. flour to make dough

When ready to form rolls, divide the dough into small pieces and shape into Parker House rolls, tea biscuits, finger rolls, cinnamon rolls, and the like. See cook books for directions.

B. MAKE GRAHAM OR OATMEAL BREAD.

Follow the short process of making bread.

GRAHAM BREAD.

1 c. liquid { ½ c. milk / ½ c. water (3 tbsp. may be potato water)
1 yeast cake (?)[1]
1¼ c. white flour
1¾ c. graham flour
1 tsp. salt
2 tbsp. brown sugar, or ¼ c. molasses

OATMEAL BREAD.

Pour two cups of boiling water over one cup of rolled oats.

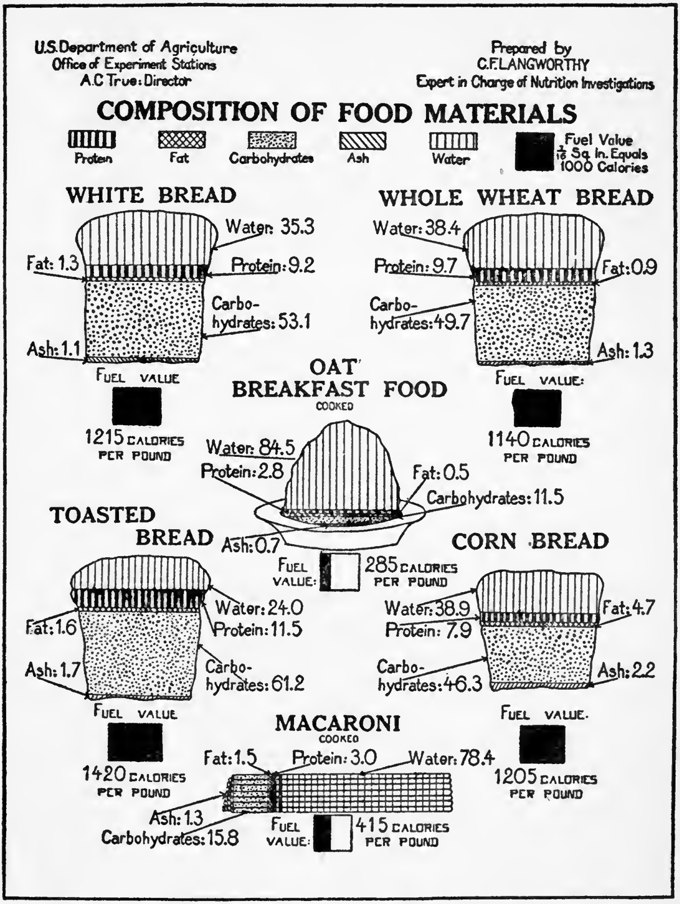
Add 4 tbsp. brown sugar, or ½ c. molasses
2 tbsp. fat
1 tsp. salt
1 yeast cake (?) [1]
Flour to make a stiff dough, about 4½ c.

BREAD

When bread has risen sufficiently, it is placed in a hot oven at about 450° F. Baking the dough accomplishes a number of things. It kills the yeast plants so that fermentation stops; it also kills any bacteria which may be present; it expands the carbon dioxide gas so that the loaf is larger after than before baking; it vaporizes the alcohol and drives it off; it hardens the gluten so that the bread, once risen, will keep its shape and will not fall when it cools; and, finally, it causes the starch on the inside of the loaf to take up water and become hydrated, while it dextrinizes some of the starch in the crust.

As these are all essential processes, it is important to be sure that the bread is so thoroughly baked as to effect

[1] Amount depends on time to be given to rising.



COMPOSITION OF BREAD AND OTHER CEREAL PRODUCTS all these results. In bread which is insufficiently baked all the organisms which are present may not be killed, and it may grow sour as it is kept. Bread is sufficiently baked when tapping the top and bottom of the loaf produces hollow sounds. Since long baking is so desirable, many people lower the heat after the bread is well baked, and leave the loaves in the oven for a long time.

Bread-making is, perhaps, one of the most common subjects for cooking contests because, if one is to count on always turning out excellent results, considerable skill is required, as well as knowledge of the reasons for all the steps. The requirements for a perfect loaf are shown by the score cards used in judging such contests. The following is the one given in the U. S. Experiment Station Bulletin No. 225.

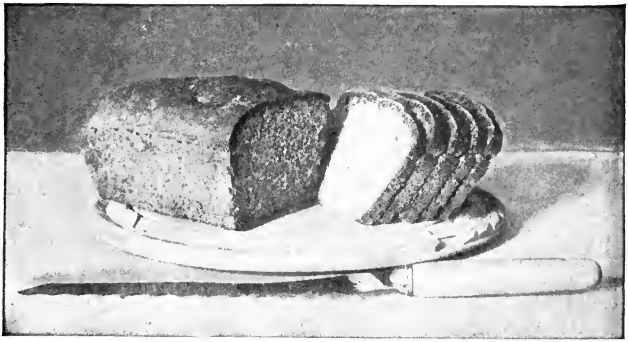
Score Card for Judging Bread

Thoroughness of baking	20
Color (1) Shade, golden brown	6
(2) Evenness	6
Shape of loaves, oblong, 1 to 2 lbs.	8
Sweetness, no sourness after thorough mastication	25
Flavor, slightly milky	15
Quality of crumb, moist but not wet	8
Evenness of crumb	3
Firmness of crumb	4
Color of crumb, cream rather than pearl white	5
Total	100

To obtain the best results in baking, the loaves should be single and about 4 inches $\times$ $4\frac{1}{2}$ inches $\times$ 9 inches in size.

Freshly baked bread is indigestible, because of the difficulty of mastication. Such bread tends to roll up into a pasty mass instead of breaking up as a cracker does when it is chewed.

Bread and Rolls made with one Yeast Cake



Graham Bread made without Kneading

Loaf of Bread and Parker House Rolls

From "Cooking for Two," by Janet McKenzie Hill.

Bakers' bread is usually much lighter than home-made bread, a slice of given dimensions weighing about half as much as a slice of home-made bread of the same size. It is, of course, slice for slice, just about half as nutritious, and we usually eat more of the bakers' bread to satisfy our appetites. This does not condemn bakers' bread as a food, but the fact remains that this must be taken into consideration in comparing the cost of purchased with that of home-made bread. The demand for the ready-made product is becoming so great that usually a fairly well-made bread can be purchased almost anywhere and the average quality is probably better than in the average home-made product, for many housewives make bread much below the standard.

Since yeast leaves no such questionable residues in the bread as baking powder does, the constant use of yeast bread is supposed to be preferable to that of baking-powder breads, but the bad effects of the too continued use of the latter may be partly the result of the habit of eating such breads hot instead of cold.

Questions

1. When would you prefer to make a long-process bread?
2. Why should bread not be put away while it is still warm?
3. Why is bread stored in a bread-box?
4. Why should cake and bread be kept in separate boxes?
5. Compare the weight and the price of home-made and bakers' loaves of bread.
6. Compare the cost per loaf, if short-process bread is set over night, or is made in two hours.
7. Compare the cost of making bread with compressed yeast set over night, and with dried yeast used in long-process bread.
8. What is "potato yeast"? How is it made and used?
9. How would you make whole wheat bread? rye bread?
10. Why is some white flour used in making such breads as graham, rye, and oatmeal?

LIV

PIES

A. **Class Experiments.**

Correct Proportions of Fat and Liquid to Flour.

I. (*a*) Mix a teaspoon of lard and three teaspoons of flour into a small cake and bake.

(*b*) Repeat, using butter instead of lard.

(*c*) To explain the difference in the results, melt, over hot water, 1 oz. butter and 1 oz. lard. Let stand, and notice any differences. How would you substitute one for the other?

II. (*a*) Repeat I (*a*), but add to each a carefully measured amount of water, the least possible necessary to make the mixture hold together. How much is used?

(*b*) Repeat, using twice as much water.

(*c*) Repeat, using three times as much water.

III. Repeat II (*a*), but use very hard fat and ice water, cutting them into the flour with a knife. Why? Write a recipe with directions for making pie crust.

B. Prepare Pie Crust.

Use either:

1. All butter.
2. All lard.
3. Half lard and half butter.
4. All Crisco.

What proportion of fat will you use in each case? How will the amount of salt vary with the amount of fat used? Roll out crust.

1. Cover the bottom of a small inverted pie-plate with a very thin crust. Prick with a fork. Bake in a hot oven for a few minutes. Slip the crust into the inside of the plate and finish baking.
2. Cover the inside of the plate with crust. Do not prick. Bake as before. Compare with (1) for use as a shell for pie. Explain the behavior of (2).
3. Bake a piece of the crust trimmings in a very slow oven. Decide upon the best temperature for baking pastry shells.

C. PREPARE AN APPLE PIE.

PASTRY

Pastry flour differs from bread flour in having a smaller amount of gluten and a larger amount of starch. The advantage in using it for pastry and for cake is that so made they are more tender than when made with the larger amount of gluten. It is quite possible, however, to make both good pastry and good cake with ordinary bread flour. If bread flour be used, greater care should be taken not to develop the gluten by too much working. This is just the opposite of what we try to do in making bread.

Pastry flour is made in two ways. It is sometimes made by grinding the "softer" winter wheat; sometimes by selecting the flour stream from the grinding of "hard" or spring wheat, which will furnish the largest percentage of starch. The housekeeper may get much the same effect by adding cornstarch to bread flour, using three parts of flour to one part of cornstarch. The flour sold as pastry flour is often unsatisfactory, being in reality only a poorer grade of flour and one not adapted especially to pie- and cake-making. Pastry flour is distinguished from bread flour by its whiter color, its smoother and less gritty quality, and by its retaining better the print of the fingers, if squeezed in the hand.

Since no leavening agent is ordinarily used in pie crust, careful handling is necessary to entangle air in the dough so that the heat of the oven shall expand it and produce a light crust. This is accomplished by the many foldings of the dough after it is first rolled out. This folding makes many horizontal layers which in a light, baked crust are separated somewhat from each other. The large amount of fat undoubtedly helps in the power of these layers to retain gas which may be partly the air, as already mentioned, as well as vapor from the water in the dough. Moisture undoubtedly plays a larger part in leavening pastry than it does in bread, because here the thin layer of crust is heated more quickly to a much higher temperature than that of the inside of a loaf of bread.

Fat in pie crust makes it short and flaky. Different fats are used, butter, oleomargarine, lard, Crisco, cottolene, and the like. Butter usually gives the best flavor, but it is the most expensive. Sometimes part butter is used.

Pie crust is not generally considered very digestible, due to a number of reasons. The lower crust, if wet and soggy and underdone, forms a soft mass which is rarely properly mixed with saliva in chewing. Well-baked pie crust which is flaky and crisp undoubtedly breaks up better and so is more digestible. Overheated fat is not easily digested and, for some people, this may be a source of difficulty. Then, so little liquid is used with the flour that, often, part of the starch is not hydrated at all, so that even after baking, it is not really changed from raw starch. It is easy to see that the really light and flaky crust is the most desirable from the standpoint of digestibility, as well as from that of taste.

Questions

1. What effect does water have on flour?
2. What effect has fat?
3. How are crusts of a two-crust pie held together?
4. Is there a difference in the oven temperature for pies filled with cooked and uncooked mixtures? Why?
5. Compare butter, Crisco, and lard as shortening in pastry.
6. What effect has temperature during mixing and before baking on the resulting pie crust? Why is this?
7. Why is pie crust difficult to digest?
8. Why is it necessary to perforate crust for single-crust pie?
9. Is it necessary to butter a pie-tin?
10. Can unbaked pastry be kept over from one day to the next? How?

LV

DOUGHNUTS

A. **Class Experiments.** Fats.

1. Examine the following fats: butter, oleomargarine, lard, cottonseed oil, olive oil, beef fat, Crisco, and snowdrift. Note the differences in color and odor.
2. Find the temperatures at which butter, lard, and Crisco melt. Place two tablespoons of each fat in small beakers, stand in warm water, insert a thermometer, and note the temperature at which the fat melts.
3. Put drops of olive oil and oil of peppermint on a piece of paper and warm them. How do they differ?
4. To determine the "cracking" or "burning point" of fats:

a. Test butter with blue litmus paper; then place about two teaspoons of butter in a small evaporating dish and heat until the first appearance of smoke. Determine the temperature of the fat. Hold a piece of moist litmus paper in the fumes.

b. Repeat with lard, olive oil, and Crisco. In which fats would it be best to fry?

5. Heat fat, lard, or Crisco to 355° F., and then determine in how many seconds a small piece of bread will brown in the fat. Repeat with the fat at 365° F., and at 385° F. What is the effect on the bread at the low temperature? Of the last two temperatures, which would be better for frying uncooked material like fritters? Material already cooked, such as croquettes?

B. Make Doughnuts.

Use one-eighth of the following recipe:

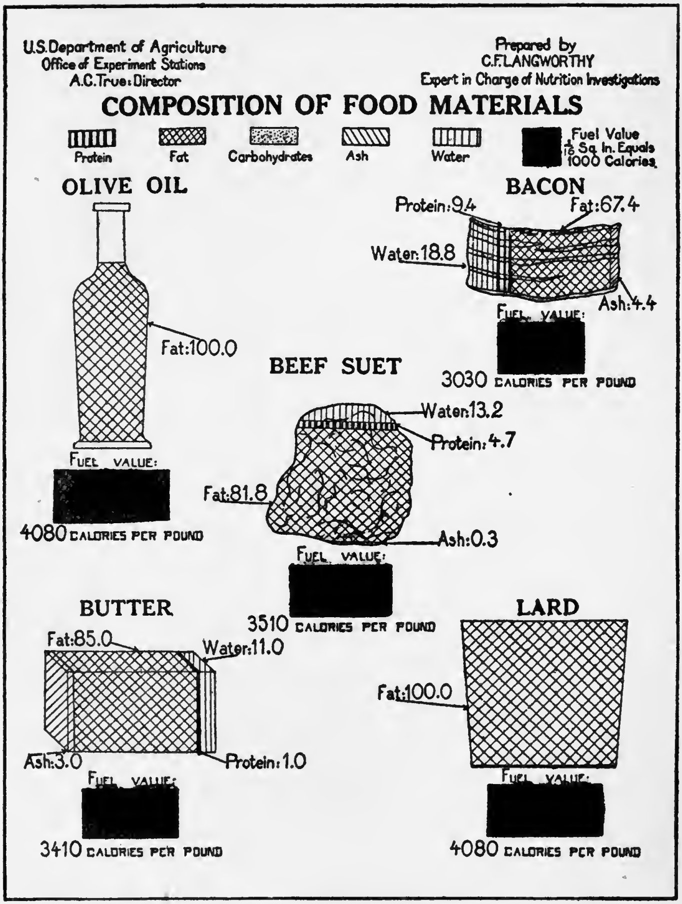
1 c. milk	2 tsp. salt
2 tbsp. butter	4 eggs
1 c. sugar	4 c. flour
4 tsp. baking powder	1 tsp. cinnamon
¼ tsp. nutmeg	

C. Clarify the Fat Used.

Heat the fat slowly with a few slices of raw potatoes; then strain through cheesecloth placed in a strainer.

Fats

Fat, a term which is used to include edible oils as well, is, like carbohydrate, a source of energy in the body. Weight for weight, fats furnish the body with two and a quarter times as much energy as do the carbohydrates.



COMPOSITION OF FOODS CONTAINING MUCH FAT

But not all substances which are ordinarily spoken of as fats are really pure fat. Olive oil and lard are practically pure fat, but butter contains only eighty-four per cent of it, the rest being mostly water, curd, and mineral matter.

Fats are usually divided into two classes, — volatile and non-volatile fats. These terms are somewhat misleading, as the volatility does not refer to the fats themselves, but to the fatty acids which enter into their composition. Most fats are chemical compounds of glycerine and fatty acids. Those that are made from volatile fatty acids have low melting points and are more digestible than most of the fats of the other class. They are found in milk fat, hence also in cream and butter.

The non-volatile fats of food are chiefly three: olein, palmitin, and stearin. The first of these has so low a melting point that it is an oil at ordinary temperatures. Olive and cottonseed oils are largely composed of olein. Stearin has the highest melting point of the three, and so fats like suet, which is largely stearin, are fairly firm. The melting point of palmitin is between that of the other two. Most of the fat of foods is a mixture of these non-volatile fats. The melting point of some of them is shown in the following table:

Stearin	140° F.	Lard	86–102°
Mutton fat . . .	116.5–123°	Butter	83–95°
Palmitin	113°	Olein	Fluid
Beef fat	107.5–122°	Olive oil	Fluid
Bacon fat	103°	Cottonseed oil . . .	Fluid

Fats which have a melting point of 110° or below, seem to be digested about equally well. However, the eating of fat causes the food to remain longer in the stomach and so retards the processes of digestion. In some cases this may cause digestive disturbances by allowing more time for the decomposition of food in the digestive tract through the action of bacteria, but fat itself is not liable to objectionable decomposition during digestion. Fat which has been heated to too high a temperature is much more liable to cause digestive difficulties, because, apparently, of the presence of irritating decomposition products. Hence it is necessary in selecting a fat for frying to consider the temperatures at which this decomposition takes place. The following is a table of "cracking points", as the decomposition temperatures are often called:

Crisco	896° F.	Lard	419–475°
Olive oil	608–680°	Butter	365–428°
Cottolene	450°		

Fats vary greatly in cost, olive oil being expensive. Advantage should be taken of the lower price asked for it in quantity. (Buying oil in a small bottle is very extravagant.) Italian oil in bulk is usually cheaper than French oil. Good American oil is manufactured in California.

Butter and cream are also expensive sources of fat, but they are very desirable for children and invalids on account of their ease of digestion. Bacon fat ranks with butter and cream both in digestibility and expense. Fat left from the frying of bacon should be carefully saved for sautéing, as should that tried out from the fat of beef, veal, pork, and chicken. Even the fat which hardens on soup stock can be used. Gravies, sauces, cream soups, and gingerbread may all be made with such fat, and vegetables and meat may be sautéd in them. Mutton fat[1] has so strong a flavor that it is usually objected to on this account.

[1] For ways of utilizing this fat, see U. S. Dept. of Agriculture, Bulletin No. 310, page 11.

Yolks of eggs are one-third fat and furnish fat in a very digestible form.

References

U. S. Dept. of Agriculture. Bulletin No. 310. "Digestibility of Some Animal Fats."

Questions

1. How are these fats obtained: butter, lard, cottonseed oil, olive oil, beef fat, lard, Crisco?
2. What does each cost per pound? Are fats sufficiently expensive foods to make it worth while to consider economy in their use?
3. Suggest good opportunities for the substitution of a cheaper fat for a more expensive one. For example, would it be better to use lard in gingersnaps or sugar cookies?
4. Discuss the digestibility of fats.
5. What care must be taken in frying food to make it as digestible as possible?
6. Why is fat-soaked food indigestible?
7. What is the difference between sautéing and frying?
8. Why does the cooking of slices of raw potato in fat clarify it?
9. Why is deep-fat frying dangerous, especially over an open flame?
10. Why should fried foods be drained on unglazed paper?
11. Why should foods to be fried be as dry as possible?
12. How is soap manufactured?

LVI

MILK FATS

Butter

Whipped Cream

Philadelphia Ice Cream

A. **Class Experiments.** Cream and Butter.

1. Examine a drop of cream under the microscope. Note the globules of fat. Compare with drops

of whole and of skimmed milk examined in the same way.

2. Chill a portion of cream and whip[1] until stiff. Reserve and finish as whipped-cream pudding.
3. Warm another portion and whip as above. Explain the difference in the result.
4. To make butter.

   Shake a weighed and measured amount of ripened cream in a preserve jar, until the fat separates. Add ice. Collect the lumps into a mass and plunge them into ice water and work out all the buttermilk. Weigh. Add salt in the proportion of one-half ounce to every pound of butter. Compute the cost of this butter and compare it with the market price.

B. Prepare Whipped-cream Pudding.

Beat into whipped cream, crumbs rolled from dried macaroons, or from gingersnaps, or dried cake, or stir in dates or figs cut into small pieces. Sweeten and flavor as desired. Candied cherries may be used as decorations.

C. Prepare Philadelphia Ice Cream.

Add flavoring and sweetening to cream and freeze, stirring. Use $\frac{1}{3}$ c. cream; add 2 tsp. sugar and $\frac{1}{3}$ tsp. vanilla; or 2 tsp. sugar and 2 tsps. ground macaroons; or melt 1 tsp. grated chocolate, add 1 tbsp. sugar and gradually stir in the cream; or add fresh or canned fruits and sweeten to taste.

Butter

It is curious to think that butter, now considered such an indispensable article of diet, was not used at all in

[1] The efficiency of different cream whippers may be tried out. Some will whip the cream from the top of an ordinary milk bottle.

ancient times. Even the butter used in the Middle Ages is said to have been semi-liquid and a very inferior article. In modern times butter-making has been a household industry until very recently. The first creamery in the United States was built about 1861. Now such establishments are common, and are often owned by associations of farmers. Sometimes the milk itself is sent to the creamery, in other cases only the cream. The milk or cream, as the case may be, is usually tested and paid for on the basis of the fat content. More and more, cream is being pasteurized before ripening. This kills any disease-producing germs, as well as most of the others, and gives a more uniform product and one which keeps well. The ripening is accomplished by the addition of skimmed milk which is in a state of active fermentation. The mixture is kept at about 70° F., then it is colored and churned. It is interesting to note, so accustomed are we to colored butter, that while the coloring of most foods is forbidden unless so labeled, the coloring of butter is permitted. The washing of the butter after churning is an important part of the process; carelessness means the failure to remove enough of the buttermilk, which gives a streaked butter of poor keeping qualities. Butter made on the farm often fails to be good because of insufficient working. Salting not only gives flavor, but helps in the keeping of the butter, partly by aiding the removal of the buttermilk. The amount of moisture in butter varies, but more than sixteen per cent is usually illegal; the average amount is about twelve per cent.

Butter which is kept too long becomes rancid, that is, of poor flavor and odor. This rancidity may be from two causes, the more common of which is not the decomposition of the fat, but the spoiling of the protein present in the curd. Renovated or process butter is butter which has been reworked after becoming more or less rancid. The butter fat is removed from the rest by melting, and air is blown through to remove any bad odor; then it is mixed with fresh cream or milk, and churned. Some states restrict the sale of this butter, although they permit the sale of poor butter.

Many housewives seem to be ignorant of the fact that poor tasting butter can be renovated fairly well at home by merely working the butter, so as to wash it thoroughly, in a succession of bowls of cold water.

Oleomargarine or butterine has one advantage over butter, although it lacks the fine flavor. It is cheaper. It is made by churning other-than-butter fats with milk, or milk and butter, or milk and cream. Soft beef fat and neutral lard are often used and are sometimes mixed with cottonseed oil, cocoanut fat, or peanut oil. The butter makers have succeeded in having a tax of ten cents a pound placed on colored butterine, which makes the price of the product too high for it to compete with butter. The tax on uncolored oleomargarine is only a quarter of a cent a pound. As many people object to "colorless butter", fats which have a natural yellow color are used to give a colored product and yet avoid the excessive tax. Unfortunately the butterine made with the yellow fats does not seem to keep as well as the other.

Oleomargarine is a perfectly clean, wholesome food and should be more widely used than it is. Many people cannot distinguish the difference in flavor between it and butter, especially for any use except with bread, and the flavor is decidedly to be preferred to that of poor butter. Its use in Europe is much more extensive than in this country.

Buttermilk may contain not more than 0.2 per cent of fat, whereas normal milk contains about four per cent.

This makes it evident that buttermilk is less hearty than whole milk, although there is a common belief that the contrary is true. Such milk is valued not only for its flavor and perhaps for its increased digestibility, but also for the lactic acid bacteria present. Some authorities hold that these bacteria are carried into the small intestine and keep in check the growth of those bacteria which cause putrefaction. Much of the milk sold as buttermilk is really fermented skim milk containing perhaps only 0.1 per cent of fat. The greater digestibility of fermented milk seems to lie in the finely divided condition of the protein.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 384. "Whipped Cream." "Farm Butter Making."
Farmers' Bulletin No. 69. "Pasteurized Cream."
Farmers' Bulletin No. 237. "Care of Cream on the Farm."
Farmers' Bulletin No. 131. "Household Test for the Detection of Oleomargarine and Renovated Butter."

Questions

1. In what form is the fat in milk?
2. Why does fat sold as cream command a higher price than the same sold as butter?
3. What is the difference between creamery and dairy butter? What is "country butter"?
4. What different butters are sold in your stores and how do the prices vary at the present time? Compare with the cost of oleomargarine.
5. What are the variations in price of butter in your stores during the year? What causes the variation?
6. What is the average percentage composition of butter? of cream?
7. What is rancid butter?
8. When butter shows whitish streaks through it, what is the cause?
9. Why does whipped cream usually sour more quickly than ordinary cream?

LVII

CUSTARDS

Custard Ice Cream

A. Prepare Boiled Custard.

Use one-fourth of the following proportions:

	Egg	Milk	Sugar	Flavoring
1.	½	1 c.	1 tbsp.	¼ tsp. vanilla and a few grains of salt
2.	1	1 c.	1 tbsp.	¼ tsp. vanilla and a few grains of salt
3.	2	1 c.	1 tbsp.	¼ tsp. vanilla and a few grains of salt

Beat the egg slightly, add milk and sugar, and cook over hot water, stirring carefully until the custard coats the spoon. Flavor and cool. Compare the various consistencies obtained. Which is best?

B. Prepare Baked Custards.

Use one-fourth of the following proportions, and the amount of egg determined in A.

	Egg	Milk	Sugar	Flavoring
1.	?	1 c.	1 tbsp.	as preferred
2.	?	1 c.	1½ tbsp.	as preferred
3.	?	1 c.	3 tbsp.	as preferred

Use scalded milk, otherwise mix as in *A.* Wet an earthen or china mold and pour in the mixture. Set in a dish of water and bake, until when tested with a knife, the blade comes out clean. What effect has the large amount of sugar on the consistency?

C. Prepare Frozen Custard or French Ice Cream.[1]

I	II
1 c. milk	1 c. thin cream
6 tbsp. sugar	$\frac{1}{2}$ tbsp. vanilla
1 egg	
A pinch of salt	

Make a boiled custard from I; cool, combine with II, and freeze.

Milk

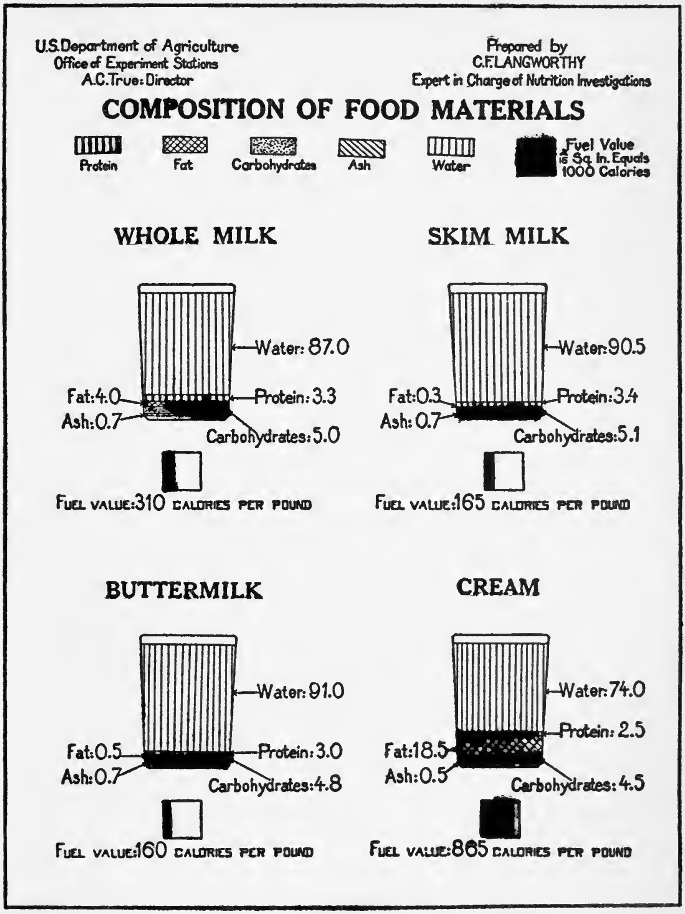
Milk is of great importance as a food, and it is estimated that in the United States the per capita consumption is over half a pint a day. Because it is so universally used and forms so large a part of the diet of children and invalids, most states have set standards to which the milk sold must conform. These standards are not identical in every state, but are more or less similar. The standards often regulate the minimum amount of fat and of total solids (or of total solids, not fat) which the milk must furnish. They are intended to prevent skimming and watering. The average composition of milk is estimated to be:

Composition of Milk

Fat	4.0 per cent.
Protein	3.3 per cent.
Water	87.0 per cent.
Carbohydrate	5.0 per cent.
Ash	0.7 per cent.
Total solids not fat	8.9 per cent.

The fat and protein content of different milks vary much more than do the other constituents. The fat is sometimes

[1] In French ice cream only the yolks of eggs are used. Some flour may be substituted for egg, if preferred.



Composition of Milk

as low as three per cent, but may even be six per cent. The protein varies less, from about three per cent to four per cent. The amounts called for in the various state standards run from two and a half per cent of fat in Rhode Island to three and a half per cent in a number of states; the total solids not far from eight and a half to nine per cent. Occasionally a state requires a greater percentage of fat in summer than in winter. It may readily be seen that these requirements are reasonable and not excessive.

Because milk sours readily, there is a strong temptation to add preservatives. This practice is forbidden by federal law for milk shipped from state to state, and is usually also forbidden by each state for milk sold locally. Such use of preservatives is less common now than formerly as a result of these laws, and is more likely to occur in small towns without milk inspectors than in large cities. Formaldehyde and borax or boric acid are the more common preservatives used, and they are not at all difficult of detection by chemical analysis. Most state food laboratories will analyze, free of charge, milk sent in by the consumer. If the milk being used does not sour so rapidly as would seem natural, it is wise to send it for analysis. The danger from preservatives is not great, but they are liable to interfere with digestion.

A much greater danger from milk lies in the fact that it is so excellent a medium for the growth of bacteria. It must, therefore, be guarded rigidly from contamination. To begin with, it must come from a healthy cow. As a great danger lies in milk from cows which have tuberculosis, it is wise to have the cows tested with tuberculin. Since the milk must be protected from dust and dirt, the adjacent parts of the cow, as well as the udder, should be cleaned before milking. The stable must be clean, well-drained, light, and airy. A special washable over-garment, worn only at the time of milking, should be used by the milker, and his hands should be freshly washed. Machines for milking which give good service are now obtainable. It is of importance that the pails be sterilized and covered or "hooded." As soon as the milk is drawn, it should be removed from the stable to a separate milk-room used only for this purpose. Not only must this room be light and clean, but it should be screened against flies. It should be unnecessary to strain the milk. If this is done, it should be poured through sterilized cloth or cotton. It is important that the milk be cooled as rapidly as possible and kept at a low temperature, since warmth so greatly stimulates the increase of bacteria.

Certified milk is often obtainable. This means milk which is so handled that it can be guaranteed to be of an unusually good quality. It means inspection not only of the milk itself, from time to time, both as to chemical composition and bacterial count, but also supervision of the herd and of the whole process of production. Such milk is of necessity costly, since this inspection must be paid for.

Pasteurized milk is milk which has been heated to a temperature sufficiently high to kill any disease-producing bacteria which may be present. Usually the milk is heated to 140°–145° F. and kept at this temperature for twenty or thirty minutes, then cooled as rapidly as possible. Pasteurization of milk is often required by the health authorities for market milk which does not come from tuberculin-tested cows. The process of pasteurization changes the taste less and brings about fewer changes in the substances present than does sterilization.

References

U. S. Dept. of Agriculture.
Farmers' Bulletin No. 363. "Use of Milk as Food."

Farmers' Bulletin No. 413. "Care of Milk and Its Use in the Home."
Farmers' Bulletin No. 457. "Production of Sanitary Milk."
Farmers' Bulletin No. 227 or 273. "Clean Milk."
Farmers' Bulletin No. 237. "Care of Cream on the Farm."

Questions

1. Can milk be bought in your stores, in "bulk" as well as in bottles? Which will you prefer? Why?
2. What do you have to pay for milk? Does this vary with the season? Is more than one grade of milk sold?
3. What is the standard for milk in your state? in your city?
4. Will your laws allow the sale of skimmed milk? If so, what does it cost? Does its food value justify this price?
5. What precaution will you take in caring for milk in the home?
6. Why will scalding postpone the souring of milk?
7. Describe a process for pasteurization of milk at home.
8. If you are not sure of the sanitary quality of your milk, why will you recommend pasteurization? Why is this especially necessary in milk for babies and little children?
9. For what purpose are eggs used in custards?
10. Why are the eggs beaten only slightly for custards? Why beaten at all?
11. How would the use of flour or cornstarch instead of some of the eggs in custard affect the price? Which of the two would you prefer to substitute and why?

LVIII

ACIDS AND MILK

Cream of Tomato Soup
Lemon Milk Sherbet

A. **Class Experiments.** Acids and Milk.

The possible effect of heat and acids on sweet milk in making cream of tomato soup.

1. Heat a little milk which is sour, but not separated. Note the result.

2. Mix a tablespoon of tomato juice with one of milk, and heat. Note the result.
3. Add tomato juice, drop by drop, to a little milk, stirring, and see how much juice can be added before the milk separates. Then reverse the experiment, adding the milk to the tomato juice.
4. Make a quarter of a cup of medium white sauce, omitting the salt, and add, stirring slowly, a quarter of a cup of hot tomato juice. Season.
5. Compare the flavor of (4) with soups made by adding a saltspoon of soda to the tomato.

Give the reasons for each of the following precautions in the making of cream of tomato soup:

1. Be sure that the milk is perfectly sweet.
2. Thicken either the tomato juice or the milk. Have each hot, and do not heat further after combining; or combine cold, and heat only to the serving point.
3. Omit salt until ready to serve.
4. Pour the tomato into the milk.
5. Avoid letting the soup stand after it is made.
6. If the milk is old, or the tomato juice very acid, or the soup must stand (as in serving a large number of people), use soda.

B. Cream of Tomato Soup.

Prepare a half cup of cream of tomato soup, seasoning by heating onion, or cloves, or bay leaf in the milk. Remove, before serving.

C. Prepare Lemon Milk Sherbet.

Make in large amounts in a freezer, or stir and freeze in a tin cup.

Lemon Milk Sherbet.

4 c. milk — $1\frac{1}{2}$ c. sugar

Juice of three lemons

Combine and freeze. Curdling will not affect the quality after freezing.

Milk (*continued*)

The amount of fat in milk varies with the breed of cow as well as with the feed given. Milk from Jersey cows is high in fat; from Holstein cows, low. Milk from the latter breed is considered best for babies. While the amount of fat in milk averages four per cent by weight, in the cream it averages from twenty to thirty per cent. The fat of milk is already in an emulsified form, so, like the fat of egg-yolk, it is considered especially digestible. Babies, however, often have difficulty in digesting much of it. This fat is peculiar in containing a relatively high amount of the volatile fats and less olein than is present in most fats used as food. It also contains a very small amount of stearin and a fairly large amount of olein.

At least three-fourths of the protein in milk is casein. Some albumin is also present, as well as other proteins in much smaller amounts. These proteins are of high nutritive value. An unusually high percentage of them is digested and absorbed, and they do not readily undergo intestinal putrefaction. The percentage of protein in milk is much greater than in mothers' milk. To remedy this, milk for feeding to babies is diluted with water, after which more sugar is added.

Sugar of milk is the carbohydrate present in milk. This sugar is less sweet than cane and is supposed to be much better for babies, because it is less liable to irritate the stomach. As, however, cheap grades of milk sugar are impure, and the pure sugar is exceedingly expensive, many doctors recommend the addition of cane sugar to the diluted milk in baby-feeding.

The mineral elements in milk need special mention.

Calcium and phosphorus are present in unusual amounts. The iron present seems to be in a form which is most readily assimilated, thus making up somewhat for the small quantity present. Babies are born with relatively more iron in their bodies than adults have. This seems to be nature's way of assuring them a plentiful supply. Diluted cows' milk furnishes less iron than mothers' milk, and so babies which are fed artificially have other food added to their diet earlier than those which are nursed.

Boiling milk seems to bring about certain changes in the substances present. The protein is undoubtedly changed, for such milk fails to clot with rennin, while raw milk clots readily. The boiling may also affect the vitamines present. This may be an important question when milk is used as the sole food. Boiled milk does not seem to be less digestible than raw milk.

When milk sours, the lactic acid bacteria present change the milk sugar to acid. The acid finally precipitates the protein and the milk "clabbers." Milk containing too little acid to bring about this, may separate when heated. If salt is present, this is even more liable to happen. Herein lies the difficulty of making cream of tomato soup without neutralizing the acid with soda, but the flavor is superior if soda is not used.

The important thing to remember in connection with milk is its value in the diet. A reasonable amount should be included even by those living at low cost. Sherman tells us that "those who are able to spend 30 to 40 cents per person per day for food are practising true economy when they buy and use liberally the best milk obtainable, even at a price of from 15 to 20 cents per quart." Also, "in no other way can the food habits now prevailing, especially in the cities, be so certainly and economically improved as by a more liberal use of milk."

References

As in the previous lesson.
Journal of Home Economics. Vol. VIII, pp. 429–432. "A Study of Condensed and Evaporated Milk."

Questions

1. What is meant by scalding milk? How can you easily tell when it is scalded?
2. Why is milk usually heated in a double boiler? When may this be done over a direct flame?
3. Would you infer that acid is present in chocolate, since chocolate fudge is so liable to separate in cooking? Does the separation affect the final product?
4. What two classes of condensed milk are there? How are they prepared? What do they cost? How does this cost compare with that of ordinary milk?

LIX

CURD OF MILK

Cottage Cheese — Junket Custard

A. **Class Experiments.**

The Effect of Heat on Sour Milk.

1. Test milk, sour enough to have clabbered, with blue litmus paper. Cut a little of the milk with a knife and strain some of the whey through cheesecloth. Save both curd and whey for comparison.
2. Boil half a cup of the milk for three minutes. Strain through a cheesecloth and compare with the curd obtained in (1), (3), and (4). Reserve the whey.
3. Heat half a cup of the milk in a double boiler until it separates. Strain through a cheesecloth.
4. Pour half a cup of boiling water into half a cup of the sour milk. Take the temperature of the mixture. Strain the curd as before.

5. Compare the whey of unheated milk with the whey obtained by heating, and decide why heat is used in separating. Examine the texture of the curds and determine the effect of great heat. Which methods of separation should be used in making cottage cheese?

B. Prepare Cottage Cheese.

Season and serve as a salad.

Class Experiments.

C. 1. To one fourth of a cup of milk, add half a teaspoon of rennin[1] solution. Boil, and set aside in a mold, until cool.

2. To one fourth of a cup of lukewarm milk, add half a teaspoon of rennin solution. When cool, compare with (1).

D. Junket Custard.

Make a recipe for a "Junket Custard", using chocolate, caramel, or vanilla, as flavoring, and prepare the custard.

Food for Children

The subject of food for children is an important one, for the digestions of little children are easily upset. Failure in obtaining a properly balanced diet means failure in proper development and growth.

Certain dishes are excluded from the children's bill-of-fare for various reasons. Coffee and tea should not be allowed, because they are nerve stimulants. Even cocoa as a regular drink is of questionable value, for it, too, contains a stimulating principle. Hot water with milk, or cereal coffee, will furnish hot drinks when called for, but

[1] Rennin solution is made by dissolving a junket tablet in two tablespoons of water.

all children should be encouraged to drink plenty of milk. A quart of milk a day for each child should be provided. This does not mean that such an amount must necessarily be drunk, because, when preferred, some of it may be served in soup, in white sauce, or in simple puddings. Secondly, foods containing much fat are excluded. This means pastry, fried foods, rich cake, and rich sauces, because they are difficult of digestion. For the same reason, pork, the fat of meat, and rich fish like salmon and mackerel, are forbidden. Spices, condiments, and strong acids such as vinegar, are also better omitted, as are raw foods containing much cellulose, as celery, cabbage, and radishes.

Almost any vegetable can be given, if it is prepared properly for the child. Little children are likely to swallow with insufficient chewing, so carrots, parsnips, turnips, onions, peas, beans, and corn may be difficult of digestion for them. But these same vegetables rubbed through a sieve and served as purée or a cream soup are excellent. The difficulty of chewing also makes veal too difficult of digestion. Bananas and cheese are so readily swallowed in lumps that the form in which these are furnished should be considered. The mixing of macaroni or rice with a little cheese affords a satisfactory way in which to serve the latter. Bananas as well as apples can be given, even to very little children, if they are scraped or baked. Children are especially susceptible to infection, so raw fruits must be clean. Berries bought in market are almost impossible to clean properly, and so are safer cooked. Figs and dates can be washed in hot water and sterilized in the oven.

Sugar may be given in moderate amounts, but it is much better not to stimulate the child's taste for it. Don't teach the baby to eat sugar. When given at all, as candy or otherwise, it should be at the end of a meal. The objections to its use on cereals is that the child should be led to eat only because he is hungry, and not because he likes the taste of a special dish. Sugar is much more apt to be irritating when taken on an empty stomach. Moreover, when eaten last, it is less apt to interfere with the appetite for other foods.

Many authorities say that children are better off without meat until they are eight or nine years old. There is no question that many children are given meat in too large amounts. As Miss Hunt points out, a child of even six to nine years of age would have sufficient protein in his daily diet from one egg, three glasses of milk, and what he will secure from the bread, cereals, and vegetables which the normal child can be depended upon to eat.

Children should be trained in eating habits just as much as in others. Many make the mistake of giving the little child only soft, mushy foods, and then wonder that he does not learn to chew. Crusts of bread and hard crackers are excellent educators for children beginning to eat.

Most mothers are in a hurry and feed the child too rapidly. The next spoonful is waiting at his lips before he has swallowed the first. So the children learn to eat too rapidly. The older child is too often forbidden to talk at the table, so even that interference with rapid eating is done away with. It is wise not to excuse children from the table when they have finished, but to require them to stay until the end of the meal. The child in a hurry to return to play will eat much more rapidly if he knows he can go when he has finished eating.

Children should be trained to like all kinds of food. If, as little children, they are fed vegetables in purées and soups, the difficulty which often occurs in teaching a child to like them will be avoided. Much can be accomplished by suggestion. If the older people do not eat all kinds of food, or if a child's dislikes are dwelt upon, difficulties will arise. The assumption that the flavor of a food is delicious and that the child will like it, will go far.

Water-drinking is another habit which may need attention. Food should not be washed down, nor should the water be iced; otherwise, water at meals is desirable, as is also water between meals. Most adults drink too little water.

Children should not eat whenever they are hungry, but at regular times. Lunches between meals should be provided regularly for little children. Care should be taken that the food be of such a nature as to be digested quickly, so as not to interfere with the following meal. It should be of such a character as to tempt only the hungry child to eat.

The amount of food required by children at various stages of their growth is shown in a table in the Appendix. The total amount is considered a minimum rather than an outside limit. A child with a natural, unspoiled appetite, fed simple, nourishing food, can safely be trusted not to overeat.

References

U. S. Dept, of Agriculture. Farmers' Bulletin No. 712. "School Lunches."

U. S. Bureau of Education. Bulletin No. 403. "The Daily Meals of School Children," by Caroline L. Hunt.

Teachers' College Bulletin. "The Feeding of Young Children," by Mary Swartz Rose.

Teachers' College Bulletin. "Food for School Boys and Girls," by Mary Swartz Rose.

Questions

1. Plan a series of meals for three days for a child of three, of six, and of ten.

2. Plan five school lunches for a child of ten.
3. Sum up the principal points concerned in the feeding of children.

LX

CHEESE

Cheese Pudding
Welsh Rabbit

A. **Class Experiments.**

Effect of Extreme Heat on Cheese.

1. Heat a small piece of cheese for some time in a hot frying pan. Allow it to cool, and examine. What two constituents do you find present? What is the effect of extreme heat on protein? on fat?
2. Heat another small piece of cheese in a double boiler (or over water). After the cheese is melted, cool it, and compare with (1).
   What precautions must be taken in cooking cheese?

B. Prepare Cheese Pudding — a luncheon dish.

$\frac{1}{4}$ c. milk	$\frac{1}{4}$ c. bread crumbs
$\frac{1}{2}$ egg, beaten slightly	3 tbsp. grated cheese

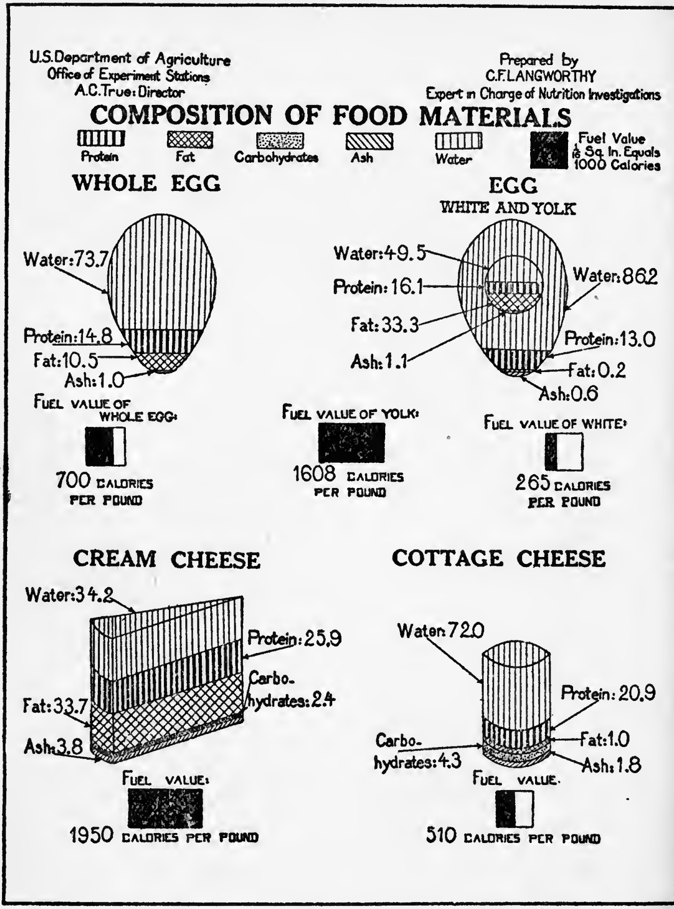
Salt and pepper

Bake in a buttered dish, until firm.

C. Prepare Welsh Rabbit.

1 oz. cheese	Cayenne or paprika
$\frac{1}{2}$ tsp. butter	$\frac{1}{4}$ egg, beaten slightly
$\frac{1}{8}$ tsp. mustard	1 tbsp. milk
$\frac{1}{8}$ tsp. salt	1 slice toast

Melt the cheese and butter in a double boiler, mixed with the dry ingredients, and add the egg in the milk



Composition of Eggs and Cheese

as soon as the cheese is melted. Stir, until it thickens, and pour over toast.

Or:

2. Make a medium white sauce and, while it is hot, stir in grated cheese, seasoning with salt and pepper.

Cheese

Cheese first was probably only a means of preserving milk; now there are several hundred varieties. Like butter, cheese was a home-made product until about 1850, while now, except for cottage cheese, almost no family makes its own supply.

In making cheese, the milk is first allowed to "ripen" until it is at the right stage of sourness. Sometimes lactic-acid-forming bacteria are added to the milk in order to hasten the souring. If the cheese is to be colored, the coloring material is mixed with the milk. Rennet is then stirred into the milk. This is a ferment capable of clotting milk, obtained from the lining of calves' stomachs. When the curd has formed, it is cut into small pieces; these are stirred and heated somewhat and piled up to drain off as much whey as possible, and so improve the texture of the cheese. The curd is again cut into small pieces and salted and pressed. The salt helps to check any further souring. The product at this stage is called green cheese, and is lacking in flavor until it undergoes a ripening process. For this purpose the cheese is stored at the desired temperature for weeks or even months until various ferments or micro-organisms, mainly bacteria, produce the desired flavor and texture. Finally, the rind is treated with disinfectants and painted or varnished to protect the cheese from further action.

Cheese is of two main types, — hard and soft. Almost three-fourths of the cheese used in this country is hard cheese, of which "American Cheese" is an example. A more accurate name for this cheese is "American Cheddar Cheese." It is often called "New York Cream Cheese."

Milk from goats may be used in making cheese. Some cheese is made from skimmed milk; some from whole milk; some even from whole milk to which cream has been added. In "filled cheese", the cream is removed and lard or some other fat is substituted. The sale of skimmed-milk cheese and of filled cheese is often regulated by state laws. Federal laws require the sale of filled cheese in labeled packages.

Cheese is often considered difficult of digestion, but undoubtedly part of this trouble is due to the failure to chew it sufficiently. Moreover, cheese, which is highly nutritious, is commonly eaten at the end of a meal and the consequences of overeating are laid to the indigestibility of cheese. Experiments conducted by Langworthy show that cheese is digestible both as to ease and completeness of digestion, there being "practically no difference between the cheese and the meat with respect to ease of digestion, at least in such quantities as are commonly eaten." American cheese is, then, a good substitute for meat, and, at ordinary prices, a cheap source of protein.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 487. "Cheese and Its Economic Use in the Diet."

Questions

1. What does ordinary cheese cost per pound?
2. What is the average composition of such cheese?
3. How does it compare in expense with meat as a source of protein? In total nourishment?

4. What other kinds of cheese are for sale in your markets, and what do they cost?

5. Give examples of hard and soft cheeses.

6. Discuss the digestibility of cheese. Give as many reasons as possible why it is ordinarily considered somewhat indigestible.

7. In making macaroni and cheese, would it be better to sprinkle the cheese on top, or mix it with the white sauce? Give the reason.

8. Suggest different cheese dishes.

9. Give the essential steps in the making of cheese.

LXI

SALADS

Salad Dressing

A. **Class Experiments.** Emulsions.

1. Shake together a few drops of oil with a little vinegar or water. Examine. Let stand, and examine again. Is the emulsion permanent?
2. (*a*) Shake together a few drops of oil with a little sodium hydroxide solution, and examine after letting it stand.

   (*b*) Shake together a little oil with a little vinegar and a little egg yolk, and examine after letting it stand.

B. Make a Mayonnaise Dressing.

Use the following proportions:

½ tsp. mustard [1]
¾ tsp. sugar
¼ tsp. salt
1 egg yolk
⅛ tsp. paprika
1 tsp. vinegar
½ tsp. lemon
½ c. oil [2]

[1] May be omitted entirely.

[2] Olive oil or a good cottonseed oil may be used. A mixture of equal parts of the two is satisfactory.

After separating, the yolk of the egg may be rolled about on a piece of cheesecloth, held flat in the hand, to remove all of the white. This will give a thicker dressing. Have the mixing bowl and the ingredients cold. In very warm weather the bowl may be surrounded with cracked ice. Beat the yolk until it is thick and creamy. Add the dry ingredients, and, beating constantly, the other ingredients in one of the two following ways:

1. Add the oil slowly, at first drop by drop, until a good emulsion is formed. Then add the lemon and vinegar alternately with the oil. Beat vigorously before each addition.
2. Add the vinegar and lemon to the beaten egg; then, add the oil, slowly. It should not be necessary to add it drop by drop. Beat vigorously between each addition.

If the oil separates out, beat another yolk, and add the separated mixture slowly, beating vigorously.

The mayonnaise may be mixed with whipped cream, or with stiffly beaten white of egg, immediately before serving.

C. Make Boiled Dressing.

1 egg	2 tsp. sugar
$\frac{1}{2}$ c. milk	1 tsp. salt
2 tbsp. butter	1 tsp. flour
2 tbsp. vinegar	$\frac{1}{4}$ tsp. mustard [1]
$\frac{1}{8}$ tsp. paprika	

Mix the dry ingredients and add the vinegar. Beat the egg slightly and add the milk. Combine the two. Which should be poured into the other? Add the butter. Cook as boiled custard.

[1] May be omitted.

If uncertain of the freshness of the milk, make without the vinegar and cool the mixture before adding the acid.

D. SALADS.

Serve dressings on salads, using such combinations of meat, vegetables, fruits, and nuts, as seem desirable.

Review Lesson XXX for treatment of lettuce.

Suggestions:

1. Apple and date with boiled dressing.
2. Orange, pineapple, and grape, with mayonnaise.
3. Apple, celery, and nut, with either dressing.
4. Cabbage with boiled dressing.
5. String beans with either dressing.
6. Banana with boiled dressing, sprinkled with nuts.
7. Potato salad with either dressing.

ARRANGEMENTS IN THE KITCHEN AND DINING ROOM

The older idea of a kitchen is quite different from our modern ideal. Originally the kitchen was a living room in which the preparation of food was carried on as one of many industries. Therefore, when the room was in order, everything pertaining to cooking was, as far as possible, put out of sight. Now, the kitchen is a workshop for the preparation of food and need be adapted only for that use, and may show frankly the use for which it is intended.

If one pictures the going to and fro which is necessary in the preparation of a meal, the advantage of a small kitchen is at once obvious. The stove, sink, and table, to save both time and steps, must be near each other. Their relative positions, also, make a considerable difference in the steps which have to be taken. In the preparation of a meal, food which is ready to go to the dining room is taken from the stove, placed in serving dishes, and carried into the other room. Therefore, a serving table should stand between the stove and the door into the dining room. This need not be a large table; it may be only a shelf, even a folding shelf. It may very conveniently be covered with galvanized iron or zinc, because then hot dishes and kettles can freely be set on it.

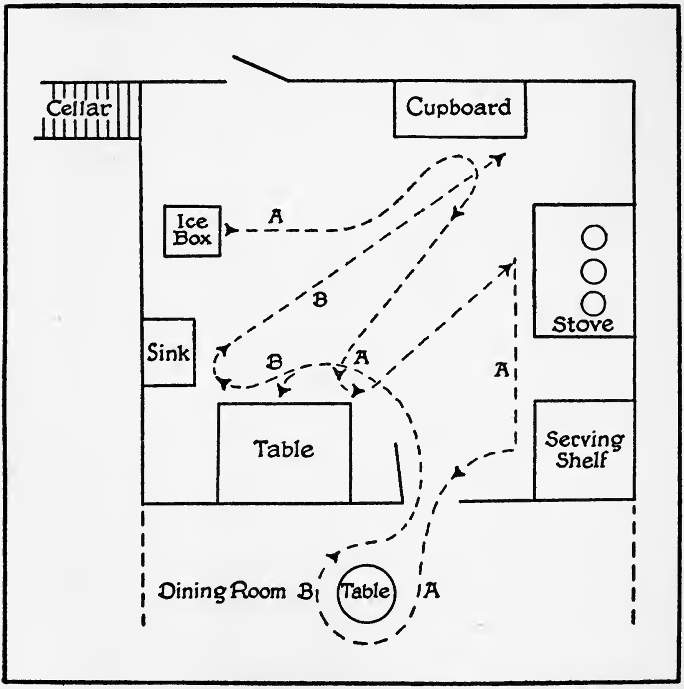
On the other hand, a table on which food is prepared for cooking should stand next to the stove and near the storage cupboard and ice-box. These need not necessarily be in one straight line. Note the accompanying illustrations (floor plans of kitchens).

For washing dishes, the drain boards and china closet should be near the sink. But, obviously, water will also be needed in mixing food, and in cooking it. The best way, then, to bring the sink near all these is to place it opposite the stove.

This sort of arrangement of work is called "routing" it. Unfortunately the positions of the stove, sink, and closets are often determined by the architect, with little or no regard to the convenience of the worker. But thought and ingenuity in putting up shelves and cupboards can do much in transforming an inconvenient kitchen into at least a more convenient one.

Nor are these larger arrangements the only ones to be thought about. Quite as much saving of time can be made by the proper placing of utensils and supplies. Think where any given article is used most and keep it near that place. For example, soap, scouring powder, silver polish, as well as the dishpan, dish-mop, and the like are all used in the sink. Store them so that they are within immediate reach. Some may hang from the wall behind the sink, or from the edge of a small shelf placed above and a little to one side of the sink. Compare the convenience of this with the practice, for example, of carrying the dishpan, often every time it is used, across the kitchen and standing it in a pantry closet.

Certain supplies should be kept near the stove, as well

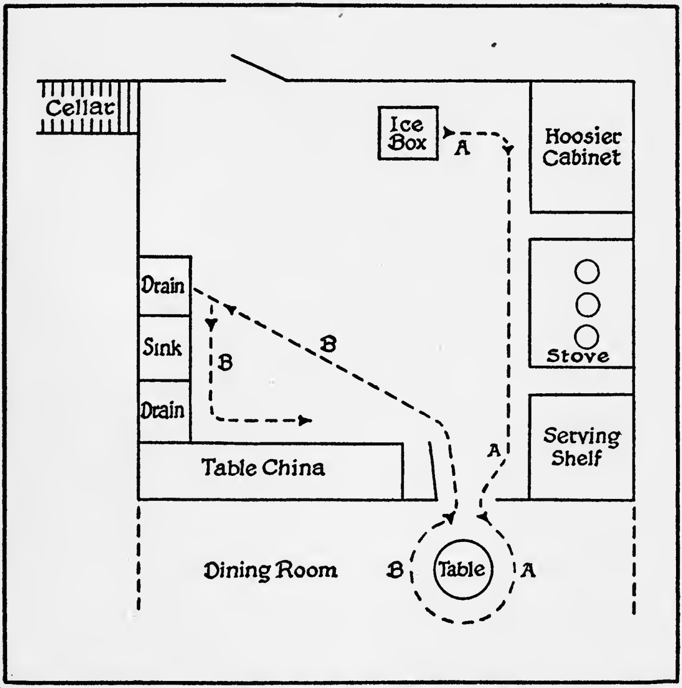


From "You and Your Kitchen," by Mrs. Christine Frederick.

Floor Plan of a Poorly-arranged Kitchen

A. Steps taken in the preparation of a meal. B. Steps taken in clearing away.

as spoons and other utensils to be used there. Of course, nothing which is not used frequently should be stored in the kitchen. Other things are better put away in cupboards or in the pantry. If the kitchen is dusty, as when a coal range is used, open shelves may be replaced by cupboards, or by curtained shelves protected by a window shade which will roll up. Narrow shelves with articles only one row deep are much more convenient than wider

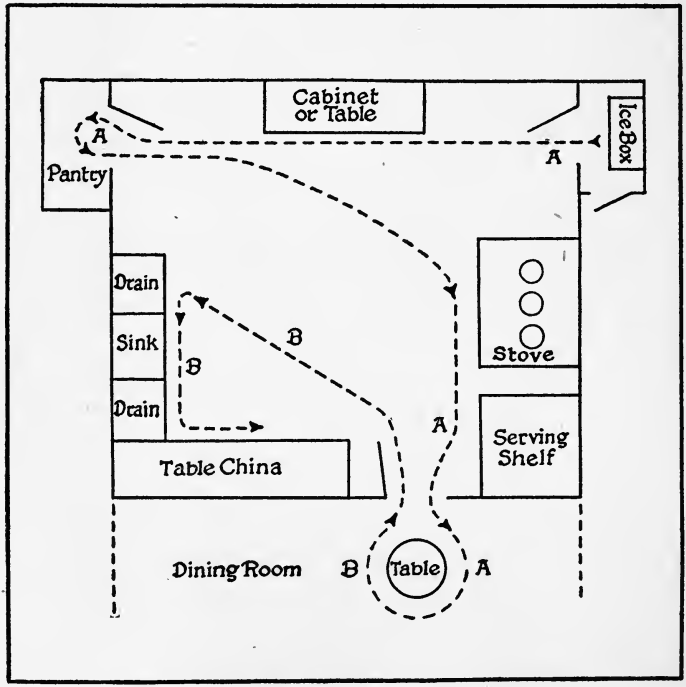


From "You and Your Kitchen," by Mrs. Christine Frederick.

FLOOR PLAN OF THE SAME KITCHEN, PROPERLY ARRANGED

shelves where the articles in front must be moved aside to give access to those behind. Plan never to hang one article over another on the same hook.

Apply these same principles to the arrangements of the dining room. Evidently salt and pepper shakers, sugar bowls, napkins in use, and other articles used only at the table should be stored as near it as possible. But what about serving dishes? If these are kept in the dining room, they must be taken to the kitchen, filled, brought



ANOTHER WELL-ARRANGED KITCHEN

back, used, carried out, washed, and brought back again for storage, only to be carried out to the kitchen again before using. This is evidently not efficiency.

Planning of this sort is really very useful. Time studies are often made to determine which is the quickest way of carrying on a given process, or to see how much time is saved by a better arrangement. Noting the exact time it takes to do a given task by one method, and then the exact time necessary in another way, shows the difference in the two much more accurately than a mere impression of the difference. Surely, the ideal is not to spend one's whole time doing housework, but to do it as quickly and efficiently as possible, so that one may have time for the larger things of life.

References

Various cook books, on salads.
"The Efficient Kitchen," by Georgie Boynton Child.
"The New Housekeeping," by Christine Frederick.

Questions

1. Into what two general classes would you divide salads?
2. Which kind of salads would it be appropriate to include in a hearty-dinner menu?
3. What are the chief points to consider in judging a salad?
4. What ways do you recommend for caring for celery which must be kept for a day or two?
5. Why is it worth while to learn to like salads?

LXII

LUNCHEON

Prepare and Serve a Luncheon.

Decide on the type of luncheon you wish to prepare (formal or informal), on the number of people to be served, and on the amount you wish to spend. How will the season of the year and the time you can spend in preparation affect your choice? Plan a menu accordingly. Prepare and serve.

Menu-making

Most of the principles of menu-making have already been stated, but it will be useful to bring them together, and sum up at this point. A great deal is said at the present time about balanced meals, and many lists of these are published. At first glance the student who knows that a "balanced diet" furnishes a certain number of total calories, — with a certain percentage of these from fats, proteins, and carbohydrates, — and a given amount of mineral elements, is puzzled, because these lists say nothing at all about amounts. It must be evident, then, that such meals are not accurately balanced in this sense. They are balanced in the sense that they furnish all the different elements required and in approximately the correct amounts. It is obvious that the housekeeper who tried to balance the diet for every member of the family would have an endless task and would seldom accomplish her end, because the various individuals would demand liberty to eat more or less of the foods provided and the accurate balance would be upset at once.

For the healthy individual no such accurate planning is necessary, but it is most important that meals be balanced in the other sense. First, meals should be considered not individually, but in groups, meals for the day, for the week. Decide, for example, how much meat you intend to include in the diet of the week, and distribute it accordingly. Some people find themselves best suited with meat only two or three times a week; others desire it at least once a day, while still others prefer it in smaller amounts even more frequently. But as meat is expensive and too much of it is probably not good for us, the skilled menu-maker will devise substitutes which will satisfy her family and gradually change their tastes. Remember that the food habits of children are much more easily changed than are those of adults.

Having selected the meat or meat substitute, begin filling out the meal. Remember that it is wise to distribute the fat so as not to have too much of it in any one meal as it is likely to cause digestive disturbances. In making combinations, do not include in the same meal dishes which furnish practically the same food principles. Rice should be substituted for potatoes and not served with them. Plan definitely to include vegetables and fruits for their mineral content. If meat and nutritive vegetables are to be served, fruits make a suitable dessert. If the dessert, on the other hand, is rich and high in food value, see that the vegetables are less starchy. If little meat is provided and the whole dinner seems too light, the meal might include a hearty soup or salad. Considering the larger grouping, we should see that the food for the day runs evenly. If a lunch or supper is hearty, the dinner should be lighter than usual, or vice-versa. Alternate days of feast and famine do not give satisfaction.

The suitability of the food must also be taken into account. People who work out of doors most of the time not only need more hearty food, but can digest it better than can those who are more closely confined and with more sedentary habits. For the latter, as for children, easily digested food must be provided.

Last but by no means least, remember to provide variety. First, variety within the meal itself. Not only should the same flavor not appear twice in a meal, as chicken broth followed by chicken, or tomato soup followed by tomato salad, but as much variety as possible in food combinations should be sought. It is evident that a meal must not be composed too largely of liquids, and the dryness or watery character of the food should be considered. Boiled potatoes are more acceptable with a meat with gravy than, for example, with Hamburg steak. Peas and beans at the same time not only provide about the same food elements in the same proportions, but are too much alike. Two creamed vegetables at once are not so pleasing as if one were mashed or served in some other way. Variety in flavor is important. Two strong-flavored vegetables, as onions and turnips, are not acceptable at the same time; on the other hand, if only mild-flavored foods are chosen, the whole is insipid. In food combinations, color, too, should be taken into account. Carrots and cranberries do not make a pleasing color harmony.

Variety also demands that the same foods prepared in exactly the same way should not be served at successive meals. Moreover, the same food combinations should not be repeated too frequently. Do not always serve peas with lamb. Bread and butter are, of course, repeated, but there are innumerable ways of serving potatoes, although if you lived in some families you would think that there were but one or two at most. Left-overs may be made to appear like a new dish, or a meal may be skipped before serving the same article again. Some boarding-house keepers and some housewives, as well, make the mistake of running on a regular schedule so that it is possible to predict the meal beforehand. This is, of course, a grave error.

A warning should be given in regard to variety. The variety desirable is not the serving of too many kinds of food at one meal. Some people, and especially country hotel-keepers, serve at one meal all the vegetables that are to be had, and there is no variety possible for the next meal. Pickles of various sorts, different kinds of jam and preserves, appear all at once at each meal, and one grows as tired of them all as if one had really eaten all the kinds, whereas one served at a time at different meals would have meant a new attractiveness. For this reason it is easy to tire of cafeteria or hotel meals where the food has to be selected before eating.

Reference

U. S. Dept. of Agriculture. Office of Exp. Station. Circular 110. "Food Customs and Diet in American Homes."

Questions

1. Why are the following menus faulty? How would you improve them?

(*a*) Split-pea soup
Roast beef
Mashed potatoes
Baked beans
Banana salad
Plum pudding

(*b*) Bouillon
Bacon and eggs
Buttered beets
Squash
Lettuce salad, French dressing
Baked apple and whipped cream

(*c*) Roast lamb
Macaroni
Creamed potatoes
Boiled rice

2. Make out balanced menus for a week's meals, providing for the use of left-overs, and introducing variety. State whether you consider the meals are low, medium, or high in price.

APPENDIX

Food Requirements

A. For Adults

1. **Atwater** and Benedict's Standard for Total Calories for average man weighing 154 pounds.

Man sleeping requires	65 calories per hour
Man sitting at rest	100 calories per hour
Man at light muscular exercise	170 calories per hour
Man at active muscular exercise	290 calories per hour
Man at severe muscular exercise	450 calories per hour
Man at very severe muscular exercise . . .	600 calories per hour

The average woman is supposed to require eight-tenths of the amount needed by the man. This is based on the fact that the average woman weighs eight-tenths of the weight of the average man.

Using the figures given above, the daily requirement for a man of average weight with the given activity would be as follows:

8 hours of sleep [65 cal. needed each hour]	520 calories
6 hours of sitting at rest[1] [100 cal. needed each hour] .	600 calories
5 hours of light exercise[2] [170 cal. needed each hour] .	850 calories
4 hours of active exercise [290 cal. needed each hour] .	1160 calories
1 hour of severe muscular exercise[3] [450 cal. each] .	450 calories
24 Total Calories needed per day	3580

[1] Eating, reading, writing, etc.
[2] Moderate walking, dressing, etc.
[3] Chopping wood, digging ditches, etc.

2. Atwater's Standard for Total Calories for adults under different conditions of activity.

Man with hard muscular work	4150
Man with moderately active work	3400
Man at sedentary or woman with moderately active work	2700
Man without exercise or woman at light to moderate work	2450

3. Standards for Protein.

How much protein is desirable is still unsettled. About fifteen per cent of the total calories should come from protein, according to Atwater; twelve per cent, according to Langworthy; eight and one-half per cent, according to Chittenden.

Mothers' milk furnishes a little less than one-tenth of the total calories from protein. As this is by nature intended for the period of greatest growth, this is probably enough for any age, provided the protein is well adapted for use in body-building.

4. Standard for Mineral Elements.

This has not been determined so accurately as has the total calorie requirement. It is probable that there is a larger demand for mineral elements in proportion to the total calorie requirement during growth than in adult life. Calcium, iron, and phosphorus are the mineral elements which are least likely to be present in sufficient amounts. The requirement is usually stated as follows:

Calcium oxide [CaO]	1.0 gram
Iron [Fe]	.015 gram
Phosphoric acid [P_2O_5]	2.75 grams

E. B. Forbes of the Ohio Experiment Station says:

"Generally speaking, a high ash content of the food is desirable, since the organism is much better able to handle an excess of ash constituents than to meet a deficiency.

It is good practice, therefore, to utilize the water in which foods are cooked, in so far as this can be done without detracting from the acceptability of the food, since the cooking water dissolves out much mineral matter. An abundance of mineral salts in the diet is also desirable, aside from nutritive considerations, because they contribute a laxative character to the food. Foods which are deficient in minerals are apt to be constipating.

"A general character of the mineral nutrients of foods is the predominance of acid or basic elements. If the nutrients are present in the proportions in which they are needed the bases will predominate, and it is probably best that the bases should exceed the acid elements in the diet. It is true, however, that the organism has the capacity to neutralize a considerable excess of acids. Meat, eggs, and cereals have acid ash; vegetables, milk, and most fruits have alkaline ash. The latter group should be liberally represented in the diet."

Foods High in Calcium

Milk and cheese [both especially rich], eggs, vegetables, fruits, hard water.

Foods High in Iron

Beef, eggs, beans, peas, and other green vegetables [especially spinach], raisins, figs, dates, prunes.

Foods High in Phosphorus

Milk and cheese, eggs, nuts, vegetables [especially peas and beans], cereal products with outer seed coats.

Table of Height and Weight

A. *For Men*

Symonds's Table of Height and Weight for Men at Different Ages. Based on 74,162 accepted Applicants for Life Insurance. (Medical Record, Sept. 5, 1908.)

Ages.	15–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69
5 ft. 0 in.	120	125	128	131	133	134	134	134	131	
1 in.	122	126	129	131	134	136	136	136	134	
2 in.	124	128	131	133	136	138	138	138	137	
3 in.	127	131	134	136	139	141	141	141	140	140
4 in.	131	135	138	140	143	144	145	145	144	143
5 in.	134	138	141	143	146	147	149	149	148	147
6 in.	138	142	145	147	150	151	153	153	153	151
7 in.	142	147	150	152	155	156	158	158	158	156
8 in.	146	151	154	159	160	161	163	163	163	162
9 in.	150	155	159	162	165	166	167	168	168	168
10 in.	154	159	164	167	170	171	172	173	174	174
11 in.	159	164	169	173	175	177	177	178	180	180
6 ft. 0 in.	165	170	175	179	180	183	182	183	185	185
1 in.	170	177	181	185	186	189	188	189	189	189
2 in.	176	184	188	192	194	196	194	194	192	192
3 in.	181	190	195	200	203	204	201	198		

B. *For Women*

Symonds's Table of Height and Weight for Women at Different Ages. Based on 58,855 accepted Applicants for Life Insurance. (McClure's Magazine, Jan. 1909.)

Ages.	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64
4 ft. 11 in.	111	113	115	117	119	122	125	128	128	126
5 ft. 0 in.	113	114	117	119	122	125	128	130	131	129
1 in.	115	116	118	121	124	128	131	133	134	132
2 in.	117	118	120	123	127	132	134	137	137	136
3 in.	120	122	124	127	131	135	138	141	141	140
4 in.	123	125	127	130	134	138	142	145	145	144
5 in.	125	128	131	135	139	143	147	149	149	148
6 in.	128	132	135	137	143	146	151	153	153	152
7 in.	132	135	139	143	147	150	154	157	156	155
8 in.	136	140	143	147	151	155	158	161	161	160
9 in.	140	144	147	151	155	159	163	166	166	165
10 in.	144	147	151	155	159	163	167	170	170	169

C. *For Children*

Age	Calories per Pound of Body Weight	Calories per Day
1–2	45–40	900–1200
2–5	40–35	1200–1500
6–9	35–30	1500–1800
10–13	30–25	1800–2200
14–17	25–20	2200–3000

D. *For Children*

I

Sill's Table of Weights of Children from Birth to the Fifth Year.
(New York Medical Journal, January, 1911.)
From Tables by Koplik.

Age		Weight
At birth		7.5
6 months		15.0
1 year		21.0
2 years	boys	30.3
	girls	29.2
3 years	boys	34.9
	girls	33.1
4 years	boys	37.9
	girls	36.3

D. *For Children (Continued)*

II

Average Weight and Height of Boys at Different Ages.
[Ninth Yearbook of the National Society for the Study of Education, Part I, 1910, Health and Education.]

Ht in.	5 yrs.	6 yrs.	7 yrs.	8 yrs.	9 yrs.	10 yrs.	11 yrs.	12 yrs.	13 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	19 yrs.	20 yrs.
39	35															
40	38	36														
41	39	39														
42	41	41														
43	42	42	42													
44	46	44	43													
45		46	46	45												
46		48	48	48												
47			49	50	50											
48			54	53	53	53										
49				54	55	55										
50				57	58	58										
51				59	60	60	61									
52					62	62	61	63								
53					62	65	65	67	67	67						
54					65	68	68	70	71	71						
55						69	71	75	75	76						
56						71	77	76	78	79	79					
57							77	79	80	82	82					
58							78	84	85	86	87					
59								84	86	90	91					
60								85	91	94	95	90				
61									98	97	99	96				
62									99	103	106	104	104			
63									100	107	112	112	110	118		
64										114	118	120	117	120	120	
65										122	119	122	122	120	126	125
66											121	125	125	126	129	139
67											128	129	128	131	134	132
68											133	133	130	136	136	136
69											134	136	139	139	139	139
70											136	140	143	143	144	145
71												140	146	146	146	164
72															149	154
73																165

D. *For Children* (*Continued*)

III

Table of Weight and Height of Girls at Different Ages.
[Ninth Yearbook of the National Society for the Study of Education, Part I, 1910.]

Ht in.	5 yrs.	6 yrs.	7 yrs.	8 yrs.	9 yrs.	10 yrs.	11 yrs.	12 yrs.	13 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	19 yrs.	20 yrs.
39	34															
40	37	35														
41	38	37														
42	41	39	39													
43	41	41	42													
44	45	43	44	42												
45		45	45	45												
46		48	47	47												
47			50	49	49											
48				51	51											
49				53	53	54										
50				56	56	57										
51					59	58	60									
52					63	62	62	63								
53						64	63	66	65							
54						69	68	69	68							
55							70	71	73							
56							75	75	76	78						
57								78	80	83						
58								83	86	88	89					
59								88	94	93	97	100				
60								94	99	96	100	104	109	103	99	99
61									104	100	102	109	109	106	105	111
62										104	106	111	110	107	111	114
63										107	109	116	110	112	113	114
64										112	118	116	117	114	119	115
65										114	118	121	125	120	123	125

TABLE OF FUEL VALUES

The approximate weight in ounces and the exact weight in grams of the amount of each food necessary to furnish 100 calories of heat are shown in the following tables, as well as the number of these calories which come from protein.

If it is desired to add other foods to the list, divide the number of calories furnished by a pound [1] of the food into 1600 to find the number of ounces, into 45,364 to find the number of grams. To find the number of calories from protein, multiply the weight in grams of the 100-calorie portion by the per cent [2] of protein in the food, and then multiply by 4.

In the table, A. P. means "As Purchased"; E. P. means "Edible Portion."

Name of Food	Weight of 100–Calorie Portion		Approximate Number of Calories from Protein
	Oz. (approx.)	*Grams*	
Berries			
Blackberries	6	171	9
Blueberries	4½	131	3
Cranberries	7½	215	3
Currants	6	175	10
Raspberries	6	164	7
Strawberries	9	256	10

One cup of berries weighs about 5½ oz.

[1] See U. S. Dept. of Agriculture. Office of Experiment Station. Bulletin No. 28. "Chemical Composition of American Food Materials."

[2] If exact results are desired, re-calculate the fuel value per pound, using factors 4, 4, 9, instead of 4.1, 4.1, and 9.3 used in Bulletin.

Name of Food	Weight of 100-Calorie Portion		Approximate Number of Calories from Protein
	Oz. (approx.)	Grams	
Biscuits (see also Crackers)			
Beaten	¾	21	10
Rolls, white (water)	1¼	36	13

One medium-sized roll weighs about 2 oz.
One large sweet roll weighs about 2½ oz.

Bread (see also muffins)			
Boston Brown	1½	43	9
Graham	1½	38	14
Rye	1½	39	14
White	1½	38	14
Whole Wheat	1½	41	16

One thin slice of home-made bread weighs about 1 oz.
One thin slice of bakers' bread weighs about ½ oz.
One slice Boston brown bread weighs about 2½ oz.

Butter (see Fats)			
Cereals (see also Bread)			
Corn Meal	1	28	10.5
Corn Flakes	1	28	11
Cornstarch	1	28	—
Farina	1	28	12
Flour, Graham	1	28	13
Flour, Rye	1	29	8
Flour, White	1	28	12
Flour, Whole Wheat	1	27	15
Hominy, cooked	1	28	9
Macaroni, uncooked	1	28	15
Oatmeal, Rolled Oats	1	28	16
Rice, uncooked	1	29	9
Shredded Wheat	1	27	12
Tapioca	1	28	—
Wheat, Cracked	1	28	12

One cup of corn meal weighs about 5 oz.
One tablespoon of corn starch weighs about ⅓ oz.
One cup of cereal weighs about 8 oz.
One shredded wheat biscuit weighs about 1 oz.
One cup of white flour weighs about 4½ oz.
One tablespoon of white flour weighs about ¼ oz.

Name of Food	Weight of 100-Calorie Portion		Approximate Number of Calories from Protein
	Oz. (approx.)	Grams	
Cheese			
Cheddar	$\frac{3}{4}$	22	24
Cottage	$3\frac{1}{4}$	91	76

One and one-half inch cube of cheese weighs about 1 oz.
One tablespoon of grated cheese weighs about $\frac{1}{4}$ oz.

Chocolate (see Sweets)			
Cocoa (see Sweets)			
Crackers			
Graham	$\frac{3}{4}$	24	10
Oyster	$\frac{3}{4}$	24	11
Saltines	$\frac{3}{4}$	23	10
Soda	$\frac{3}{4}$	24	10
Water	$\frac{3}{4}$	25	12

Four square wafers weigh about 1 oz.

Cream (see Milk)			
Desserts (see Sweets)			
Eggs			
Whole E.P.	$2\frac{1}{2}$	68	36
White	7	196	97
Yolk	1	28	17

One egg without shell weighs about $1\frac{3}{4}$ oz.
One egg white weighs about 1 oz.
One egg yolk weighs about $\frac{1}{2}$ oz.

Fats (see Oil)			
Butter	$\frac{1}{2}$	13	0.5
Cottolene	$\frac{1}{2}$	11	—
Lard	$\frac{1}{2}$	11	—
Oleomargarine	$\frac{1}{2}$	13	0.5
Salt pork	$\frac{1}{2}$	13	1

One tablespoon of butter weighs about $\frac{1}{2}$ oz.
One pat of butter weighs about $\frac{1}{2}$ oz.
One cup of butter weighs about 8 oz.

Name of Food	Weight of 100–Calorie Portion		Approximate Number of Calories from Protein
	Oz. (approx.)	Grams	
Fish			
Blue, E.P.	4	113	88
Butter, E.P.	2	59	42
Cod, fresh, dressed	7¾	216	96
Cod, salt, E.P.	3½	126	97
Halibut, Steak, E.P.	3	82	61
Herring, smoked	1¼	35	51
Lobster, canned	4¼	119	86
Oysters, E.P.	7	198	49
Salmon, dressed, E.P.	1¾	49	43
Sardines	1½	37	34
Whitefish	2¼	67	61

One serving of halibut or whitefish weighs about 3 oz.
One cup of oysters weighs about 6 oz.

Name of Food	Oz. (approx.)	Grams	Approximate Number of Calories from Protein
Flour (see Cereals)			
Fruits (see also Berries)			
Apples, A.P.	7½	212	3
Apples, dried	1¼	34	3
Apricots, A.P.	6½	184	8
Bananas, E.P.	3½	101	5
Cherries, fresh, E.P.	4½	128	9
Cherries, candied	1	29	0.5
Cherries, canned	4	112	5
Currants, fresh, A.P.	6¼	175	11
Currants, dried	1	31	3
Dates, A.P.	1¼	32	3
Figs, dried	1¼	32	5
Grapes, A.P.	5	138	5
Grape Juice	3½	100	—
Grape Fruit	8	220	7
Lemons, A.P.	11½	324	9
Lemons, E.P.	8	226	9
Muskmelons	18	510	6
Olives, A.P.	1½	46	2
Oranges, A.P.	9½	268	6
Oranges, E.P.	7	195	6
Peaches, A.P.	10½	297	7
Peaches, canned	7½	213	6
Pears, A.P.	6¼	177	4

Name of Food	Weight of 100-Calorie Portion		Approximate Number of Calories from Protein
	Oz. (approx.)	*Grams*	
Fruits (see also Berries)			
Pears, canned . . .	5	132	2
Pineapples, E.P. . .	8¼	232	4
Pineapples, canned . .	2¼	65	1
Plums	4	118	5
Prunes, dried, A.P. .	1¼	39	3
Raisins, A.P.	1¼	32	3
Raisins, E.P.	1	29	3
Rhubarb, E.P. . . .	15¼	433	3
Watermelons, A.P. . .	28¼	800	5

One medium-sized apple weighs about 5 oz.
One large banana weighs about 5 oz.
Three dates weigh about 1 oz.
One fig weighs about 1 oz.
Five olives weigh about 1 oz.
One large orange weighs about 6 oz.
One medium-sized peach weighs about 4 oz.
Three prunes weigh about 1 oz.
One cup of raisins weighs about 4 oz.

Gelatine	1	27	100
Meats			
Bacon, smoked . . .	½	16	7
Beef, corned	1¼	34	21
Beef, dried	2	56	67
Beef, Heart	1¼	39	25
Beef, Liver	3¾	78	64
Beef, Porterhouse Steak	1¼	37	32
Beef, Roast	1	29	26
Beef, Round, lean . .	2¼	64	55
Beef, Sirloin	1½	41	31
Beef, Sweetbreads . .	2	57	38
Beef, Tenderloin . .	1¼	35	23
Beef, Tongue, E.P. .	2¼	63	48
Chicken (broilers), E.P.	3¼	93	80
Fowl, E. P.	1½	45	35
Ham, fresh, medium fat	1	31	19
Ham, smoked, medium fat	¾–1	24	16
Ham, deviled . . .	1	26	20

Name of Food	Weight of 100-Calorie Portion		Approximate Number of Calories from Protein
	Oz. (approx.)	Grams	
Meats			
Lamb, Chops, broiled, E.P.	1	28	24
Lamb, Leg, medium fat, E.P.	1½	44	34
Mutton, Leg, medium fat, E.P. . . .	1½	41	32
Pork, Chops, medium fat, E.P.	1¼	34	22
Pork, Tenderloin . .	1¾	52	39
Sausage, Pork . . .	¾	22	12
Sausage, Pork and Beef	1¼	35	17
Sausage, Wienerwurst .	1¼	32	36
Turkey, E.P. . . .	1¼	34	29
Veal, Cutlet, E.P. . .	2¼	66	13
Veal, Leg, medium fat, E.P.	2¼	62	50

Two slices of broiled bacon weigh about ½ oz.
One serving of meat weighs about 3–4 oz.

Milk			
Buttermilk	9¾	280	30
Condensed, sweetened .	1	31	11
Condensed, unsweetened . .	2	59	23
Cream, thin	1¾	51	5
Cream, thick . . .	1	26	2
Skimmed	9½	273	37
Whey	13¼	375	15
Whole	5	145	19

One cup (½ pint) of milk weighs about 8½ oz.
One cup of cream weighs about 8 oz.
One tablespoon of whipped cream weighs about ¼ oz.

Molasses (see Sweets)			
Muffins (see Biscuits)			
Nuts			
Almonds, shelled . .	½	15	13
Butternuts, E.P. . .	½	15	17
Chestnuts, E.P. . .	1½	41	10

Name of Food	Weight of 100-Calorie Portion		Approximate Number of Calories from Protein
	Oz. (approx.)	Grams	
Nuts			
Cocoanut, fresh . .	½	17	4
Cocoanut, prepared .	½	15	4
Peanuts, E.P. . . .	¾	18	19
Walnuts, California, E.P.	½	14	10

One cup of shelled nuts weighs about 5–5½ oz.

Oil, Olive	½	11	—

One tablespoon of oil weighs about ¼ oz.

Pies (see Sweets)			
Puddings (see Sweets)			
Rolls (see Biscuits)			
Soups, canned			
Celery, Cream of . .	6½	187	16
Corn, Cream of . . .	3½	102	12
Pea, Cream of . . .	7	196	28
Tomato	9	225	18
Vegetable	26	735	85
Sweets			
Cake, Chocolate layer .	1	28	7
Cake, Frosted . . .	1	27	6
Cake, Fruit	1	27	6
Cake, Gingerbread . .	1	27	6
Cake, Sponge . . .	1	25	6
Chocolate	½	16	8
Cocoa	¾	20	17
Doughnuts	¾	23	6
Fig bars	1	28	5
Gingersnaps	¾	25	6
Honey	1	31	0.5
Macaroons	1	24	6
Marmalade, Orange .	1	29	0.5
Molasses	1¼	35	3
Pie, Apple	1¼	37	5
Pie, Custard	2	56	10
Pie, Lemon	1½	39	6
Pie, Mince	1½	35	8
Pie, Squash	2	56	10

Name of Food	Weight of 100-Calorie Portion		Approximate Number of Calories from Protein
	Oz. (approx.)	Grams	
Sweets			
Pudding, Apple Tapioca	3	82	1
Pudding, Cornstarch .	1½	45	12
Pudding, Lemon Jelly .	3	78	5
Pudding, Rice . . .	2	51	12
Sugar	1	25	0
Syrup, Maple . . .	1	23	0
Vanilla Wafers . . .	1	23	6

One square of chocolate weighs about 1 oz.
One tbsp. of cocoa weighs about ¼ oz.
One medium-sized doughnut weighs about 1½ oz.
One tbsp. of honey weighs about 1 oz.
One cup of molasses weighs about 11 oz.
One serving of pie weighs about 5½ oz.
One lump of sugar weighs about ¼ oz.
One tbsp. of sugar weighs about ½ oz.
One cup of sugar weighs about 7½ oz.
One cup of maple syrup weighs about 11 oz.

Name of Food	Oz. (approx.)	Grams	Approximate Number of Calories from Protein
Vegetables			
Asparagus, fresh, E.P.	16	450	33
Asparagus, cooked, E.P.	7½	213	18
Beans, baked, canned	2¾	78	21
Beans, dried	1	29	26
Beans, Lima, canned .	4½	130	21
Beans, String, canned	17¼	488	22
Beans, String, fresh .	8½	241	22
Cabbage, E.P. . . .	11¼	317	20
Carrots, E.P. . . .	7¾	221	10
Cauliflower, E.P. . .	11½	328	24
Celery, E.P.	19	540	24
Corn, canned . . .	3½	102	12
Corn, green, E.P. . .	3½	99	12
Cucumbers	20¼	575	18
Egg plant	14½	358	17
Lettuce	18½	524	25
Mushrooms	7¾	223	31
Onions	7¼	205	13
Parsnips	5½	154	10

Name of Food	Weight of 100-Calorie Portion		Approximate Number of Calories from Protein
	Oz. (approx.)	*Grams*	
Vegetables			
Peas, canned	6½	181	26
Peas, fresh	3½	100	28
Potatoes, Chips . .	¾	17	5
Potatoes, Sweet, E.P.	2¾	81	6
Potatoes, White, E.P.	4¼	120	11
Pumpkins, E.P. . . .	13¾	389	16
Radishes, E.P. . . .	12	341	18
Spinach	14¾	416	35
Squash, E.P.	7¾	217	12
Tomatoes, fresh . .	15½	439	16
Tomatoes, canned . .	15¾	443	21
Turnips, E.P. . . .	9	254	13

One-half pint of baked beans weighs about 7¼ oz.

One serving of most vegetables weighs about three to four ounces.

One serving of celery, lettuce, or radishes weighs about one ounce.

SUPPLEMENTARY LABORATORY LESSONS

I. Dried fruit. Baked bananas. Baked apples.
II. Peach butter. Canned tomatoes.
III. Apple and mint jelly.
IV. Chili sauce. Mustard pickles.
V. Spiced prunes. Watermelon-rind pickle.
VI. Potatoes in the half shell.
VII. Marguerite salad. Shirred eggs.
VIII. Scrambled eggs with or without milk.
IX. Date tapioca. Chocolate tapioca.
X. Turkish Pilaf. Compote of rice and pears.
XI. Tapioca cream. Brown-bread brewis.
XII. Iced tea. Cinnamon crackers.
XIII. Fruit punch. Percolated and drip coffee.
XIV. Iced cocoa or cocoa shake.
XV. Frappé. Apricot ice.
XXIV. Potatoes *au gratin*. Creamed eggs.
XXV. Rice croquettes. Egg cutlets.
XXVI. Baked macaroni and cheese.
XXVII. Creamed celery.
XXIX. Cauliflower.
XXX. Brussels sprouts. Kale.
XXXIII. Cannelon of beef, or beef loaf.
XXXIV. Breaded chops. Franconia potatoes.
XXXV. Swiss steak. Braised beef.
XXXVII. Noodles. Beef tea.

XXXVIII. Irish moss. Agar-agar. Jellied meat. Double mold.
XLI. Fried smelts. Creamed codfish. Finnan haddie. Planked fish.
XLII. Scalloped oysters. Panned oysters. Oysters with bacon.
XLIV. Cream puffs. Fruit puffs.
XLV. Celery fritters. Timbale cases.
XLVI. Waffles. Johnny cake.
XLVII. Hot-water sponge cake. Angel cake.
XLVIII. Date muffins. Sally Lunn. Boston brown bread.
XLIX. Chocolate cake. White cake. Gold cake. Boiled frosting.
L. Dutch apple cake. Cinnamon roly-poly.
LI. Hermits, or other drop cookies.
LII. Raisin bread. Nut bread. Baking-powder nut bread.
LIII. Finger rolls. Swedish tea ring, etc.
LIV. Custard pie. Lemon cream pie. Fruit tarts.
LV. Raised doughnuts. Sour-milk doughnuts.
LVI. Mousse. Parfait.
LVII. Frozen pudding. Spanish cream.
LIX. Cottage cheese and walnut sandwich. Maids of Honor.
LX. Cheese balls. Cheese fondu. Cheese straws.

INDEX

INDEX

ACETYLENE, 102.
Agar-agar, 193.
Albumin, 183, 274.
  in meat, 170.
Alcohol, grain, 102, 246, 250.
  wood, 102.
Apple, coddled, 2.
  fritters, 220.
  jelly, 13.
  sauce, 2.
  tapioca, 57.

BABY-FEEDING, 274.
Bacon, broiled, 119.
  fat, 261.
Bacteria, 21–24, 25–29, 247, 248.
  in meat, 181, 182.
  in milk, 266, 270–271, 275.
Baking, 219.
Baking powder, 226–229, 237–239.
  and soda, 229.
Baking powder biscuit, 237–239, 253.
Beef, 171.
  broth, 189.
  chipped, 130.
  cuts of, 177.
  roast, 175.
  steak, 176.
  stew, 180.
  tea, 189–191.
Bread, 244–253.
  bakers', 253.
  baking, 250.
  composition of, 251.
  digestibility of, 252.
  graham, 250.
  kneading of, 245, 246–247.
  mixing, 245–248.
  oatmeal, 250.
  score card for, 252.
  spoon bread, 183.
Breakfast foods, buying, 55.
  classification of, 54.
  cooking of, 51, 55.
  cost, 54, 62–63.
  crisping of, 62.
Breakfasts, 67, 122.
Butter, 260, 261, 262–266.
  butterine, 265.
  digestibility of, 261.
  in cake, 236.
  making, 263.
  oleomargarine, 265.
  rancidity, 264–265.
Butterine, 265.
Buttermilk, 265–266.

CAKE, 227, 233, 235–236, 255.
  making, 235–236, 255.
  plain, 233.
  sponge cake, 227.
Calories, 53, 153–157, 304–312.

Candies, 162–163.
Canning, 7, 8, 12.
Carbohydrates, 163–167.
  caloric value, 154.
  See also CELLULOSE, PECTIN, STARCH, SUGARS.
Carrots, creamed, 139.
Casein, 274.
Cellulose, 15, 34, 37, 63–64, 133, 278.
Cereals:
  composition of, 52, 54.
  corn meal, 232.
  corn pudding, 176.
  Indian pudding, 62.
  mineral elements in, 299.
  mush, fried, 123.
  rice, boiled and steamed, 57.
  rice pudding, 62.
  spoon bread, 183.
  See also BREAKFAST FOODS.
Cheese, composition of, 282.
  cottage cheese, 277.
  digestibility of, 284.
  effect of extreme heat on, 281.
  manufacture, 283.
  mineral elements in, 299.
  pudding, 281.
  soufflé, 132.
  wafers, 79.
  Welsh rabbit, 281.
Chicken, 198–201.
Children, food for, 277–280.
  foods bad for, 277–279.
  food requirements for, 280, 301.
  habits of drinking, 280.
  habits of eating, 279.
Chocolate, 84–85, 236.
  sauce, 135.
Coal, 100.
Cocoa, chocolate and, 83–85.
  composition of, 85.
  effects of, 85.
  for children, 277.
  making, 83.
Coffee, 79–82.
  buying, 81.
  composition of, 81.
  effects of, 81–82.
  for children, 277.
  making, 79.
Combustion, 98–103.
Condiments, 86–89, 278.
Cookies, gingersnaps, 241.
  oatmeal, 83.
  sugar, 241.
  See also WAFERS.
Cornstarch, manufacture of, 136–138.
  mold, 135.
  thickening power of, 135.
Cream, 262.
  whipped cream pudding, 263.
Cream soups, 142, 261.
Croquettes, 132.
Croutons, 142.
Cucumber pickles, 20.
Custard, baked, 267.
  boiled, 267.
  frozen, 268.
  junket, 277.

DINING ROOM, 214–216, 287–292.
Dinners, 194, 213.
Doughnuts, 258.
Drafts, 104–107.
Dumplings, 180.

EGGS, 47–50.
  boiled, 40–41.
  buying, 48.

Eggs — *Continued*
composition of, 47–48, 262, 282.
cooking temperature of egg white, 40.
cost, 48.
digestibility, 49–50.
fat in, 262.
freshness, 39, 48.
milk and, 267.
mineral elements in, 299.
omelets, 122–123.
poached, 46–47.
preservation of, 49.
scrambled, 115.
solubility of egg white, 46.
stuffed, 41.
tests for freshness of, 39.
Electricity, 103.
Energy, 153, 154.
total daily requirements, 154–155, 280, 297–299, 301.
Extractions, 170.
Extracts, 89.

FAT, caloric value, 154.
clarification of, 258.
composition of foods rich in, 259.
cost, 261.
digestibility of, 260, 261, 274.
emulsions of, 285.
in butter, 262–266.
in eggs, 262.
in meat, 170.
in milk, 268, 270, 274.
in pastry, 254, 256.
Fireless cookers, 116–117, 149.
Fish, baked, 202.
boiled, with egg sauce, 203.
buying, 205–206.
chowder, 208.
composition of, 203–205.
croquettes, 132.
digestibility, 206.
effect of different ways of boiling, 203.
scalloped, 203.
Flies, 24.
Flour, bread, 130–131, 133–134, 234–235.
composition of, 133.
kinds of, 231–232.
graham, 231.
mixtures, 217–219.
manufacture of, 130–131, 133–134.
pastry, 234–235, 255–256.
rye, 232.
weight of, 231.
white wheat, 231–232.
Food, daily amount necessary, 152–157, 280, 297, 299, 301.
composition of, 155–157.
cost of, 157.
for children, 277–280, 301.
fuel value of, 155–157, 304–312.
lacking in mineral elements, 152.
laxative effect of food, 5, 64.
mineral elements in, 152, 299.
preservation, 20, 28, 29, 270.
Freezing, 90–94.
See also under ICE, ICE CREAM, SHERBET.
Fritters, apple, 220.
Frostings, 234.
Fruit peel, candied, 95.
Fruit, buying, 3, 6.
canning, 7, 8, 12.

Fruit — *Continued*
composition of, 3, 14–16.
cooking of, 2.
cost of, 3, 6.
digestibility of, 5.
for children, 278.
laxative effect of, 5.
mineral elements in, 5, 152, 299.
nutritive value, 4, 5.
pickling of, 20, 25.
spoiling of, 1, 7, 8–12.
Fuel value of food. *See* FOOD, FUEL VALUE OF.
Fuels, 98–103.
acetylene, 102.
alcohols, 102.
coal, 100.
gas, 101–102.
gasolene, 102.
in body, 153.
kerosene, 101.

GARBAGE, 24.
Gas, 101–102.
Gas stoves, 109–113, 117.
Gasolene, 102.
Gelatine, 191–194.
Bavarian cream, 192.
from meat proteins, 170.
in soups, 189.
Irish moss, 194.
jellied prunes, 213.
lemon jelly, 192.
snow pudding, 192.
Spanish cream, 195.
vegetable, 193–194.
Gingerbread, 238, 261.
Gingersnaps, 241.
Gluten, 130–131, 185, 246–247.
Greens, cooking of, 151.
Griddlecakes, sour milk, 224.
sweet milk, 226–227.

HEAT, conduction of, 115.
convection of, 115.
radiation of, 114.
Height and weight, 300–303.
of boys, 302.
of children, 301.
of girls, 303.
of men, 300.
of women, 300.
Hot-water systems, 119–120.
Hundred-calorie portions, 157, 304–312.

ICE, lemon, 91.
Ice cream, frozen custard, 268.
Philadelphia, 263.

JELLY, covering, 17.
apple, 13.
grape, 13.
making, 15, 19.
principles of making, 15–18.
prunes, 213–214.
repeated extractions for, 17, 19.
storing, 18.
sugar in, 16, 19.
Jellying, tests for, 13.

KEROSENE, 101.
Kitchen arrangements, 287–292.
Kitchen ware, selection of, 120–121.

LABORATORY LESSONS, supplementary, 313–314.
Lamb, 172–173.
Leavening, air, 221, 256.

Leavening — *Continued*
baking powder, 226, 228–229.
carbon dioxide, 221.
in cake, 236.
in pastry, 256.
principles of, 220.
soda, 222–225.
water vapor, 221, 256.
yeast, 221, 240–243, 246, 247, 248.
Luncheon, 292.

Macaroni, 131, 136.
Marguerites, 95.
Marshmallow wafers, 74.
Meals, balanced, 293.
See also Menu-making.
Meat, beef, 171.
beef, chipped, 130.
beef, cuts of, 177.
beef, mineral elements in, 299.
beef, roast, 175.
beef stew, 180.
beefsteak, 176.
beef tea, 189–191.
broth, 189.
buying, 171.
care of, 174.
chicken, 198–201.
composition of, 169–170.
consumption of, 181, 187.
cooking of, 175–176, 179–180.
cuts of, 171–174, 176–178.
dangers from, 181–182.
digestibility of, 201–202.
extract, 189–191.
for children, 279.
inspection, 181–182.
in the dietary, 293–294.
juice, 190.
lamb, 172–173.
left-overs, 183.
left from soup, 191.
meat cakes, 168.
mutton, 172–173.
pork, 173.
poultry, 200–201.
soups, 188–191.
structure, 168–170.
veal, 171–172.
Menu-making, 293.
Meters, gas, 111–112.
Micro-organisms, bacteria, 21–24, 181, 182, 247, 248, 270–271.
conditions favoring growth, 25–29.
molds, 8–12, 25–29.
yeasts, 21–24, 25–29, 221, 240–243, 246, 247, 248, 253.
Milk, acids and, 272–275.
boiling, 275.
buttermilk, 265–266.
certified, 271.
composition of, 268–269.
dangers from, 270–271.
effect of heat on curd, 276.
eggs and, 267.
fat in, 274.
for children, 278.
mineral elements in, 274–275, 299.
pasteurized, 271.
proteins in, 274.
sour, uses of, 277.
souring of, 275.
value in diet, 275.
Mineral elements:
acidity and alkalinity, 66.
daily requirement of, 157, 298–299.

Mineral elements — *Continued*
foods lacking in, 152.
in cereals, 299.
in cheese, 299.
in eggs, 299.
in foods, 152, 299.
in fruits, 5, 152, 299.
in milk, 274–275, 299.
in nuts, 299.
in potatoes, 37.
in vegetables, 146, 149, 152, 299.
in water, 299.
use of, in body, 65.
Molasses, 225.
Molds, 8–12, 25–29.
Muffins, 230.
Mush, fried, 123.
Mutton, 172–173.
Myosin, 170.

Nuts, composition of, 184.
mineral elements in, 299.

Oils, 258–261.
Oleomargarine, 265.
Omelets, 122–123.
Oysters, 207–212.
composition of, 209.
cooking of, 207.
cultivation of, 210–211.
stew, 207.

Pastry, 254–256.
digestibility of, 256.
Peaches, sweet pickled, 25.
canned, 7.
Peas, creamed, 139.
Pectin, 13, 15, 19–20.
Pickles, cucumber, 20.
sweet pickled peaches, 25.
Pies, apple, 255.
Pop-overs, 216–217, 221.
Pork, 173.
Potatoes, boiled, 30–31.
buying of, 36.
composition of, 31, 33, 35.
digestibility, 37.
mashed, 31.
mineral elements in, 34, 37.
preparation for the table, 36, 37.
salad, 119.
scalloped, 98.
stuffed, 104.
sweet, 38.
Poultry, 200–201.
Preservatives, 20, 28–29, 270.
Pressure cooker, 41.
Protein, 34, 152, 183–187.
calorie value, 154.
daily requirement, 155, 186–187, 298.
in meat, 170.
in milk, 274.
Pudding, cheese, 281.
chocolate bread, 108.
corn pudding, 176.
Indian pudding, 62.
rice, 62.
rice, boiled, 57.
whipped cream, 263.

Receptions, 95–97.
Refrigerators, 117.
Rice, boiled and steamed, 57.
Rice pudding, 62.
Rolls, Parker House, 249.

Saccharin, 166.
Salads, 287.
potato, 119.

Salad dressings, boiled, 286.
French, 151.
mayonnaise, 285–286.
sour cream, 151.
Sandwiches, 96.
Sauce, chocolate, 135.
egg, 203.
fat in, 268.
tomato, 136.
white, 129, 132, 142.
Serving, 195–198.
Sherbet, lemon, 91.
lemon milk, 273.
Soda, 222–225.
baking powder and, 229.
cream of tartar and, 229.
molasses and, 225.
sour milk and, 189.
Soufflé, cheese, 132.
Soup, beef broth, 189.
beef tea, 189–191.
chowder, 208.
cream of celery, 142.
cream of onion, 146.
cream of potato, 142.
cream of tomato, 273.
gelatine in, 189.
principle of cream soup, 142.
split pea, 195.
tomato, 213.
Sour milk, 223–224, 229.
effect of heat on, 276.
griddlecakes, 224.
Sponge cake, 227.
Spoon bread, 183.
Starch, 56, 57–61, 64, 128–129.
cooking of, 59.
cornstarch, 135.
digestion of, 59–60.
effect of moist heat on, 139.
manufacture of, 57.
mixing with liquids, 137.
tapioca, 56.
Stoves, coal, 105–107.
fireless cookers, 116–117.
gas, 109–113, 117.
Sugar, 165–166, 278.
beet, 160–161.
candies, 162–163, 278.
cane, 160–161.
composition of foods containing sugar, 164.
crystallization of, 163.
digestion of, 161, 166.
in baby-feeding, 274, 278.
in cake, 236.
in milk, 274.
manufacture of, 160–161.
stages in sugar cooking, 162.
test for, 159.
Syrup, 123.

Table-Manners, 123–128.
Table-setting, 67–72.
Tapioca, apple, 57.
Tea, black, 75, 77, 88.
composition, 77.
effects of, 78, 81–88, 277.
green, 74, 77, 88.
making, 75, 77.
Thermos bottles, 117.
Tomato, sauce, 136.
soup, 213.
soup, cream of, 273.

Veals, 171–172.
Vegetables, beets, 159.
buying, 147.
cabbage, scalloped, 142.
canned, 140–141.
carrots, 139.
classification of, 143–145.

Vegetables — *Continued*
composition of, 144.
cooking, 146, 149, 158–159.
corn pudding, 176.
for children, 278.
freshening, 147, 149–150.
green vegetables, 149–151.
in fireless cooker, 149.
lettuce, 150–151.
mild flavored, 158–159.
mineral elements in, 146, 149, 152, 299.
onions, scalloped, 142.
peas, creamed, 139.
spinach, 151.
squash, 158–159.
strong flavored, 146, 149.
turnips, creamed, 168.
Vegetarianism, 186–187.

Wafers, cheese, 79.
Marguerites, 95.
marshmallow, 74.
Water, 30, 39, 41–45, 46, 152.
classification of, 4.
drinking, 43–44, 45, 280.
hot-water systems, 119–120.
mineral elements in, 299.
necessity to body, 42–43.
relation of surface to evaporation, 51.
safe, for drinking, 45.
stages in boiling, 32.
uses in cooking, 30, 39, 42, 46, 51.
Weight and height, boys, 302.
children, 301.
girls, 303.
men, 300.
women, 300.
Wheat, 130–131, 133.
See also Flour.
White sauce, medium, 129.
thick, 132.
thin, 142.

Yeast, 21–24, 25–29, 221, 240–243, 246, 247, 248, 253.
as a leavening agent, 221.
cakes, 241–242.