

FOODS
AND
THEIR
USES
—
CARPENTER

CARPENTER INDUSTRIAL READER

FOODS
AND THEIR USES



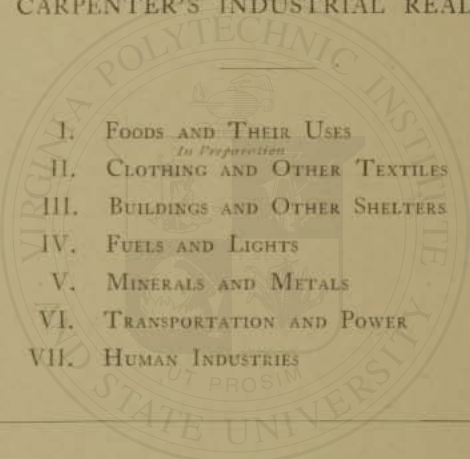
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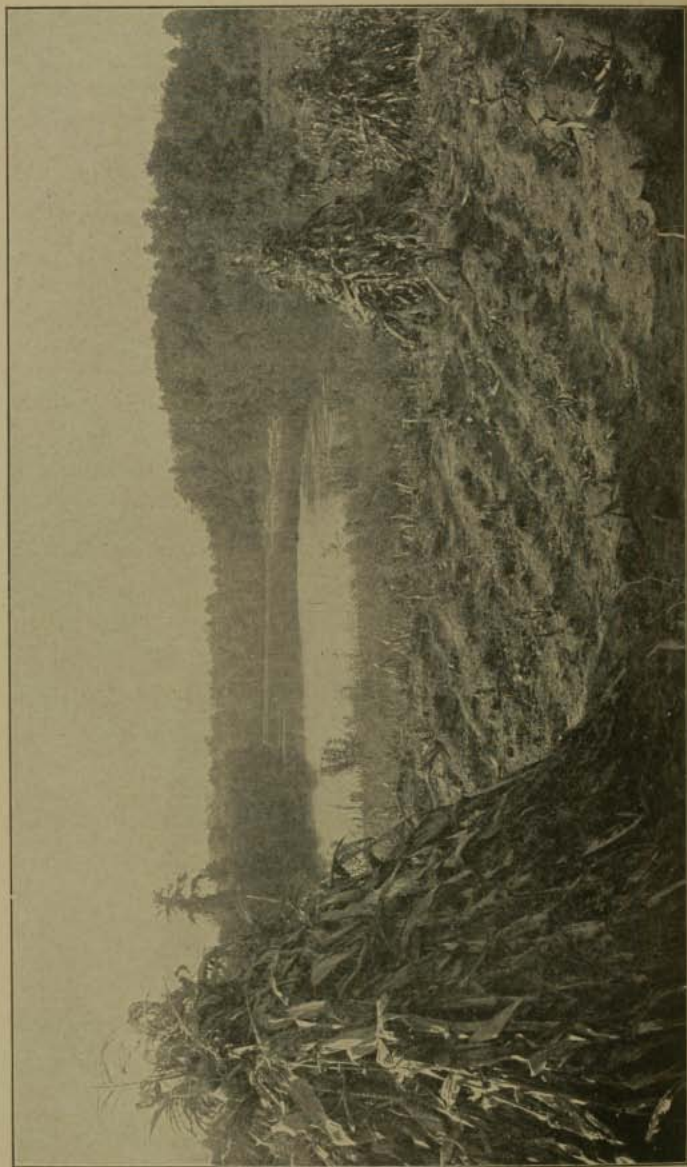
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Cornfield at Harvest Time

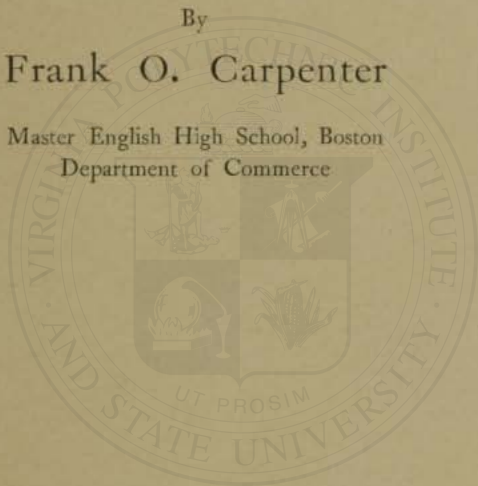
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Foods and Their Uses

By

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Department of Commerce



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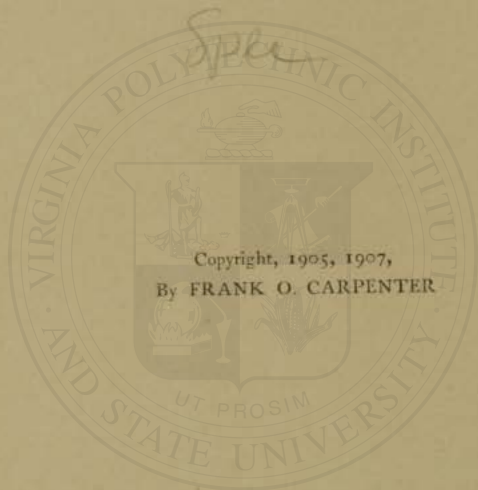
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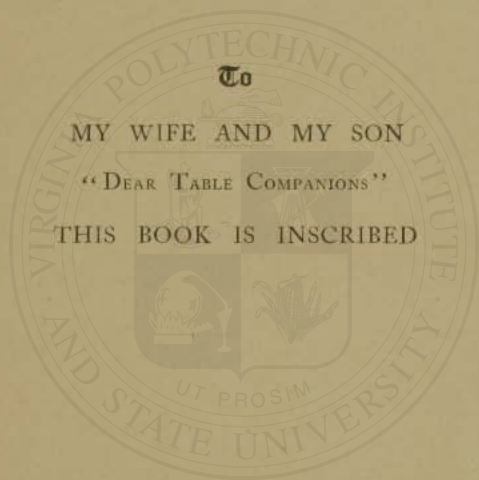
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To

MY WIFE AND MY SON

“DEAR TABLE COMPANIONS”

THIS BOOK IS INSCRIBED

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CHAPTER I

WHERE YOUR DINNER CAME FROM

I WONDER if you ever stop to think when you eat your dinner, of the people scattered over the world, who have worked through many days and nights, in order that you may have the food you need to keep you alive and well. You are fond of reading stories of brave men who fight in war for their country, but just as brave men have fought in storms, in cold, in heat, and with all kinds of difficulties in order to prepare the foods for your dinner. I am sure you would be surprised to know what long distances the different articles of food have travelled in order to reach your table.

For example, we will suppose that you had for dinner to-day—

ROAST BEEF AND POTATOES	
CANNED FRENCH PEAS	
BREAD AND BUTTER	COFFEE JELLY
ORANGES, NUTS, AND RAISINS	

First, in order that you may eat comfortably, hundreds of men have cut down trees around the Great Lakes and sawed

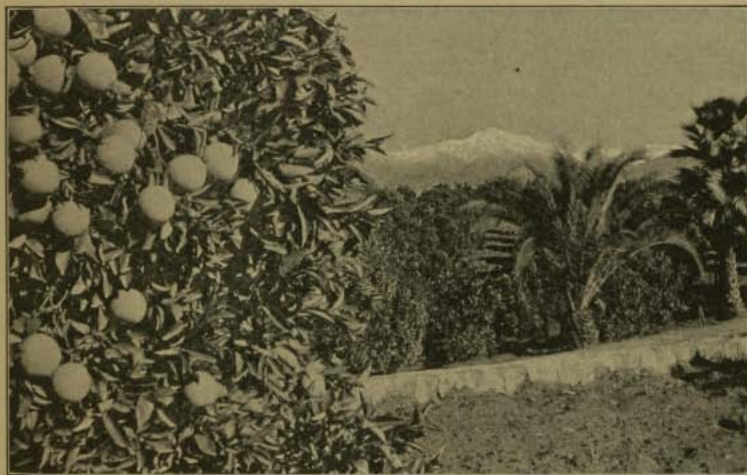
them into boards, which were made into tables and chairs in central Michigan. The white tablecloth was made in Ireland, from flax that was grown in France or Holland. The steel of the knives was made, perhaps, in England from iron that was mined in Sweden. The silver forks and spoons were made of silver from mines in the famous silver district of Nevada. The china dishes were made in France or Germany. The glass tumblers were blown in Pennsylvania, while the decorated teapot that your mother likes so well was made and painted under the cherry trees in far-away Japan.

Second, several years ago some cattlemen on the western plains began to grow young beef animals for market, and for two or three years these animals wandered up and down over the prairies, grazing in the summer, and in winter being fed with corn and hay. When they were old enough they were sent to the great cities, Chicago, St. Louis, Kansas City, and Omaha, where they were killed and the meat prepared for use. It was then put in refrigerator cars and sent to the market where your meat was bought.

The potatoes may have been raised near home, but it is more likely that they were grown in Prince Edward Island, in Bermuda, or in the southern United States. The green peas were grown and canned in France and brought over the Atlantic hundreds of miles for you.

If you should go to Dakota or Minnesota, you would see great fields of wheat so wide that if you stood in the middle of one of them, you would be, as it were, out of sight of land, just as if you were at sea, and it would be very much like it in another respect. As the wind sweeps over the broad plains the wheat rises and falls just as the sea waves do, and the color would remind you, too, sometimes, of the waters of the sea. This wheat was harvested, then ground into flour, and came many long miles overland for your dinner. The butter was made from milk of cows raised on farms in Vermont or central New York.

The coffee with which the coffee jelly was flavored, came from far-away Java in southern Asia, where it was picked in the hot, sunny fields by little brown-skinned children just about as old as you. The oranges were grown on the Pacific slope in the fertile orchards clustering about the foothills of the Rocky Mountain peaks, which are always white with snow, though within the orange orchards it is always summer. The



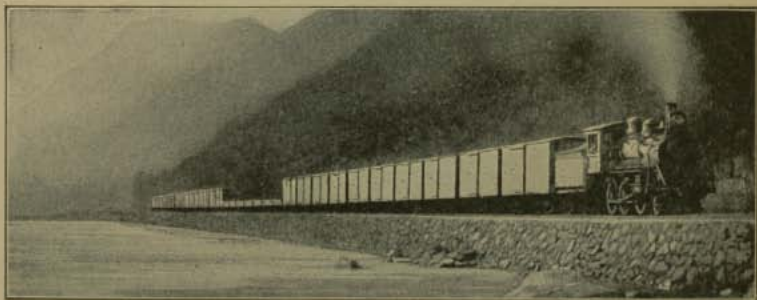
Orange Orchard in California

raisins for your dessert came from Spain. The dark-eyed Spaniards loaded them on their mules, wearing their tinkling bells, and carried them down the mountain paths to the shore, to be sent over the sea to you. Even the nuts with which you end your dinner have come from all over the world. You have English walnuts, perhaps, which should be called Naples walnuts, which come from Spain and Italy. You have almonds from Greece or Turkey or California. Far up the waters of the Amazon, two thousand miles away from us by sea, and a

hundred miles or more up the river, in the land where the monkeys swing from tree to tree, and watch the men at work, the Castane or Brazil nuts were gathered for you. The filberts and pecans came from Texas.

So you see, hundreds of thousands of men all over the world have worked for months at a time to get your dinner ready to-day. Thousands of sailors in steamships and sailing vessels have brought these foods across the seas. Everywhere in the world men are working by day and by night, the whole year through, in order that some other men, women, and children, *whom they do not know*, may have food for their daily work in life. There are about two billions of people in the world, and more than half of them spend their whole lives growing plants or rearing animals to supply the food that all men must have.

You will find it is just so with regard to clothing and buildings, and the other needs of life. You will think of this sometimes, perhaps, when you are older and doing your work in the world, and will wonder what far-away people in other parts of the earth will eat the food you have helped to make, or live in the houses made from the materials that you have worked upon.



Bringing Food by Railroad

CHAPTER II

KINDS OF FOOD

IF, then, most of us are hard at work preparing food for the other people on the earth, it will be interesting to consider what the different kinds of food are, what parts of the world they come from, what the uses of food are, and why we need it at all.

Ages and ages ago, so very many years ago that you could not imagine the length of time if you tried, men began to live on this earth. They were naked savages who lived in a warm climate, where they needed no clothing and were not much better or more intelligent than the animals which were about them. They did not know how to prepare food for themselves and merely took it, as the animals did, from the trees and bushes around them. When they had eaten up all the food in one place they wandered on until they found another spot where food was abundant.

At first men ate only vegetable or plant food, such as the fruits that grew in abundance about them. When the fruits were not plenty enough, they ate the seeds of the grasses if they became hungry, and found they nourished them even better than the fruits. They tried all kinds of grasses, and at last found there were *eight* which were good to eat. Men have lived on the earth thousands of years since that time. They have often been hungry and have tried to eat almost everything that grows on the earth in the way of plants, but they have not been able to find any other food grasses

but these eight, which we call *cereals*, and which people use to-day all over the world to make into bread.

These eight are *wheat, corn, rye, oats, barley, buckwheat, rice, and millet*. Most of these you are familiar with, and very likely you have eaten food made from them all except the millet, and yet, many millions of people in southern Asia would die if it were not for the millet seeds, which form their principal food throughout the year.

After men learned to eat grass seeds, they found that inside the hard nutshells was a rich, palatable food. They also learned to dig in the earth after roots of various kinds, which have been developed into the vegetables of to-day.

There came a time at last when the climate grew cold; the snow fell, the plants would not grow, and men grew very hungry because they could not find the fruits and grass seeds. Then, rather than starve, they ate the flesh of the animals that were about them, and found that they could live on that through the winter, until nature, in the summer time, brought a new harvest of fruits.

By and by when the supply of wild animals grew less, men learned to tame some of the milder-tempered ones, so that they could keep them about their families, and raised them for food. The people still wandered from place to place, but they took their flocks and herds with them. Thus they became what we call pastoral or nomadic people: nomadic, because they wandered; pastoral, because they kept flocks and herds.

After they had wandered a good many years, they learned to plant the grass seeds and raise crops for themselves, and to assist nature in providing a supply of plant food for the winter time. When they did this they were forced to stay in one spot, such as some fertile valley, where there was plenty of water, because they could not carry the heavy masses of grain about with them as they drove their sheep and goats and cows. So the pastoral people became agricultural people, that is, farmers,

and where they stopped in those ancient times and began to till the soil, men still live in the world and raise foods of various kinds.

Sometimes, men beside the great lakes and rivers, or on the seashore, when they were hungry and could not find animals on the land, or enough plant food, learned to catch the quick-darting fish in the streams or in the sea, and found that they would support life comfortably, and from that time to this



Highland Cattle

thousands of people have used fish, either fresh or preserved, as a very large part of their food.

Then men, having tried the animals and the fish, naturally enough tried the birds, and found them to be especially delicious. When they became farmers they learned to tame or domesticate some of the birds, and so we have the poultry of to-day, the hens, geese, and turkeys.

When men wandered very much they did not raise cows, but they had sheep and goats, horses and camels. They did not raise beef cattle because they are heavy, walk slowly and get tired easily, and when robber bands swept down on a weak

tribe they could easily be stolen. But when men became farmers they began to raise them, not only for their flesh but for their milk, and they soon learned to make butter from the fat or cream, and cheese from the rest of the milk. We call these foods *dairy products*.

Men tried everything in the air, on the earth, and in the water as food, and found most of them good to eat. Just a few, they learned, would make them sick, perhaps kill them, and they learned to let these alone and called them poisons; and we to-day, with all our civilization, know very little more about the poisonous plants and animals than ancient man did, so many centuries ago.

Sometimes when men could not find anything else to eat, either flesh, fish, fowl, or plant, they tried, in despair, to eat the earth itself in a vain hope that it would keep them alive. It never did, and it never will probably; and there are no kinds of food that are *mineral* which will keep men alive to-day. But, perhaps you will say that we use salt, and we use cooking soda and baking powder. These are not really foods; we use the salt to give a pleasant taste to the food, and as a sort of tonic to quicken the circulation of the blood and help the stomach to digest the food.

The cooking soda and cream of tartar and other baking powders, when mixed with water in food, turn into a gas which tries to get out of the food, and in so doing makes it rise, that is, become porous. It finally escapes into the air, and nothing remains in a loaf of bread, for example, of the baking powder that was put in it, but some harmless mineral.

While men were trying all sorts of plants for food, they found some that had a pleasant taste, although they would not keep men alive, and they learned to use what we call spices and mix them with their foods. These spices are cloves, cinnamon, pepper, nutmeg, allspice, mustard, and many others.

There is another kind of food, of which the world to-day uses enormous quantities, but ancient man did not have it at all. Even the Greeks and Romans, a couple of thousand years ago, did not have it except in a very few cases, when it was used as a medicine. It was in many fruits, as in grapes, but men did not know it. This very important food material is *sugar*, which is, perhaps, the food which the people in the world to-day like best. It is produced every year in a larger quantity, but people never have enough of it.

The ancients had just one kind of sweet food, and that was honey, for the bees were wiser than men and learned to find sugar in the plant juice, to extract it from the blossom and store it away in those curious eight-sided cells of the honey comb, which they made from a plant gum we call wax, which they also found in the blossoms. It is only a couple of hundred years since the use of sugar became common in the world, but its use has increased so fast that there is scarcely a boy or girl who will read this, who would not rather have some candy to eat than any of the other foods which we call substantial.

Like sugar, in some ways, are the *starches*, as tapioca and sago, and *gums*, as gum arabic that is used in gumdrop candy.

Many plants, too, contain *oils*, as the olive, cottonseed, and corn. These are good foods, and we use them very much in making salads.

With food men must have, of course, water to drink, and it is found abundantly all over the world. At first men drank nothing but water, the only time in the history of the world, perhaps, when men were all teetotallers. By and by they learned to heat water and to cook things in the boiling water, and they learned that by so doing they could get very pleasant flavors from their food and make what we call soups. As they tried everything, they tried to boil the leaves and stems and seeds of plants to see what would happen, and dis-

covered the "beverages," that is, things to drink. These are tea, coffee, cocoa, chocolate, and maté, which is used so much in South America in place of tea.



City Market

So through long years, men have discovered, tried and tested the different kinds of food which you can see if you visit some great grocery and provision store, or walk down past the countless stalls loaded with meat, vegetables, fish, and fruit, which fill the counters in a large market of a great city.

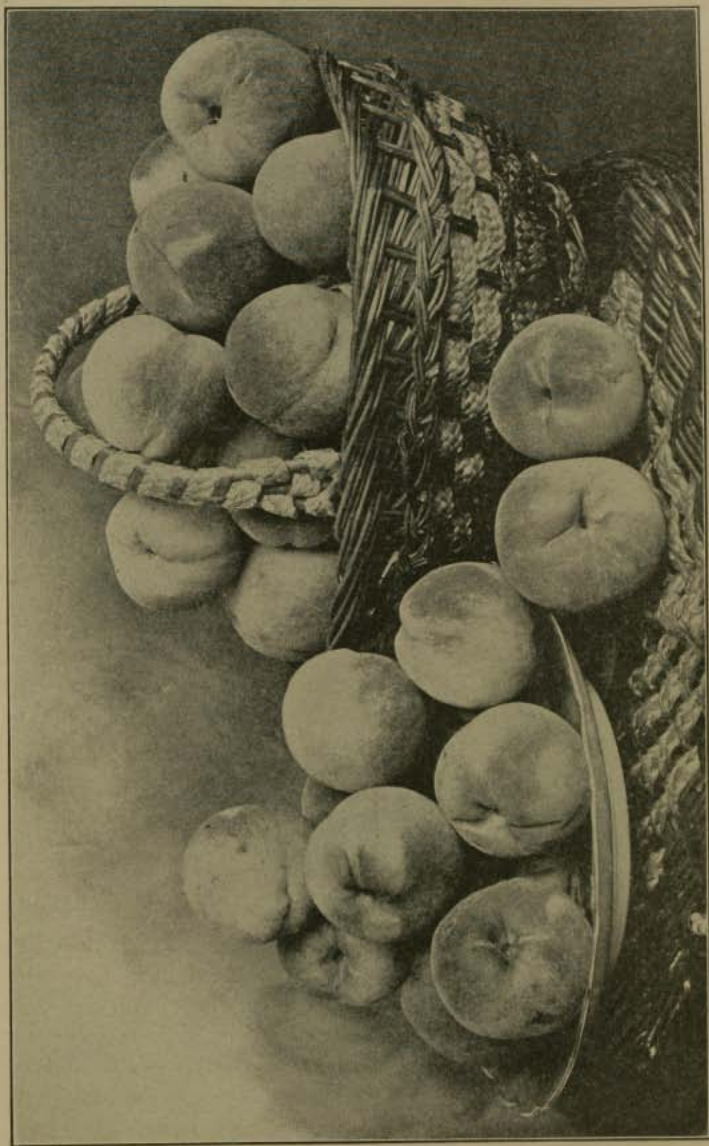
CHAPTER III

USES OF FOOD

If so many people in the world spend their whole life preparing food for other people to use, it is worth while for us to think what the uses of food are, and why we need it at all. Suppose we did not have any food at all to eat, what would happen? You say we would die in a little while. Therefore we need food to keep ourselves alive, but there are other uses, too. The child needs food so that he may grow. The tired man needs food that he may rest and get strong again for the next day's work. The cold man needs food to keep himself warm. The exhausted man needs food to restore his energy. The sick man needs food that he may become well. So that we have five uses or needs for food: 1. Growth; 2. Repair; 3. Heat; 4. Energy; 5. Medicine.

GROWTH AND REPAIR

Every time that you move a muscle, as, if you lift your hand to your head or lift your eyes, a certain amount of muscle tissue is worn out in the body. The body is made up of cells, and every time that you make any exertion some of those cells wear out. If you did not rebuild those cells you would soon die. The child in growing, not only needs to replace the worn-out cells which he uses up fast in his play and active work, but also he needs more cells in order to grow larger. These cells joined together are called tissue, and we speak of worn-out tissues of the body. Therefore, we need foods to restore this loss, and we call them "tissue builders" or "tissue foods."



Peaches

HEAT AND ENERGY

If you were in tropical lands, you would be hot, and you would be satisfied to have fruit, vegetables, and other plant food, and you would not care much for meats. If, on the other hand, you were in Greenland, you would be very cold. You would need to eat fat meat to keep warm and you would not care so much for fruits. So that, you see, the kind of food you would want would vary according to the part of the world you were in, and as the climate was hot or cold. The reason for this is, that some kinds of food give more heat than others, and we call them "heat producers" or "heat foods." In the natural world, if you do not have heat you cannot have energy, and it is just as true of the human body, therefore, to keep up a man's energy, he must eat a certain amount of food that gives heat, and we call those foods "force givers," or "energy producers."

Chemists have found by studying the different kinds of food that they are made up of various elements, such as oxygen, hydrogen, nitrogen, carbon, phosphorus, sulphur, and others. You know that oxygen and hydrogen burned together form water, and that oxygen and nitrogen mixed together make the air that we breathe. You know that we burn carbon in our furnaces in the form of wood and coal. Three-quarters of the human body is water, and the other quarter is made from foods which contain nitrogen, carbon, oxygen, and the others. In our bones and teeth we must have phosphorus and lime. The doctors and chemists together have found that the foods we need to build the body, or to replace the worn-out cells nearly always contain nitrogen, and the foods that we need for heat and energy contain carbon.

You all know very well, I suppose, how a fire is kept up in a furnace, and that whether you burn wood or coal, you put the fuel into the furnace, set it on fire, and it burns. Now

burning means that the carbon when heated unites with the oxygen of the air and forms a gas called carbon-dioxide or carbonic-acid gas. This gas is drawn out of the furnace through the chimney. As the carbon burns it gives off heat.

After the fire is over you have left ashes and clinkers, which have to be taken away from the furnace constantly in order that the fire may burn brightly and steadily. Your body is exactly like a furnace, and it is necessary to burn fuel in it just as in the furnace in order to keep up the heat. Oxygen unites with the carbon in the body as it does with the carbon fuel in a furnace. Just as long as you supply enough fuel of the proper kind the body will keep warm and life will continue.

There is one thing that you need to remember, and that is, that the walls of the furnace and the bolts themselves will wear out and need to be repaired. When you wish to repair a furnace you have to stop the fire, take out all the fuel and ashes, and let it cool while you put in the new parts and then start the fire again. But with the body, it is very much as if you could burn with the fuel, bits of iron and brass and lead, which would repair the broken down parts of the furnace without stopping the fire, because the body once cooled off is dead, and cannot be started again. Therefore, all the material for use in the human body which we call food and which is intended either for growth or repair or heat, is taken into the mouth and stomach, and afterward is changed to the proper form and is transported to those parts of the body where it is needed.

TISSUE FOODS

The foods which repair the tissue and which we call "tissue builders" or, "tissue foods" generally contain much nitrogen. These nitrogen foods or "nitrogenous foods" as they are usually called, have also another name with reference to their use in the body. This name is *proteids*, that is, foods composed of

the substance *protein*. All *proteids* are *tissue* foods. Proteid food makes up a large part of all animal food and forms the albumen of the egg, the casein of milk, from which we make cheese, the fibrin of meat, and the gluten of cereals. The nitrogen foods are harder to produce than the other kinds, and therefore they cost more. That is one reason why beef and wheat flour cost more than vegetables.



Rib Roast Beef, a Tissue Food

HEAT FOODS

Heat and energy foods or "heat givers" are of two kinds:

a. Carbohydrates, b. Fats and oils.

Carbohydrates is rather a long word but you can remember that they contain carbon, and are therefore "carbon foods." They are mostly forms of starch and of sugar. Their duty in the body is to burn, that is, unite with oxygen, as carbon always does, and furnish heat. If you eat too much starch and sugar, more than you can burn at the time, the surplus is stored away in the body in the form we call fat. We find starch in all the cereals and a great many other plant foods, and starch is changed into sugar as follows: If you heat starch with a little moisture it turns into a substance which is called dextrin. If you heat the dextrin somewhat longer it will turn into a substance called dextrose, which is what we call grape-sugar. This we find naturally in a great many fruits and in vegetables.

Sugar as we have it, comes from different sources: first, from the sugar cane; next, from the sugar beet; third, from the maple tree; fourth, from a palm tree, and, lastly, from fruits. Corn yields syrup called glucose which contains a kind of sugar. If you lived in New England, you would look forward in the winter with great delight to the time when the sap begins to run in the maple trees in March, and you could boil the sap down and pour the hot syrup upon a lump of snow and have it cool into a waxy kind of candy, which is a soft maple sugar. If you lived far away near the equator in tropical lands you would probably be a dark-skinned boy or girl, but you would be just as glad there to have your father tap the palm trees and boil down the sap into palm sugar as you would be in the maple orchards of New England.

When you eat raisins or dates you often find little lumps of brown sugar in the wrinkles of the fruit. That is the kind of fruit sugar which Nature herself makes when the fruits are dried. If you take a bit of sugar and burn it in a flame it will give off heat, and you will have left a black substance which looks like a coal and is a bit of charcoal. If you burn the sugar or starch in the body you will have practically the same thing, but the carbon is absorbed in various ways by the body, and you get no solid waste from it. You breathe it out from the lungs as carbonic-acid gas.

FATS AND OILS

When you eat fat meat, or when you eat food made with lard you eat fats. When you have a salad you probably use olive oil for the dressing. Many people have come to use cottolene instead of lard for cooking. Cottolene is made from cotton-seed oil with a little of the best quality of beef fat added to it to make it solid. It is more nutritious and healthful than lard, which is the fat of the hog and a food which is not easily digested.

A fat is a solid; an oil is a liquid. One of the most common animal fats that we all use as food is the cream of milk, which we churn into a solid form as butter. Perhaps the best of all the oils, when it is pure, is that made from olives. Besides olive oil and cotton-seed oil we have other valuable oils in nuts of various kinds, especially in the peanut. In chocolate, which we are all so fond of, there is a very large amount of oil, and that is why it is often said to be too rich for the stomachs of children to digest. If this oil is pressed out of the chocolate it hardens and we call it cocoa butter.

When you see a lamp or a candle burning you see how oily substances can be burned, whether solid or liquid. Candles, you know, are made generally of wax, which is a vegetable substance; of tallow, which is an animal sub-



Seals

stance, or of paraffin, which is a mineral. Kerosene oil is used in lamps in these modern times, but if you had lived long ago in the old Greek days you would probably have used in your little lamp some olive oil, which the people of Greece then used as food.

Before the people learned to get the petroleum from the ground and turn it into kerosene, they had to use the oil of whales and seals in their lamps. We would not think that we could eat the heavy, strong-smelling whale and seal oil to-day, but the Eskimo in the far-away, icy countries of the

North eats seal oil with much delight. These oils and fats, excepting the kerosene, have been used for a long time and are used to-day by different people in the world as food and for fuel. When they are burned in the air, in a lamp, they give out heat as well as light, and when burned in the body, they give out heat in just the same way.

Therefore, if we must have both tissue food and heat food together with plenty of water in order to keep in good health, a complete food is one which contains all these substances. If we had one, then man could live on it for an indefinite time and keep perfectly well. The reason why one cannot live indefinitely on any one kind of our ordinary foods, is because they do not contain tissue and heat foods in the proper proportion. All foods contain water, but not enough, so that we would always have to drink a certain amount of water to keep well, and the grown-up man ought to drink every day about five pints of water.

The only food which is practically a complete food is milk, and infants and young animals for the first part of their life live entirely on it until they have grown large enough for their stomachs to digest other foods. Let us see if the milk contains the necessary ingredients. From milk we get cream, which is churned into butter. This is the fat of milk. What is left after the cream is taken off is skimmed milk or "skim milk." From the skim milk we get casein which is pressed into cheese. This is proteid or tissue food. When the casein is removed we have whey. The whey contains milk sugar, which is a carbohydrate. Mixed with this sugar in the whey there is a small quantity of mineral matter, so that you see that you have in the milk all the kinds of food which are necessary to support human life—fat, proteid, carbohydrate, water, mineral. That is why man can live so long on milk alone, and why milk is such a very popular and valuable food everywhere in the world.

There is no other food so complete as milk, but eggs contain albumen, or the white of egg, which is a tissue food or proteid, and the yolk which is a fat, so that it is possible for a man to live a long time on eggs alone. Wheat flour



Mowing Grass for Hay

contains a large amount of gluten, which is a proteid, and a large amount of starch, which is a carbohydrate or heat food. The reason why wheat is considered the most valuable of all the cereals, is because it contains a larger amount of gluten and starch, that is, tissue and heat food, to the pound than any other one kind of cereal or plant. Peas, beans,

and lentils are foods that contain a very large amount of tissue food, and that is why they are used so much and considered so valuable.

Very few people in the world know these facts about tissue or heat food substances, but they have learned through centuries of use which kind of foods make them feel best, on which they can live longest, and by the use of which they can do their work most easily. The ones they have found out by centuries of experiment, are the same as those which the doctors now tell us we ought to eat. Starch, although so important and so common in our foods, especially as most of it comes from wheat, corn, and potatoes, will not alone support life for any length of time. Sugar, into which starch is turned, will support life for a short time.

Recent experiments with soldiers in Germany and the United States have shown that there is no food which will so quickly rest and restore tired soldiers as sugar, and a larger quantity is now given to the soldier with every day's ration. A ration means the amount of food given to a soldier for each day's use. Mountaineers use sugar when climbing hard peaks for the same reason.

In addition to solid foods and water a very large part of the people of the world drink tea, coffee, chocolate, or maté. They like them because of their pleasant taste, especially if sugar is put in them, and because they feel refreshed and rested after drinking them.

One reason why these drinks refresh us is because they are used hot, and the heat warms the stomach and body and makes food digest better. If you should drink plain hot water, you would be helped as much, but the taste is not pleasant, and we should lose the stimulating effect of the tea and coffee.

There are also some chemical substances that stimulate and rest the body, as thein in tea, caffen in coffee and choco-

late. There is a substance called tannin found in tea not properly made and this injures the body.

The quantity of these substances is so very small in each cup of tea or coffee, that you would have to drink a very large quantity to be hurt much, that is if you are "grown-up" people. The reason why children are not allowed to drink tea or coffee is, that while they are young and active, they do not need any help, and a stimulant hurts them and they do not grow so fast or so strong as they would without it.

You remember men learned to eat meat when they could not find enough plant food.

The habit of eating meat, for it is a habit, and many people think it is a bad one, has been practised for so many centuries that the body has become used to it, so that for most people in temperate zones, a small amount of meat is necessary to keep them in health.

Vegetarians, that is people who believe that nothing but plant food should be eaten, believe that flesh eating is wrong for these reasons:

First, that the human body is fitted by nature to eat and digest plant food only; second, that many very troublesome and dangerous diseases are directly caused by eating meat, as, for example, rheumatism; third, that plant food contains all the food elements necessary to keep the human body in perfect health, and people who eat plant food entirely are just as strong, intelligent and skilful as those who eat meat; fourth, that a man's health of body and brain is dependent on the kind of food that he eats.

While this is all true, it is not likely that people will give up the habit of eating meat, though since the many new and attractive forms of breakfast cereals have been prepared, people eat much less meat for breakfast.

FOOD FOR ANIMALS

The food of animals is much like that of man, but only a very few animals like the lion, tiger, and others of the cat tribe eat meat. The fish eat other smaller fishes or insects that fall into the water.

All other animals eat plant food of some kind.

Man raises animals for two uses, one for food, as the cow,



Gathering Hay on Ox-Cart

sheep, and hog, and for work, as the ox, horse, mule, and camel. But we feed them the same way. We let them eat grass or leaves in the pasture, or in the winter in the stable we give them hay (which is dried grass), corn, or oats. We also give them the poorer parts of the cereals, that we get in grinding them to flour, as bran, meal, etc. Animals also are fond of vegetables and fruits, as turnips, pumpkins, apples, and other kinds.

The animal needs food for the same reasons that man does, and it rests him, keeps him warm and able to work in just the same way it does man.

WATER—AIR

All men and animals alike, in order to live, and be strong must have plenty of pure water to drink, and pure fresh air to breathe. These are not food substances, but if we did not have water, there would be no liquid like the blood to carry the fine particles of food about the body where they are needed.

If we did not have plenty of pure air to breathe, the lungs could not do their work, which is to purify the blood by burning the carbon out of the blue blood in the veins, which carry the waste material, turning this carbon into a gas which we breathe out from the lungs, and then to send the fresh, red blood back into the heart to be driven out through the arteries to every part of the body. So that water and air, though not foods, are necessary that our foods may nourish the body.

CHAPTER IV

CEREALS

YOU learned in the first chapter that very long ago, men had found that seeds of various grasses ground to flour made very valuable food. They had learned to save the seeds from season to season, to plant them in a rude way, to reap the harvest when ripe, and so to provide food for times of hunger. They found eight grasses which grew seeds that were of use. These are **wheat, corn, oats, rye, barley, buckwheat, rice, and millet.** The three most important ones are wheat, corn, and rice. We call these seed grasses **grains** or **cereals.**

The name cereals was given to them, from the name of the Roman goddess Ceres who was called the goddess of agriculture and who was supposed to make all crops grow. Cereals were and often are still called corn plants. The word corn really means "kernel," that is the seed or grain, but it has various meanings in different parts of the world. In the United States it means Indian corn or maize; in Scotland, oats; in England, wheat; in Northern Europe, rye. In the Bible we read that Ruth in the **barley** harvest gleaned ears of "corn" after the reapers; and again that Samson, the strong man, burned the standing "corn" of the Philistines in the time of the **wheat** harvest. In many lands the entire crop of cereals that a country produces is called "corn." In this book, however, it will hereafter mean only Indian corn or maize.

Cereals will grow wherever the soil is fertile, but they grow best and give the largest yield on broad wind-swept plains.

Their stalks are long and slender and bend easily in the wind, but stand up straight again as soon as the wind blows by. The appearance of great fields of cereals when the wind blows over them, is very much as the sea looks when you see the great green waves come tumbling in. In cereal plants the seeds or grains are borne in a head at the top of the long, slender



Heads of the Cereals

stalk in a little husk. The ears of corn grow in much the same way, except that the stalk is shorter, and the husk thicker.

When the cereals are about half ripe there is a time when the grains are very tender and are said to be "in the milk." We eat sweet corn at this time. When the grains are ripe they shake very easily from the husk, and the reason for this is that nature intends that the wind shall blow the seeds away from the parent plant so that they may have room to grow.

Most kinds of food spoil or decay very quickly, but cereals will keep unchanged in a dry place for a great many years. Sometimes one reads interesting stories in the newspapers, telling how a few seeds of grain held in the hand of an Egyptian mummy several thousand years old, found in a pyramid have been planted and produced a crop. These stories are not true, because the grain, although it might keep its food value for thousands of years, would lose in a few years its power to sprout and grow. Cereals give a very large amount of food in a small bulk, which is a valuable thing for men. Wheat has five times as much tissue food material and three times as much heat food as the same quantity of potato. That is, one pound of wheat gives as much food as five pounds of potato.

The cereals are all produced in the same way. That is, they are sowed (planted), harvested (reaped), and milled (ground into flour). Cereals are sometimes used whole, that is, with the grain berry unbroken, and cooked in various ways, but the chief use is in the form of a coarsely ground powder which we call meal or a finely ground powder that we call flour.

Within the last few years a great many different forms of grain food have been sold in the stores under the name of "cereals" or "breakfast cereals." The only new thing about them is that they are different forms of the various old cereals, as wheat, corn, malt, etc., sometimes mixed together and put up in an attractive way as oat meal, shredded wheat, flaked rice, etc. Most of these are good and deserve to be popular, but they do not give any more food value than the older forms of the grains, as flour, and they usually cost twice as much.

There is one way, however, in which cereals are used by all people in the world and that is in the form of bread, which is made of flour mixed with water into a paste or dough with

a little salt and yeast added, and then baked (heated) until the particles of the grain are thoroughly cooked. Cake is only a sweetened bread.

I. WHEAT

If you could be in a balloon or an airship and follow the sunrise as it goes westward around the earth, you would find men everywhere at work raising wheat all day long. If you should begin at Christmas there would not be a week, perhaps not a day, when the people of the world somewhere were not planting or harvesting wheat.

In November and December you would find them harvesting wheat in New Zealand and South Africa, in January in Australia, in February in India, in March and April in Egypt and Mexico, in May in China and Japan, in June in France, Southern Russia, and Southern United States. In July and August the harvest time in Europe has reached Germany, Belgium, and England, and in the United States it has passed through Kansas, Minnesota, and Dakota to Manitoba. In September and October in Scotland, Sweden, and Siberia. In November the harvest begins again in South Africa, so that wheat is being produced for man and by man all the year round. If you look at the map you will see how this march of the wheat goes from the south of the world to the north. It is the only food crop in the world which grows this way, and for this reason it is the most important of all the cereals, although in some countries like the United States, the crop of corn and of oats is larger in the number of bushels. Wheat has been used by man for thousands of years. It was probably first grown in Asia Minor or Egypt and its use spread eastward to China and west into Europe.

After Columbus discovered America it was brought to the new world, and to-day the United States raises more wheat than any other nation in the world and one-fifth of the whole

world's crop. We raise about ten bushels of wheat for every man, woman, and child in the United States, which would make about two barrels of flour for each person.

Wheat was used in olden times as money and we read of a thing being worth so many "measures of wheat." This was because people judged the value of a thing by the amount of human labor it took to produce it, or as we say so many days work of a man. In those times, one day's labor of a man produced at the end of the season a bushel of wheat, so that it was natural that people should measure the value of things by bushels of wheat. Wheat is the only grain which will give a white flour from which we can make a white bread and it gets its name wheat from an old Saxon word which means white.

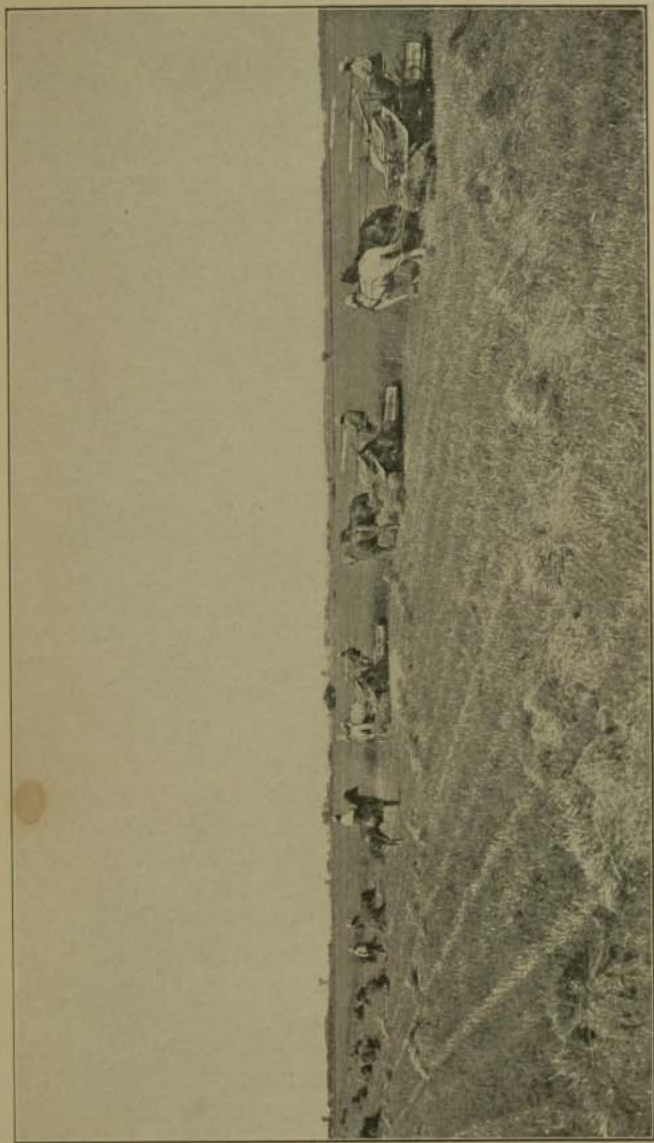
There are three kinds of wheat grown in the world.

1. **Spring wheat**—that which is sown in the spring-time and is reaped in the autumn.

2. **Winter wheat** is that which is planted in the fall, lives through the winter and is reaped early the next summer.

3. **Macaroni wheat** which is like spring wheat in quality.

The spring wheat is harder than winter wheat because it contains more gluten, *i. e.*, tissue food, and we use it to make bread flour. It is grown further north than the winter wheat, in Minnesota, Dakota, and Manitoba. Winter wheat is softer than spring wheat, because it contains more starch, *i. e.*, heat food and from it we make pastry flour. Macaroni wheat is harder than spring wheat and contains more gluten. It makes just as good bread as spring wheat, but its gluten makes it of greater value for making macaroni, Italian paste, etc. The macaroni wheat will grow in a great many places where ordinary wheat will not grow because it does not need so much water, and we are growing more of it every year.



Reaping Wheat in Dakota

PRODUCTION OF WHEAT

IN pioneer settlements a large amount of work must be done by the farmer before he can plant grain. If the country is covered with woods, he must cut down the trees to get open land, and the brush and stumps must be burned. If the land is open, like prairie land, he must plow it and break up the heavy soil so that the sun and the air may make it fit for use, for the new land is often "sour," and will not produce good crops for a year or two. After a while, as the years pass, the fields are cleared and the soil becomes light and fertile, so that modern ways of farming are possible, and these have been wonderfully developed in the United States during the last century.

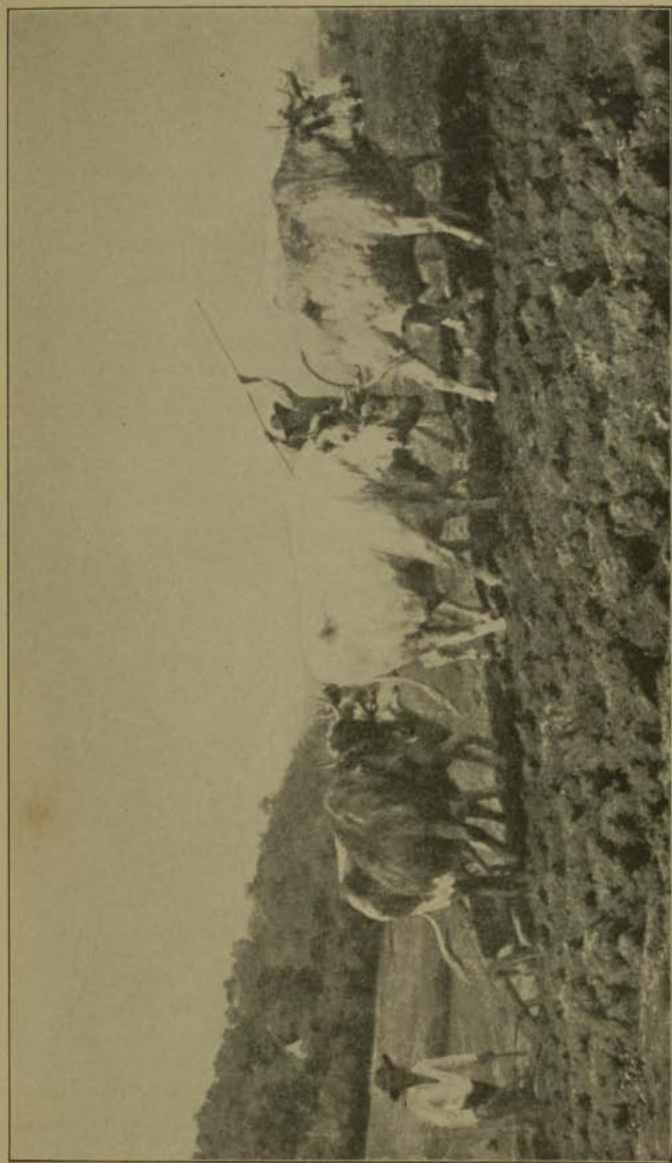
There are seven different operations necessary in the production of wheat, or any other cereal.

(1) **Breaking up the land by hoeing or plowing.** (2) **Fertilizing the soil.** (3) **Sowing the seed.** (4) **Cultivating the young plants until full grown.** (5) **Irrigating, or watering.** (6) **Harvesting the grain.** (7) **Threshing the grain from the straw.** (8) **Storing the grain until used.**

1. BREAKING UP THE LAND

The surface of the earth, except, perhaps in forests, is pressed or caked into a hard crust, or a heavy wet layer. This crust must be broken up into fine particles so that the roots of the little plants may be able to get from the soil the food and moisture they need for growth.

We call soil that part of the earth's surface which is in small particles caused by the wearing off, or "weathering," of the rocks of the earth. The soil is in various forms, such as sand, clay, gravel, or fertile loam or humus. Humus is the dark brown or black soil formed by the decay of trees and



Ploughing with Oxen, France

other wood fibre. It is the most fertile of all soils. The breaking up of the soil is done in two ways.

(a) Spading or Hoeing

Among ancient races, men first made a hole in the ground with a pointed stick, into which they dropped the seed. Later they learned that the grain grew better if the ground



Hand Ploughing, Persia

was broken up, and they invented the spade, by which they could more easily break up the soil.

Another way of breaking up the soil was by turning the handle of the spade at right angles with the blade, so that the man could strike the ground with it. The modern mattock or "grub-hoe" is a good example of the heavy hoe used the world over. The light, strong, American hoe is a recent

invention. The labor of breaking the soil with the hoe is very slow and very hard. Then came the first rude form of the plough.

(b) Ploughing

The first plough was a pointed stick such as men had used to make furrows in the earth by hand, to which an animal was fastened by a rope or stick. You can see these ploughs in pictures of carvings on old buildings in Egypt.

The next step was to put a metal point on the wooden stick, and the modern steel plough which has been made within the last few hundred years is only an improvement of that old form. Ploughing on small farms is done by a single plough drawn by some animal. On large farms or ranches, as in the wheat country, it is done by ploughs drawn by horse-teams which turn several furrows at once. On some great farms, steam ploughs, turning eight to ten furrows at once are used, while the very latest (1905) is an automobile plough that will turn ten to fifteen furrows at once. On the great farms of hundreds of acres, the ploughs go in gangs, one a little after the other, across the plains. They often go straight on all day without turning. One machine can plough twenty miles in a day. The men sleep where they stop work at the end of the day, because cooking and camping wagons follow them.

The ploughing is usually done in the fall, in October, after the grain has been harvested, and the furrows lie through the winter exposed to the frost and the rain, which crumbles the earth. In the spring the fields are harrowed.

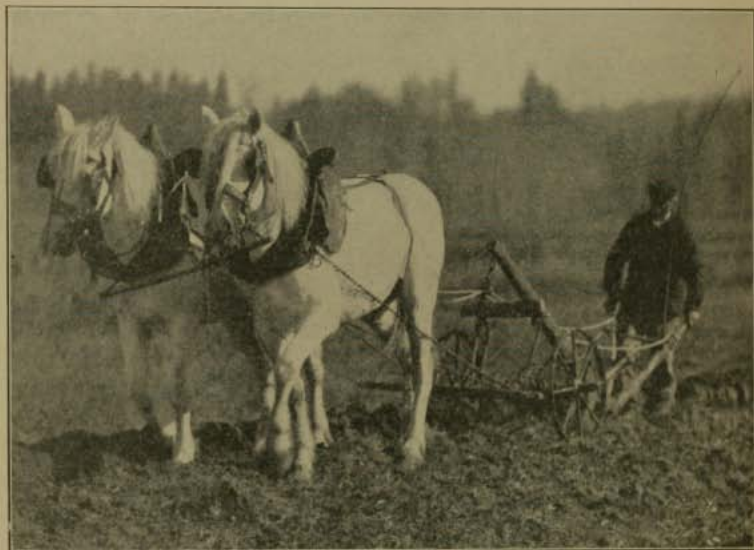
(c) Harrowing

Is the breaking of heavy clods, or lumps of dirt, into fine particles. On some farms this is done by dragging over the ground heavy timbers, armed with strong iron teeth. This harrow is usually shaped like a letter "A." On large

farms the harrowing is done by a machine which has a series of revolving steel discs, which harrows a place as wide as your school-room at once.

2. FERTILIZING

Each kind of plant takes a special kind of food from the soil where it grows, and after several years of the same crop,



Ploughing with Horses, France

the land becomes less fertile for that plant, though it may still be good for other plants. So farmers have learned to plant crops in "rotation," as, 1st year, wheat, 2d year, corn, 3d and 4th years, grass, 5th year, wheat again and so on. By doing this, the soil recovers its former fertility.

The need of "rotation of crops" disappears, and the same crop can be grown every year in the same soil, if artificial fertilizers are used. These are usually barnyard manure, or

commercial fertilizers, as phosphates, guano, nitrates, lime, etc. Guano is a sort of rock formed from the manure of millions of birds that have lived on certain islands for thousands of years.

3. SOWING

After the ground is harrowed, the seed wheat is sown—on small farms by hand, as it has been done for thousands of years, and that is the way it is sown to-day over the greater part of the world. It takes a bushel and one quarter of seed



Steam Ploughing

to sow an acre. On large farms the seed is sown by a machine called a drill, which is drawn by four horses, and can seed a wide strip at once.

4. CULTIVATING

Plants like corn, grown in hills or rows, must be hoed by hand or cultivated by machine, to keep earth about the roots—but wheat, rye, oats, etc., need no cultivating.

5. IRRIGATING

After planting there is nothing to do for several months, unless irrigation is used. When the climate is very dry

and rain rarely falls, water is brought by ditches from some stream or reservoir, and allowed to run in little trenches through the fields.

As you have learned, there are two common kinds of wheat: winter wheat, and spring wheat. The winter wheat is planted in the fall just as soon as the ground is ploughed. It sprouts in the fall, lives through the winter, and is ready to grow quickly as soon as the spring opens.

Water freezes at 32 degrees (Fahrenheit). All plants stop growing when the thermometer falls below 42 degrees, and begin again whenever the temperature rises above 42 degrees, so when the temperature of the earth rises permanently above 42 degrees, after the winter is over, we say, "spring has come." If, in any way, we could, in the winter, raise the temperature above 42 degrees for a week or two, the buds on the trees would begin to swell, the seeds would sprout, and the leaves of the trees might unfold.

Spring wheat is planted in lands that are colder than those where winter wheat is planted. The seed would be killed if it stayed in the ground over winter, so that it is planted in the springtime as soon as the frost is gone. The winter wheat ripens earlier than the spring wheat, but the method of harvesting is the same.

6. HARVESTING

There are five operations necessary in harvesting wheat: (a) Reaping. (b) Binding. (c) Threshing. (d) Winnowing. (e) Storing.

(a) Reaping

Cutting the stalks of the grain. It was done in early times, and is done in the greater part of the world to-day, by the reaper who seizes a handful of the stalks, and cuts them by a stroke

of a curved knife called a sickle. The next step was to cut the wheat by fastening this curved knife to a long stick, and we call this instrument a scythe. When men cut the grain by hand, the stalks are kept together and parallel, but when they are cut by a scythe they are likely to fall in different directions, and to shake out some of the grain. To prevent this they put into the handle of the scythe some long curved wooden teeth, or fingers, which catch



Reaping with the Sickle

the falling stalks and lay them straight side by side. We call this instrument a cradle, and the operation, cradling.

After men had devised these tools, they stopped inventing for a great many years, and made no improvements, until about fifty years ago, just before the War of the Rebellion, when the mowing machine was invented, which cuts the grain and leaves the stalks lying parallel in a long row.

The next machine was one called the harvester, or reaper and binder. This cuts the grain, ties it up in bundles, and tosses it to one side. The latest and most wonderful of these

machines is one that is drawn slowly along the field, cuts off the head of the grain, threshes the kernels from the husk, and puts them into bags.

(b) Binding

After cutting the grain it is necessary to tie it up in bundles, which is called binding. The reaper makes a band by tying



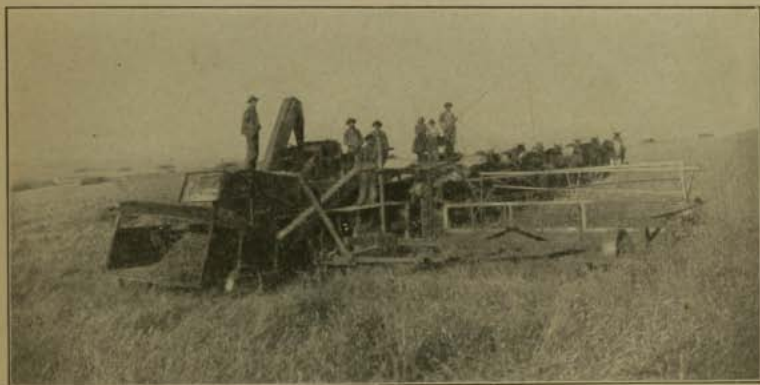
Cradling Wheat

together two small handfuls of wheat stalks. He then takes up as much of the grain as he can hold in his arms easily, puts the band about it, twists the loose ends around each other, and thrusts one end under the band about the grain. The bundle is called the sheaf or shock or bundle. On large farms the reaper and binder machine, as we have said, cuts the grain, gathers it in bundles, ties it with twine, or wire,

and leaves the sheaves or shocks behind the machine in a continuous line.

(c) Threshing

Threshing means to beat the husk of the grain so that the kernels drop out. Threshing, in early times, was done by laying the stalks on a floor, or some flat place on the earth, where the ground had been stamped hard, and then having animals walk about on the grain. This is what is referred



Twenty Horse Harvester

to in the Bible as the threshing floor. This method is still used in Asia. Sometimes men beat the grain with sticks, and the modern form of this stick is called a flail.

In the United States, even on small farms, the threshing is now usually done by machine. The threshing machine takes the grain in the stalk, and passes it through rollers filled with teeth, which beat the seeds from the husk, and delivers the grain into bags ready to be shipped to the mill.

(d) Winnowing

Grain is winnowed by letting it fall through the air on a windy day. The wind will blow away the light chaff, or par-

ticles of husk, while the heavier grain falls straight down. Where grain is threshed by machine the winnowing is done at the same time, by blowing away the chaff. Threshing is done just as soon as convenient after the grain is harvested, because the grain keeps better out of the husk.

The straw that is left after the grain is threshed from it, is used loose as bedding for animals, and for men it is put in mattresses. Sometimes it is pressed into great blocks which are used to build the sides of barns in which the wheat is stored. Your summer hats are often made from the pretty soft straw of wheat stalks.

(e) Storing

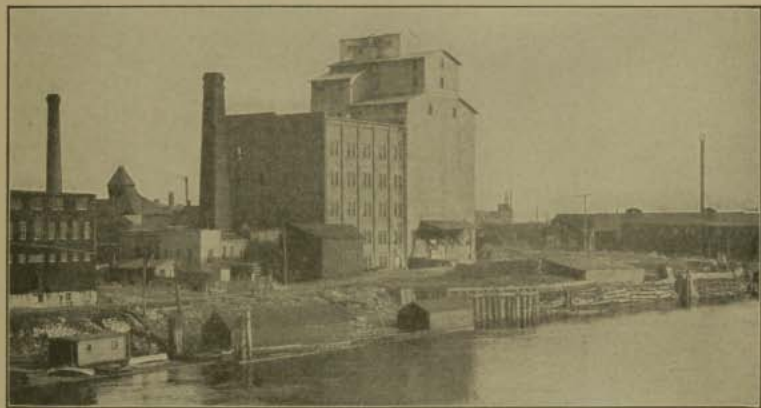
The wheat in bags, or loose, which is called "in bulk," is stored in the farmer's barn until sold, and then it is taken to the nearest railroad town and delivered at the elevators. Elevators are odd-shaped, tall buildings (as you see in the picture) built especially for the storing of grain. At the proper time, when needed, the grain is taken by car from these elevators to the flour mill, or sometimes it is put in steamers which carry it across the ocean.

When the farmer takes his wheat to the elevator, an inspector looks at it, tests it, and grades it according to quality. The farmer's wheat is then put into a great bin and mixed with other wheat of the same quality, which may come from a hundred farms. The chief wheat markets of the United States are Chicago, Minneapolis and Duluth, and the best grade of wheat used for bread is called "A No. 1 hard spring wheat."

WHEAT MILLING

AFTER the wheat is gathered and stored in the elevators, the next process necessary to make it fit for human food is to turn it into flour. This is called grinding, or milling. The separate wheat grain is called the wheat berry. If you cut

it open you will find in the centre, a little ball of white starch; lying next to it is the tiny germ, or plant, which in the ground will sprout and grow. Around these two parts, the starch and the germ, is a thick, tough layer of gluten. Outside the gluten is a coating which contains various mineral substances, which is called the bran layer, and outside of that, to protect



Grain Elevator, Minneapolis

the berry from cold and moisture, is a thin, but very tough, woody covering called the husk.

The starch is the heat food, as I have told you. The germ contains the fat or oil of the grain, and while very useful as a food, it is generally taken out of the flour, because it often turns rancid and spoils. The gluten is the "tissue builder" as you know. Now, these two layers, the starch and the gluten, together with the outer coat of bran, are stored by nature in the wheat berry for the use of the little germ, or plant, when it shall sprout, that it may serve as food for it until it grows strong enough to get its own food from the soil, and the little plant uses those substances pretty nearly as we use them in our body.

Now, what men want in flour is to get the useful parts of the wheat berry separated from the other parts, and the parts which man wants to use, are mostly the starch and the gluten. Of all the different things in the wheat berry the gluten is the most valuable for human food, but people have the fancy that they want a white flour and white bread, because it looks nicer. If there is very much gluten, or bran in the flour, it makes it gray, and when cooked makes a dark-looking bread, so people, for a long time, have chosen the flour which was whitest, and that always has the most starch. All the parts of the wheat berry are valuable for human food except the outside husk, so that what we need to do is to remove the outer husk and grind all the rest of the berry into flour.

It would be possible to eat the wheat raw, that is uncooked, and live on it for a while, but it would take us a long time to chew the hard grain to a pulp, so that the stomach could digest it, but it would then be a valuable food. You may read in the Bible that once the men going through the wheat fields, "when they were hungry, picked the ears of corn," which really means the heads of wheat, and ate the grain raw. If you should take the wheat when it is in the milk, as we have described before, you would find that it had a very pleasant taste, indeed. The moist gluten is much like chewing gum. But because it takes so long to eat wheat uncooked, men have learned to grind it to a fine powder, and then mix it with water and cook it. Cooking the food by heat causes various changes which make the food more easily digested.

1. FLOUR GRINDING

The ancient method of turning wheat into flour was to put the grain into a hollow of a stone, and then pound and rub it into a coarse powder, or flour with another stone. This method is used to-day by a great many savage races. From the hollow stone, used to hold the grain, and the stone to beat

it, men have developed the mortar and pestle, now used by druggists for grinding medicines. This method of grinding can be done by man alone, that is, human power unaided.

When we say man, we are not quite correct, because, to tell the truth, most of the grinding of grain in the savage races is done by the women, and the man considers that kind of



Indian Woman Grinding Corn

work too humble for him. He considers that it is his business to hunt the animals, and protect the family, so he lets the woman plant the grain, reap it, grind it into flour, bake it into bread, make it ready for him, and then he consents to eat it, if he thinks it is good enough. Civilized men have not entirely given up these methods of their savage ancestors.

The next step in grinding was to make millstones, that is thick stone discs, which turned upon each other, and ground the grain between the two revolving surfaces. The stones were turned successively by hand-power, that is by man, then by animals, wind, water, steam, and to-day by electricity, and some one of these methods is used to-day for grinding wheat all over the world.

There is a hole in the centre of the upper millstone through which the grain is dropped. You know that if you tie a stone to the end of a string, and whirl the stone around while you hold the other end of the string it will move in a circle. Now, if you let go of the string while you are whirling it, the stone will fly off at the edge of the circle with what is called centrifugal motion. Centrifugal means "running away from the centre." Now, the grain which is dropped through the centre of the upper millstone upon the under millstone is whirled around faster and faster, and, in the same way as the stone, moves to the outside edge of the millstone and is thrown off. As it moves from the centre to the edge it is broken to pieces or ground into flour between the two millstones.

The stones are nearer together on their edges than in the centre, so that the wheat is ground finer and finer as it moves along. The millstones revolve in a circular box, and when the flour is thrown off from the edge of the stone it strikes against the sides of the box, and drops into the bottom, which is shaped something like a funnel so that all the flour slides down into the centre.

From that box the flour is carried away by a belt, which has little metal cups fastened to it, and the flour is then put through sieves made of fine wire cloth, or fine silk gauze, and is said to be "bolted." It is then ready for use and is packed in bags or barrels.

This is the way almost all the people in the world, of civilized

communities, make their flour, but there are some faults and they are these:

(1) There is a good deal of stone dust mixed with the flour, which comes of the rubbing of the millstones together. (2) The grain is not always thoroughly cleaned before grinding. (3) The heat of the friction in grinding sometimes injures the flour. (4) There is too much flour wasted.

There are two kinds of mills in the world: one, a **custom mill**, like the country grist mill in the United States where the farmer takes his grain himself to the mill and has it ground to flour. Formerly he paid the miller for grinding the grain, by giving him a certain part of the flour which was ground. Nowadays he usually pays for it in money. The grist mills in this country, as well as in other parts of



Windmill in Holland.

the world, are usually run by water, by the aid of a water wheel, or in France and Holland by windmills, in places where the wind blows strong and steady all day long.

The second kind of mill is the **merchant mill**. These are great mills in the United States and elsewhere that buy the grain and grind it to flour, which is used at home and exported. Almost all the people in the world turn their grain into flour by grinding it, and so they have done for thousands of years. If you should go to New Mexico and visit some of those queer

pueblos where the Zuni Indians live, you would see the Indian women sitting in the sunshine and grinding the grain into flour in hollow stones which their ancestors have always used. If you should go to Holland to a mill beside one of the canals, you would be interested with little Hans or Gretchen to watch the great arms of the windmill go around with its long creak, creak, while the great millstones inside the queer house slowly grind the wheat into flour.

2. PATENT FLOUR MILLING

However, you probably have never eaten any flour made in any of these ways, for just about the time when the Civil War ended, in 1865, a new process of turning the grain into flour was discovered and patented in the United States. In this new process of making flour, instead of putting the wheat grains between millstones, and grinding them to pieces, they are put between rollers, which squeeze or crush them into flour. All the large mills in the United States use this process.

The rollers are made of very hard, and very highly polished steel, or of very smooth porcelain. The grain is run through several sets of rollers, the first ones not very close together, but yet near enough to break the grain into coarse pieces. The next rollers are nearer together, and crush it finer, and so on until the particles are crushed into a dust which is flour.

There is a new machine, invented within the last few years, called a disintegrator; this is made of two discs of steel which have teeth on their inner surfaces, and which revolve against each other. The wheat is dropped between these discs at the top. The discs revolve with great rapidity, and by the time the wheat has fallen to the bottom edge of the discs, it is turned into the finest flour.

Now, you remember, that the wheat berry has a little ball of starch, surrounded by a thick coat of gluten. The starch

breaks up very easily indeed, almost at a touch, while the gluten is like a gum, and instead of breaking up into a powder, flattens out at first as gum would flatten. The starch, therefore, would be turned into flour at the first grinding, or milling, for the word "milling" is used instead of "grinding" where the grain passes through rollers; therefore after the first rolling or "first break" the grain is sifted, and the fine starch of the flour taken out. What is left is called "middlings," and is passed through the rollers again. It is sifted again, and passed through another set of rollers. This is the second reduction or "second break." This is done over and over again, usually seven or eight times, until both the starch and the gluten have been ground into a flour, and sifted out. What is left is called bran.

The bran contains a great many substances which are valuable for food, but which our stomachs are not strong enough to digest, that is to dissolve, or break them into particles so fine and light that the body can use them in building new cells. Animals, however, like the horse and the cow, have stronger stomachs than we have, and as they can digest the bran, it is a common and valuable food for all domestic animals.

When the wheat goes to the flour mill it is mixed with the seeds of many kinds of weeds, among others mustard seeds. You have seen, perhaps, in the summertime, growing sometimes in gardens and sometimes by the roadsides, the delicate, feathery plant called mustard with its small, bright yellow blossoms. You also find cockle seeds (odd little seeds with two points like a pitchfork), which stick to your clothes when you go through wild land.

The wheat is generally dusty, and at the end of each separate kernel are some little hairs which are called a beard; there is usually mixed with the wheat gravel, sand, and bits of leaves or twigs. Now, if we should grind them all together,

we should, of course, get the flour from the wheat, but we should have all these other things mixed in it, of which some would be useless, some would be poisonous, and some would give a bad taste to the flour, so that before the wheat can be ground it has to be cleaned in various ways, and separated from everything that is not wheat.

The first process is usually to sift it through sieves, the meshes of which are just large enough for the wheat to drop through, so that straws, leaves, and large pebbles are left behind. The wheat next passes over a series of sieves, the meshes, or holes of which are too small for the wheat berry, but so large that all the other smaller seeds and fine dirt drop through. Then they have a special roller over which the wheat passes, which takes out the cockle seeds in little holes shaped like a cockle seed. Next the wheat passes through another set of sieves, through which a strong current of air blows. This takes off the dust and light chaff which did not sift out before.

The mustard seed, of which we spoke, is of itself of value, so by various processes they separate it from the other seeds, and grind it up into the yellow mustard, which is used to flavor meats on your table. After these siftings you have the wheat free from anything else, but it still is dirty and has its beard, so that, something like a man, it needs to be washed and shaved before it is fit to go into respectable society. The wheat is blown against a stream of water which washes it thoroughly and is exposed to a current of hot air which dries it without burning it. It is next passed through some brushes which break off the beard, and at last is ready for grinding.

All of the great mills use these processes, and probably every bit of flour you ever ate had to pass through all these methods before it was ground at all. It takes four and one-half bushels of wheat to make a barrel of flour. Now, four and one-half bushels of wheat weigh 270 pounds,

of which 200 are flour, and 70 are waste, or "offal," which is made up of bran and husk, and low-grade middlings. Remember middlings are the particles of wheat which have not been ground into flour. Of the 200 pounds of flour, four pounds are lost somehow, and are called "invisible waste," and the millers have tried for years to find out where those four pounds go to, but in vain, so that out of the 200 pounds of flour we have left 196 which is what the barrel of flour weighed that your father bought the other day. One hundred and ninety-six pounds is the correct weight for a single barrel of flour.

Minneapolis is the greatest flour centre in the world, and in that one city alone, millions of barrels of flour per year are made. Most of the bread flour made from hard spring wheat is ground in Minneapolis and Duluth. The soft winter wheat, which is used for pastry flour is mostly ground in St. Louis. A great deal of wheat is sent to Europe unground, so that the millers in France and Holland may have work to do in their mills. We send wheat flour to China, because the Chinese mills are not very good ones, and so they buy flour of us instead of grain. We also send flour to England, because the people are too busy manufacturing various things to stop to grind their own flour.

There are eight times as many people in the world who eat bread as there are people who live in the United States, and there are eighty millions of us. Each bread eater uses in a year, on the average, one barrel of flour. If you could stand by the Hudson at New York, and watch the broad river as it sweeps down toward the sea, you would think that the quantity of water was enormous, but if that water could be turned into wheat, you could still stand there beside the river for a day while the same quantity of material swept onward to the sea, before you would see the last of that vast mass of wheat which is used in a year by the people of the earth.

After the wheat was gone, you could stand there another day while the corn used during the year swept by, and then the oats, and the rice, on which about one-third of the people of the world live, and the rye, the barley, the buckwheat and the millet, until you would really get dizzy at the sight of the cereals or bread stuffs produced every year in order that every man, woman, and child may have what they need to eat.

In describing the various processes of raising the grain, harvesting it, and milling it, we have spoken of wheat all the time; partly because wheat is the most important food crop in the world, and partly because all the other grains are raised and harvested, and ground in almost the same fashion. The only difference would be, perhaps, in the case of corn, which, instead of growing at the top of a long slender stalk, like the wheat, the rye, barley, etc., grows on a very much thicker stalk, in an odd, hard bunch that we call an "ear of corn."

This is not really different from the wheat, because the centre of the ear of corn, that we call the cob, is like the thin, light stem to which the grains of wheat, and the other cereals are fastened in the head, or husk. In the small grains, we thresh the berry away from this stalk and by putting the ear of corn through a machine called a corn sheller, we separate the kernels of corn from the cob, and from that time, the corn is handled and ground exactly like wheat.

Flour is put up at the mills in three ways: in paper bags, as you see it in the grocery stores; in sacks, made of burlap, to be sent across the ocean to China, or to England, or in the wooden barrels with which you are all familiar. The wooden barrels are not usually exported, because they take up too much space; that is, a lot of space is wasted between them that cannot be used for anything else; when the flour is shipped in bags, either of paper or cloth, they squeeze together

into this waste space, and make an almost solid mass, so that a great deal more flour can be packed in the same vessel in bags than in barrels.

The breakfast cereals are usually put up in pasteboard boxes, called cartons, and these are packed in wooden boxes, which hold from one to several dozens of cartons.

After the flour is sent away from the mill it goes either to a baker who makes it into loaves of bread, which are sold in the bakeshops, or into great factories which make all kinds of crackers and cakes. It goes also into the various homes where the people cook it themselves in all sorts of ways, and so at last the wheat berry which was grown in Dakota, Russia, or Austria, South America, or Australia, India, or Egypt, is ready to be eaten and has served the purpose for which nature made it grow.

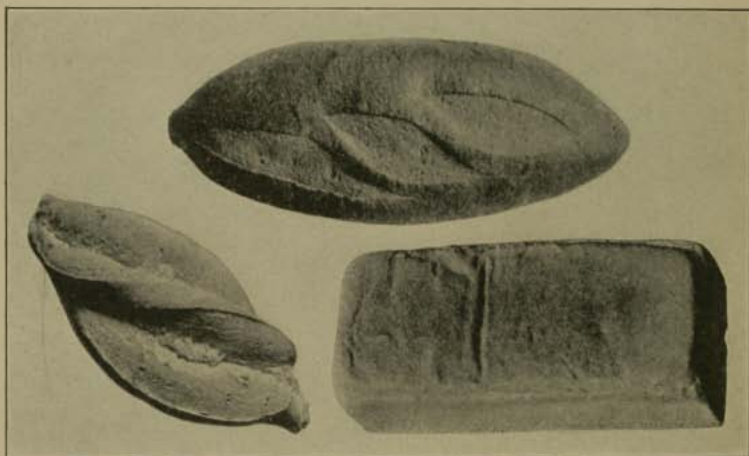
I am sure that hereafter when you eat your piece of bread, you will think sometimes of the great number of people, of all colors, red, brown, black, yellow, and white, who work by day and by night to grow the wheat, and other grains for you; of the brave sailors who, through stormy seas, carry it over the world, and of the millions of other people who buy it and make it into food.

BREAD

There are two kinds of bread used in the world,—unleavened and leavened.

1. Unleavened bread is made by mixing flour or meal with water into a stiff dough without any yeast or baking powder. This is rolled or beaten into thin cakes and these are baked. Crackers or as the English call them, biscuits, are made of unleavened bread, and so is the Jewish Passover bread. These foods are dry and hard to masticate, but they are very healthful and nutritious, and keep the teeth in good condition from the hard biting required.

Masticate means to chew to a fine powder and to mix this powder while chewing with the saliva of the mouth, making a soft pulp which can be easily digested in the stomach. The saliva acts in a chemical way upon the starch in the food and turns it into a kind of sugar, which is almost ready for use in the body. This should be done in the mouth, but the American "quick lunch" habit of eating fast and swallowing the



French and American Bread

food in large mouthfuls throws an extra amount of work upon the stomach and frequently causes indigestion. Crackers are so-called from the way they break, while "biscuit" in New England means a small cake of raised bread like a roll.

2. Leavened or "raised" bread is made by mixing a dough as in making unleavened bread and adding to it either baking powder or yeast. Both of these, when heated, produce a gas. This gas swells and tries to escape into the air, but the gluten of the flour is sticky, like a gum, and prevents it from escaping for a time. The more the gas is heated the more it expands

and in doing so it lifts the dough up or makes it "rise," until it gets so thin that it can no longer hold the gas which finally escapes into the air. The spongy mass of dough is then easily baked.

Wheat flour, as we have said, is the only flour that will make a white bread. Rye is the only other cereal or grain which has enough gluten in it to make a raised bread, but the bread made from rye is dark colored. It is called black bread and is not attractive in appearance like our American white bread, but it is very nutritious and the people of southern Russia live very largely on this black, rye bread. It is possible to make a raised bread without either baking powder or yeast in one other way, that is by mixing soda water with the dough which is then baked as usual. The bread rises, however, in just the same way as if made with yeast, because the gas which escapes from the yeast is the same as that used in making soda water, *i. e.*, the carbonic-acid gas or carbon-dioxide, which, you remember, is the gas that is thrown away when fuel is burned in a furnace.

Macaroni, vermicelli, and Italian paste are kinds of bread dried instead of baked. They are usually in the form of tubes, or rods, in different sizes.

Bread is usually made in the United States from Graham Flour, Whole or Entire Wheat Flour, and Standard Patent Flour.

(1) Graham Flour is a wheat meal. The entire wheat berry is ground to a coarse powder without sifting or bolting. It contains all the valuable parts of the wheat berry, but has much bran. It is not more nutritious than other flours, though sometimes said to be so.

(2) Entire or Whole Wheat Flour is much like Graham, but the outer woody skin, or husk, is removed before grinding. It is not so coarse as Graham. A good many "entire wheat flours" are made by mixing low grade flours and germ meal.

(3) Standard Patent Flour. This is the flour generally used in the United States. It is made by crushing the wheat berry between rollers, a process that was patented about the time of the civil war (1865), and so is called "Patent Process" flour. The standard patent flour is made by mixing various qualities of patent process flours. Patent flour does not contain the germ, or the bran, which would make the flour dark colored. Standard Patent Flour is the most digestible, Entire Wheat second, and Graham least. The whitest flours contain the most starch and the least gluten. They are popular because they make the whitest bread, but they are not so good as those which contain more gluten. Bread is one-half water, one-half food material, and gives a large amount of heat and energy food, a moderate amount of muscle or tissue food, a little mineral, and almost no fat. That is why butter is generally used with bread, to add the fat needed by the body.

Wheat bread alone would not keep a man alive, for if he ate enough to get the necessary proteid (gluten) he would eat too much carbohydrate (starch). Bread and milk however would support life for a long time, if nothing else were eaten.

II. MAIZE OR CORN

The largest cereal crop of the United States is corn, or maize, which is greater even than wheat in quantity and value. It is a native of America and Mexico. When Columbus landed in the West Indies, he found the natives making bread from a grain new to him that they called "mahiz," from which comes our word maize, and which later the Europeans called Indian corn, because it was used by the Indians. Columbus carried seeds of this grain to Europe, but it did not meet with favor, and not until after the Civil

War in America did the nations of Europe begin to plant it. Its use has since spread all over the world, and enormous quantities are raised in Africa, Asia, and South America. The natives of Central America considered it sacred and had special religious ceremonies and holidays in honor of the maize at harvest time. It was found in the tombs of the Incas of Peru and Mexico.

Corn, like wheat, is a developed grass plant, but its appearance is very different from wheat, because instead of the slender stalk that we have in wheat, rye and barley, with a single head at the top bearing the grain and growing to a height of two to six feet, Indian corn has a thick, fleshy stem, with long leaves, and grows to a height of from five to twelve feet. It usually bears from two to four ears of corn on each stem. The kernels are borne on a stout, woody core, called the cob. The cob with its kernels is called the ear of corn. The ear is wrapped up in many layers of paper-like tissue, called the husk. A long hair-like thread, which is really a tube, runs from each kernel to the top of the husk, and is called silk because of its appearance. The silk threads are tubes into which pollen dust from the blossom of the corn, which is called the tassel, is drawn to make the seed grow.

Corn has many advantages over wheat which would appeal to savage people. It may be planted without ploughing or



Ear of Corn

breaking up the soil. A seed kernel dropped into a little hole made by a hoe or stick will take care of itself. Wheat, when ripe, must be harvested within a short time, or it will spoil; corn, when ripe, may hang for weeks uninjured, and can be picked easily from the stalk without threshing. If corn is



Corn Growing

sowed with care in fertile land, it will produce, with little labor, twice as much food as any other kind of grain. This fact was of great value to the early New England settlers about Plymouth, and made possible the great population of Central America in the time of the Aztecs, who had used the plant for centuries before Columbus came.

Corn is planted in furrows or separate hills. The ears of corn, when ripe, are picked from the stalk by hand and are husked, *i. e.*, the outer coverings of the ear are pulled off. This can be done now by machine, but in the old New England days "husking-bees" were held on the farms in succession, when the entire community would gather together,

husk the corn of the farm and pass the rest of the evening in games and feasting. It was almost the only merry-making of those stern old Puritan settlers. In a similar way in Old Mexico, as we have said, the gathering in of the corn was celebrated by weeks of festival. The ears of corn are shelled by machine, *i. e.*, the kernels are removed from the cob, and are then carried in bags to the elevators and sent to the mills. The corn in grinding follows almost exactly the process of wheat in being turned into flour.

KINDS OF CORN

There are three kinds of corn in use in the world: **field corn**, **sweet**, (or **sugar**) **corn**, and **pop corn**. The field corn is nine-tenths of the whole crop. It is of two varieties: flint and dent corn. The dent corn is so called from a peculiar dent in the outer end of the kernel, like a dimple in your chin. It is from the field corn that we get corn meal, corn oil, corn starch, glucose, grape sugar, alcohol, and whiskey.

Sweet, or sugar corn, is usually eaten as soon as it is ripe, while in the milk, as it is called. It is then very juicy and delicious. It is called sugar corn because there is really a larger amount of sugar in it than in other corn. Some kinds of field corn may be eaten when in the milk, but they harden and become tough in a few days. Enormous quantities of sweet corn are canned and sold, and all the canned corn that you ever see in the market is made from sweet corn. Sweet corn is never ground into flour or meal or eaten in any other way, except that the Indians used it as a parched or toasted corn. The dried kernels of sweet corn have a withered, shrivelled, whitish appearance which always distinguishes them from the bright yellow kernels of field corn.

Pop corn is a dwarf variety of field corn, with small, smooth, bright kernels, either red, white, or yellow. There are two varieties, pearl and rice pop corn, because of their resemblance to pearls and rice grains. Pop corn has the curious property of swelling under the influence of heat and finally popping, *i. e.*, exploding into a soft, white fluffy form many times the size of the original kernel. It is then a delicious, digestible food, and is very popular in the eastern United States. A very common form of pop corn is the pressed flat cake sold in the stores. The popped kernels are mixed with molasses, or sugar and butter, and pressed into

cakes which are wrapped in paraffine paper to keep them from sticking to the fingers. Sometimes the kernels are ground fine before mixing. No circus, cattle fair, or public holiday, in the northeastern United States takes place without the sale of large amounts of pop corn.

USES OF CORN

Almost every part of the corn plant has some commercial use. The kernel is used for food for man and beast. In the United States it is prepared in many forms for human food. It is ground into meal and flour like wheat; it is broken into particles, which are called hominy and samp; (samp is coarse broken, hominy is fine broken); it is rolled into flakes as in corn crisp, and other breakfast cereals. Ash cake, hoe cake, and corn pone are southern United States names for cakes of corn meal, made up by stirring corn meal with water and a little salt and baked before the fire. They are also called Johnny-cakes, a misspelling, of "journey-cakes," which were cakes made by the old settlers on their journey into the West. The Mexican tortillas are a similar cake.

Corn meal sprinkled slowly into boiling water and well stirred forms a thick mush, called polenta in Italy. It cooks in a few minutes, hence the name hasty pudding, common in New England. The Indians made a mixture of corn and beans that was called succotash which is still popular in New England. The kernel of corn is very rich in starch and corn starch and most of the laundry starch used in the United States is made from Indian corn. From the germ, *i. e.*, the little plant of corn, we get corn oil, which is used as a salad oil, to burn in lamps and to make into soap. It is also used as a substitute for rubber. Nearly all of the grain alcohol made in the United States, and the greater part of the whiskey, is distilled from corn. There is a corn whiskey made in rude



Field Corn

stills in remote ravines in the Carolina and Tennessee mountains that is called moonshine whiskey, because it is made often at night by moonlight, as it is against the law for the mountaineers to make it without a license.

Another valuable product of corn is the syrup called glucose, which is much used by the makers of candy instead of sugar cane syrup, because it is cheaper. Most table syrups sold are nearly pure glucose. Glucose is perfectly harmless and nutritious, but it is not quite so sweet as cane syrup. By boiling down the glucose we can get the sugar in a solid form, which is called grape sugar, and this is used by confectioners, and by breweries in making beer. Ears of corn, or cobs, after shelling make good fuel. One hundred bushels in the ear equals one cord of hard wood; three tons of corn cobs equal one ton of hard coal. From the ashes of the burned corn cobs potash can be made. Ground corn cobs make meal for cattle.

The husks, as well as the stalk and leaves of corn, can be made into a good paper and will also yield textile fibres which can be made into cloth. The husks are used in packing glass and to stuff mattresses instead of hair or excelsior. The pith of the corn stalks yields a material called cellulose. This has the property of swelling very fast when wet, and for this reason it is put between the outer and inner walls of a warship, so that, if a cannon ball goes through, within a few minutes after the sea water touches the cellulose it will swell and stop up the hole as tightly as any one could do it with wood or steel. You see then that corn for food and other purposes is one of the most valuable plants man has learned to use.

III. OATS

The next largest crop in the United States after corn is that of oats. It is raised the world over to the amount of millions of bushels. It is used as a food for man, generally in the form of oatmeal, or in the modern form of rolled oats, but the chief use of oats in the world is food for horses and other domestic animals. It is one of the most nutritious of all the cereals, although it will not make white bread, and

the persons using it are very strong, hardy, healthy people. The people of Scotland use it as their principal food, and the people of the rest of the world are learning to use it more and more every year.

An anecdote has been told many times which is worth repeating here, of an American and a Scotchman who were speaking about oats. The Scotchman made the statement that in his country the people ate a great many oats. The American replied, "In my country that is what we feed the horses." The Scotchman answered, "Yes, and that is the reason why you have such good horses in America, and we have such good men in Scotland."

IV. RYE

Another important cereal in wide use is rye. Rye is the only cereal besides wheat which contains so much gluten in the flour that raised bread can be made from it. The bread made from rye flour, however, although very nutritious, is dark colored and is not popular in the United States. It is, however, the staple food of thousands of people in Russia and Germany. Rye will produce an abundant crop in soil that is too poor to raise wheat, and will grow farther north, that is, in colder countries than wheat can grow in.

Rye-straw is used as well as wheat-straw for making braid for hats. Rye grain is also used for making whiskey.

V. BARLEY

Barley is probably the first grain that men raised to any extent. It is far older than wheat in history, and as far back as we can go we find that men raised barley. In the old Bible times it was the principal crop. For example, in the pretty story of Ruth, she went into the fields to gather up the stray heads of barley that had been dropped here and there by the reapers. This was called "gleaning," and is common

to-day on the grain fields in Asia and Europe. If you should go over those grain fields after the harvest is done, you would be unable to find even a single stalk of the grain. In China the children of the farmer follow the reapers and are punished if they do not pick up every stalk.

Barley is used in the United States chiefly in a form called pearl barley for putting in soups, but is not used much as flour except by the Jewish people. The principal use of barley, however, is for making beer and other malt liquors, and a great many of the valuable breakfast foods of the present time have various other grains mixed with malt. Whenever you see the syllable "malt" in a name of a food, you can know that barley in some form has been mixed with the other substances.

Malt is made as follows: the barley is moistened and spread on the floor of a large room which is kept quite warm. The little plant or germ in the barley begins to sprout under the influence of heat and moisture; that is, it begins to grow. In the process the starch in the grain turns into sugar. The barley in this condition is called malt. The barley is then dried, the little sprout is broken from the grain and is sold for cattle feed under the name of malt sprouts. The malt is then ground or crushed and if it is to be used for breakfast foods it is mixed with other grains; if it is to be used for making beer it is mixed with water so that the sugar in the grain may be dissolved by the water. This sweetened water is made to ferment, by the use of yeast, that is, the sugar changes into alcohol and then this liquid is beer or ale. Hops are generally added to the beer to give it a peculiar bitter taste and certain stimulating effects. After the sugar is dissolved from the malt, the grain is dried and sold for cattle food under the name of "brewers grits."

Barley was the first unit of weight and gave us the unit of a "grain"—1000 grains of barley weigh 1000 grains troy

weight. It also was a unit of measure as: "three barley-corns make one inch," and to-day, just as thousands of years ago, three grains of good barley, end to end, measure exactly one inch.

VI. BUCKWHEAT

There is a kind of cereal grain called buckwheat; which is grown to some extent in the United States, India, and some other countries. In the United States it is used almost entirely in the form of buckwheat flour for making griddle cakes. In other lands it is used like any other flour. The chief value of buckwheat is that it will grow in soil so poor and barren that no other food grain will grow in it, and so has great value in many parts of the world.

The name buckwheat is a mispronunciation of beech wheat or beech nut wheat, so called because the grains of buckwheat are shaped exactly like the curious triangular nuts of the beech tree. One variety is called sometimes "India wheat."

VII. RICE

With the exception of wheat, more millions of people in the earth eat rice as their chief food than any other one kind of cereal. The larger part of people of Japan and India and China live chiefly on rice. It differs from other grains in the fact that it is almost entirely pure starch and has very little gluten. If you look at the grains of rice you will see that they are white, and ground up they look almost like pure starch. There is however a little gluten in it so that people who live on it in those warm countries can have enough tissue food to keep well. Rice is grown in swampy places, and the best rice grows in places where there is a foot or two of water above the roots about the stem. The rice grain is threshed from the stalk as other grains are, but the husk or bran cover of the rice is so tight that it cannot be beaten off easily as from wheat, and so is passed through a machine

having a series of knives which cut it off. The rice before husking is called "rice paddy": after husking it is called head rice, broken rice or ground rice. The last two are merely the broken particles.

There are two kinds of rice commonly sold. The Carolina rice, which is a long, slender grain, and the Japanese rice, which



Man Sifting Rice, Persia

is a short, flat, oval grain. It is a curious fact that if the Japanese rice is planted in the United States, it will in two or three sowings yield a grain shaped exactly like the Carolina rice, showing that the shape is due to something about the soil and the climate which we do not yet know.

We raise in the United States as fine rice as is grown anywhere in the world, but at present we raise about one-half as much as we need. The rest we import from Japan, China, or India.

From the rice stalk or straw we get the finest and softest of all the straw mattings which are sold and each tiny straw is cut its entire length so as to make it curl up and break less easily. From the rice straw also we get that peculiar soft Japanese paper called rice paper used in making cigarettes, paper napkins, etc. It is also used for fine straw hats.

A new kind of rice food is "puffed rice," which looks and tastes something like popcorn. The rice paddy is steamed until it swells or puffs. It is then blown at high speed through a very hot tube. It goes through so fast it can not burn, but it dries before it can shrink. It is very good and nutritious.

Ages ago, people took the habit of throwing rice at a young couple when they were married as the sign of their wishes that they might have plenty of food in their life, and the custom spread over the whole world.



Children Hulling Rice, India

VIII. MILLET

There is a grain you probably never have tasted, which is not grown in the United States for food for man, although farmers sow a great deal of it for cattle, because the stalk is thick and juicy and very good for animals. This

grain is millet. It is the smallest of all the food grains in size, and consequently harder to gather and use, yet a great many people in Asia would starve but for the millet which forms much of their food. Like the rye and buckwheat, millet will grow in a great many places where wheat could not grow, and so it is raised instead of wheat. There are great districts in India, hundreds of miles in extent, where nothing but millet is raised; millions of bushels are grown every year. The grain is ground to flour and made into bread as other flour is made.

You may sometimes see what is called Hungarian grass, which is a grass with a big head in the blossom, composed of a lot of seeds mixed with long soft hairs. The food millet of Japan and China looks much like that, except that it is larger.

There are three curious grass plants from which wheat and perhaps some of the other cereals have descended. They are "spelt," "einhorn," and "emmer." These are all grown in Europe to some extent by the people for food, and made into flour, but we do not have them in the United States, and they do not appear on the market at all, being used up in countries where they grow. They are mentioned here only as curiosities, and because they are probably the plants from which the greatest food plant in the world, wheat, was developed by man ages ago.



A Basket of Peaches

CHAPTER V

FRUITS

NEXT after the cereals in importance to men comes the great class of fruits. Fruits are probably the first kind of food that mankind ate, because they grow on the trees and bushes ready made, as we might say, so that man has nothing to do but just to pick them when they are ripe and eat them. They can almost all be eaten raw, that is uncooked, and not many of them are cooked except to make them into jellies, sauces, preserves, and pies.

Fruits are of various kinds, as, First, **fleshy fruits** like the apple and pear and quince; Second, **stony fruits** that is,

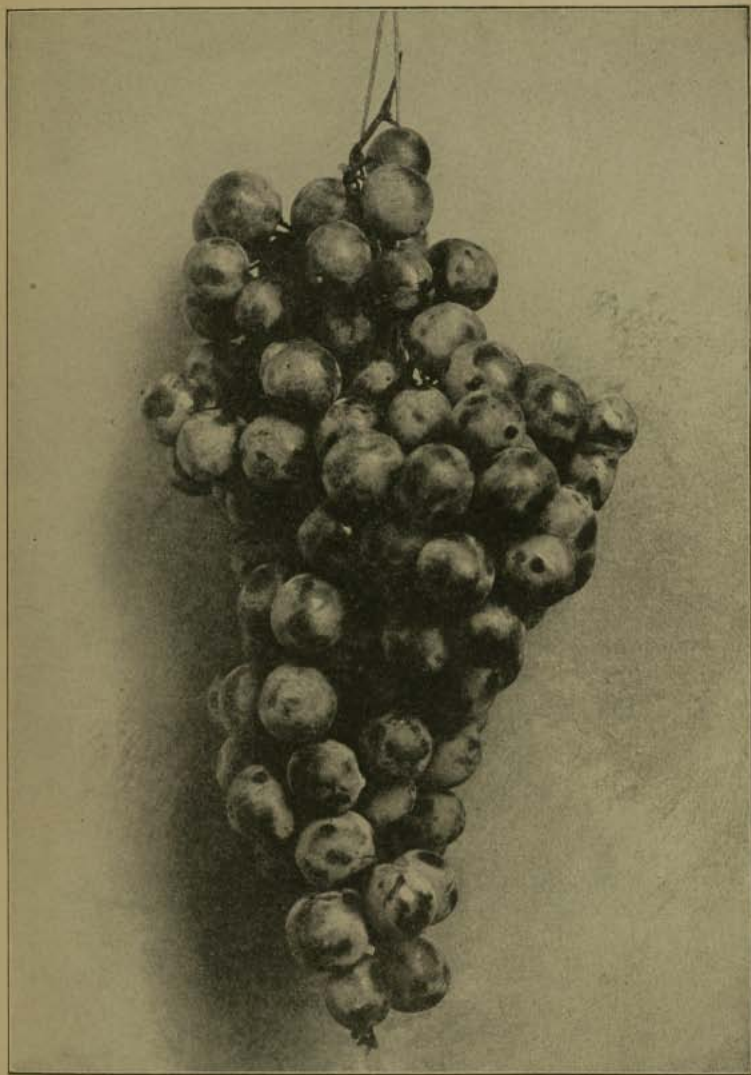
fruits which have the seed encased in a hard shell or stone which is in the centre of the pulpy fruit. These fruits are the peach, apricot, plum, cherry, olive; Third, **citrus fruits**, that is, fruits which contain an acid called citric acid. These are the orange, lemon, pomelo or grape fruit, tangelo, and kumquat; Fourth, **berries** of all kinds, such as strawberries, rasp-



Strawberries

berries, blackberries, blueberries, gooseberries, currants, cranberries; Fifth, **miscellaneous fruits**, as the pineapple, banana, pomegranate, mango, persimmon, and fruits that grow on a vine like the grape. The tomato also should be called a fruit.

Fruits may also be classified as **temperate**, **sub-tropic**, and **tropic fruits**. Temperate fruits are those which grow in the



A Bunch of California Grapes

temperate zone where the weather is cool. Almost all the fruits we have just mentioned are grown in the temperate lands except the citrus fruits, pineapples, bananas, etc., which do not grow where the weather is cold enough for frosts to occur. These fruits are usually called sub-tropic, because while they must grow in warm lands they do not grow where it is extremely hot, *i. e.*, in the tropic or torrid zone.

That is what the name sub-tropic means. There is a large variety of delicious fruits which grow in tropical lands, but as they are very soft in flesh, they cannot be trans-



Loading Bananas, Jamaica

ported and must be eaten where they grow, and so they do not appear in the markets of the world.

There is another class of fruits which we call dried fruits. Some of the dried fruits are the ordinary fruits which have been cut in pieces and dried. These are dried apple, peach, pear, the dried plum, which is called a prune, and the dried grape, which is called a raisin. There is a little grape about as big as the end of a lead pencil which grows in the Mediterranean countries, which is dried and is really a little raisin, but it is sold on the market and used in cooking under the name of Zante currants, because they grow largely on the island of Zante. If we take the grapes which we grow in our gardens and dry them, we should not get raisins, for the raisin grapes are a particular kind and look a great deal like the grapes which are called Malaga, or white grapes that come from Spain and elsewhere. They are made also from a grape which looks like the dark purple Tokay grape which is grown in California.

There are some other fruits which are delicious when fresh, but which are always dried when we get them. They are figs and dates. Until a few years ago the dried fruits, figs, dates and raisins, were imported from different parts of the world, mostly from Europe, but it was found that California had just the soil and the climate that was needed for these fruits and now we raise there a very large part of what we use in the United States. We have never yet grown any dates for market, but the scientific men have found that in Arizona and New Mexico the soil and climate is similar to that of Asia Minor and other regions where the date palms grow, and, therefore, it will not be many years before we will raise our own dates here.

No food is more healthful than fruits, because they contain different kinds of acids, which taken into the human body, destroy the germs of disease and so help

keep us well. People who eat a large amount of fruit are not very often ill.

Fruits that can be transported, are put up for market in boxes, baskets, or crates. The larger fruits like the oranges, lemons, and peaches are generally wrapped in a piece of tissue paper to protect them. The smaller fruits like strawberries, blueberries, etc., are packed in quart baskets, and are put together in boxes called crates. Apples

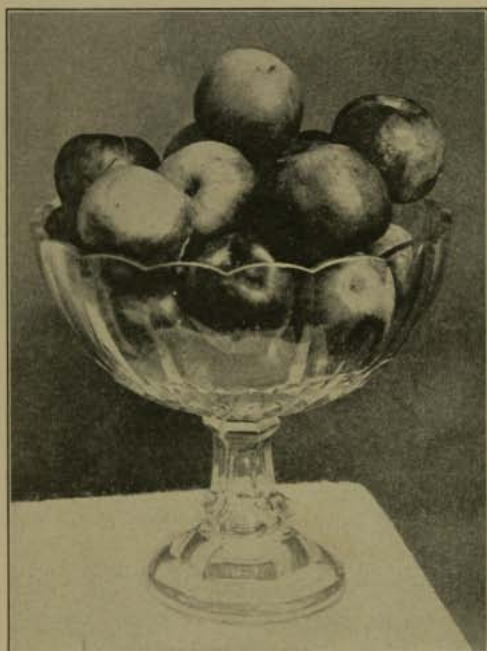
are packed in barrels. Bananas are rather an odd fruit in their method of growth. They grow curving upward something like the fingers on a hand, and because of this resemblance, the parts of the bunches of bananas are called "hands" by the dealers. The bunches are usually

hung bottom upwards in the stores. They are of two kinds, the red and the yellow. The red are more nutritious than the yellow. In the United States we usually eat the bananas raw, but there are several ways in which they may be cooked to make a very palatable dish. When dried and ground to flour, they can be made into a bread which has more food material in it than there is in bread made of wheat flour. That is, a pound of banana flour is equal in food value to three of wheat flour. A way of drying bananas has recently been found.



Apple Blossoms

Fruit is usually eaten fresh, but is also preserved in various ways. It is put up as preserves in the form of canned fruit, as canned peaches, canned tomatoes, etc., and is sold either in tin cans or glass jars. The fruit is usually heated, mixed with sugar, which makes a syrup with the juice of the fruit,



Apples

and then the jars are sealed while hot. When properly done, the fruit will keep for years without spoiling. If the pulp of fruit is pressed and strained, so as to remove all juice, leaving only the woody fibre, the juice, if heated, will generally harden into what is called jelly; sometimes by themselves,

sometimes by the addition of a little gelatine (made from beef animals).

Jellies are a very delicious and very popular form of food, and a very large quantity is made and sold. Sometimes the fruits are boiled in sugared syrup until they are thoroughly soaked with the syrup and then are allowed to dry, and we have what is called candied fruit, that is, in which the sugar as it dries has hardened just as it does in any kind of candy. Orange peel, the pulpy rind of the citron, the root of the plant called flagroot, and the ginger root may be preserved in this way. The Chinese make a very delicious preserved ginger put up in syrup and packed in odd round ginger jars.

The juices of many kinds of fruit are used as flavors, and are drunk as beverages. So we have strawberry, pineapple, orange, and lemon in syrups for soda water, and in extracts for food flavoring, as in puddings and cake. Vanilla extract made from the vanilla bean is used very much. Lime juice, raspberry juice called raspberry shrub, grape juice, and lemonade are common and popular drinks.

Groups of apple, pear, and peach trees are called "orchards." Orange and lemon trees grow in "groves" (or orchards), bananas and pineapples are raised on "plantations." Fields of grape vines are known as "vineyards."

Of all the fruits that grow and are used by man, there is probably not one that is so good for the body as apples. The apple acid is especially valuable as an aid to digestion.

CHAPTER VI

NUTS

IF you live in the country, you must enjoy very much going after chestnuts or hickory-nuts just after the frost has opened the burs, or perhaps you have picked the hazel-nut from the bushes where it hangs in its curious two-fold or three-fold fringed pods. Perhaps, if you live in the South, you have grown peanuts in your own garden. If you were a brown skinned child on some island in the middle of the Pacific Ocean the only nut you would know anything about would be the cocoa-nut, from which you would get many kinds of things to eat, to drink, and to wear. If you live in the city, however, you never have had a chance to see the nuts grow, but still your Thanksgiving or Christmas dinner would not be complete if you did not have nuts to eat at the end of it. The candy stores, now-a-days, keep and sell salted nut meats of various kinds, as salted almonds, salted pecans, salted peanuts, etc. These are taken from their shells by machinery and then salted.

Everywhere on the earth, from the forests close to the Arctic regions, down to the tropical lands in the scattered islands in the ocean, nuts of some kind grow abundantly and are eaten by the people of all lands. A great deal is said about wheat, corn, meat, sugar, fruits, and vegetables that people must have to eat in order to live, but it is said by those who have studied the subject that six times as many nuts go to waste every year, not counting what the world uses,

as would keep all the people of the earth alive for one whole long year. So that you see nuts are one of the important food products of the world and as abundant as all the others.

Nuts are used either for food or for oil, and most of them for both. We can divide them into two classes: nuts of the temperate zone and nuts of the tropical zone. The nuts of the temperate zone are the hickory, English walnut, black walnut, chestnut, beechnut, butternut, hazelnut, peanut, pecan, filbert, which is a large hazelnut, and piñon. The nuts of the tropical lands are the almond, Brazil-nut, cocoonut, and quite a number of others which do not appear in the markets of the world, although they form a large part of the food of the people in the places where they grow.

Of our northern nuts the hickory or shagbark walnut with its cousin the pignut, which is the smooth variety, the chestnut and the beechnut are the most common. They are eaten either raw, or are mixed with candy as a confection. It is the same with the English walnut, the black walnut, the butternut, the pecan, and the filbert. The peanut is not fit to eat as it is grown, for you remember it grows in the earth like a potato, and is not a nut although for convenience we call it so. The peanut must be roasted in order to be digestible. It is then one of the most popular foods of America and no circus, or cattle show, or popular holiday, is successful unless the people are able to buy and eat large quantities of peanuts. It is also ground into a paste, which is sold in jars and called peanut-butter and other similar names. The peanut is ground up and pressed, yielding an oil which is used for a great many commercial purposes. Most of our English walnuts are grown now in California, and all the other food nuts are grown in the United States except the Brazil-nuts and cocoonuts.

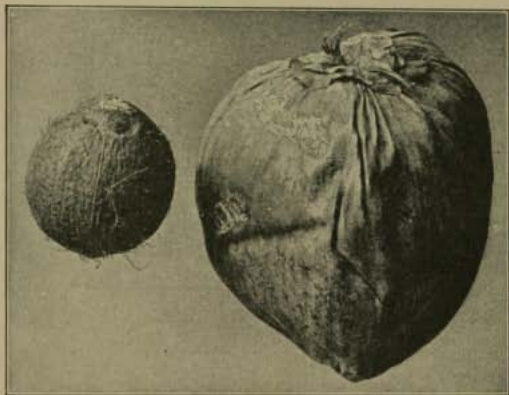
The piñon is the seed of a great pine tree that grows in California. You have seen, no doubt, the ordinary pine cones

three or four inches long which grow on the pine trees near your homes, and you may have noticed, when they were open, a thin seed between the flakes of the cone. In California these cones grow sometimes a foot long and the seeds are equally large in proportion. They give a long slender nut and meat which is used a great deal now in candy and in sprinkling over the top of little cakes. The piñon is a very important part of the food for many Indians on the Pacific slope, and they would nearly starve at certain times of the year if the piñon trees or pine trees did not bear their fruit.

The Brazil-nuts or Castane-nuts grow in South America far up the Amazon River and are gathered by the Indians. If you should see them growing you would not recognize them at all and could not imagine what they were. The nuts grow ten or twelve together in a round pod about the size of your two fists, so hard that it is almost impossible to saw it and you have to strike it very hard with a hammer before it will break. The nut is delicious when it is fresh, but it has a sickening taste when it happens to be old. It is full of oil and you can try an interesting experiment with it. Take a Brazil nut meat which has come out from the shell without breaking, set it on end, light a match and hold the lighted end against the top of the nut meat. In a short time it will take fire with a great clear flame like a candle, and if the nut is fresh, it will burn a long time until the meat is entirely consumed. If the nut meat is rather old, you can cut the meat into strips and then it will burn the same way. The ground Brazil-nut is used to make what is called Brazil-nut butter, and is used by the natives as we use ordinary butter to put upon our food.

The tree which bears the cocoanut is one of the most wonderful trees in the world, and the people who live where the cocoanut trees grow, can get everything they need in the way of food and clothing and buildings from the cocoanut

tree. From the wood of the trunk they make their huts or houses, and the roofs they make of the bark. Each cocoanut grows in a big pod surrounded by a thick layer of fibre, which is cut open when the nuts are gathered. From the fibre and the husk of the cocoanut they make rope and all kinds of thick and thin cloth and other fabrics, sails for their boats,



Cocoanuts

and baskets. From the shell of the cocoanut they make dishes and cups of various kinds.

The meat of the cocoanut takes the place of bread, and may be ground up into a flour that makes a kind of bread. The juice of the cocoanut when fresh is called milk and it resembles it in color and somewhat in taste; it has almost the same nourishing qualities as milk. If you shake a fresh cocoanut near your ear, you can hear the milk dash about inside. When the milk is old it is made into a drink or a vinegar. We can also make sugar from the juice of one kind of cocoa palm. The trees are tapped, the juice extracted, and boiled down into syrup or sugar just as was done with the sap of the maple trees. This is the practice in India

and in Chile. The cocoanut meat is taken from the shell and dried and shipped to different parts of the world under the name of "copra." It yields an oil used in making soap.

The husk of the nut is sold, in the same fashion, under the name of "coir fibre," which is used for packing glass-ware and china. Very likely you have at home a doormat made of light brown, woody material. It is made from the cocoanut fibre and is so cheap and so good that it controls the market for that sort of purpose and nothing else can equal it in wearing value. The heavy matting used in some public halls is made of coir fibre. The cocoanut comes to you also in another form, which is called shredded cocoanut, that is the white cocoanut meat cut up into thin threads and dried. The cocoanut cakes, with which you are all so familiar, are made from this shredded cocoanut.

You will remember that a peach is a fruit composed of a pulp with a hard-shelled stony centre. Inside the peach stone is a meat, which is usually very bitter and indigestible.

A nut is a fruit whose parts, though similar to those of a peach, have developed differently. The pulp of the peach corresponds to the outer husk of the nut, to the bur of the chestnut, etc. The hard shell of the nut remains the same, but in a nut the interior kernel has been developed at the expense of the other parts, so that from the kernel we get the food and the oil. The outer husks of all kinds have no use whatever except as fuel.

A nut from the West Indies has lately appeared on the market called the cashew nut. It is shaped much like a curved bean, and has a very delicate and pleasing flavor.

CHAPTER VII

VEGETABLES

Vegetables are plant foods, but it is hard to describe them so that you could always tell whether or not a certain plant was a vegetable.

They are, for the most part, either roots, leaves, or legumes, a class which includes beans, peas, and lentils. Fresh sweet corn, though really a cereal, is sold with the vegetables. Vegetables are divided into three classes according to the way they grow.

1. Those which grow **beneath the surface**, that is, in the soil like potatoes and turnips.
2. Those that grow **upon the surface**, and usually rest on it like the squashes and melons.
3. Those that grow **above the surface** of the earth and are kept from it by the support of their own stalks or on trellises or poles, like beans and peas.

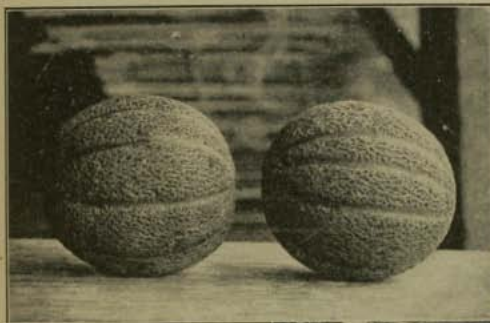
1. VEGETABLES WHICH GROW UNDER THE SURFACE

These are either roots, tubers, or bulbs. A root of a plant draws from the earth the water which the plant needs for drink and the minerals which it needs for food. The food roots are merely the ordinary roots of the plant which have become thickened and have stored in them a considerable amount of material which the plant can use for food in time of need. Tubers are not roots, for they have practically nothing to do with the growth of the plant. They

are branches from the root, the ends of which have swollen into something that looks like a root or bulb. A bulb is a flower stem which grows below the surface of the earth, and you can see, if you look at one, as an onion, how the thickened leaves lap over each other as they would around a stem.

a. The **roots** in common use are the turnip, beet, carrot, parsnip, radish, sweet potato (or yam).

b. **Tubers** are potatoes, peanuts,



"Rocky Ford,"
Muskmelons

and artichokes, which grow in the earth exactly like potatoes. We usually speak of the peanut as a nut, because, except in



Muskmelons in Crate

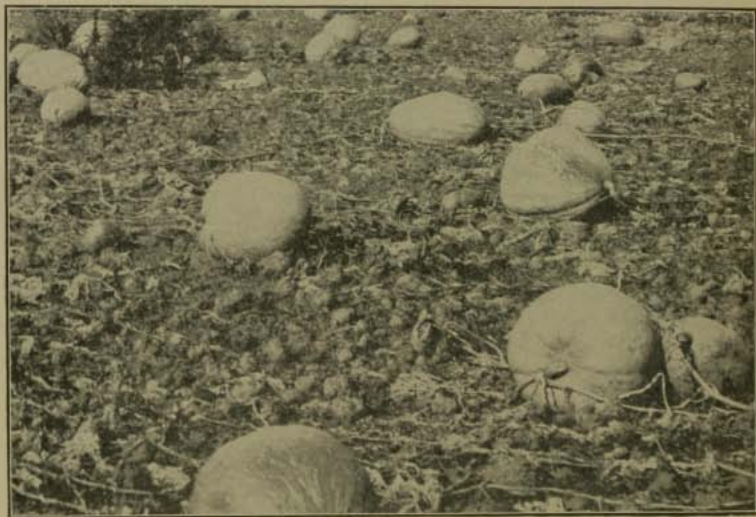
the manner of growth, it has all the qualities of a nut.

c. **Bulbs** are onions, garlic, leeks.

2. VEGETABLES WHICH LIE ON THE SURFACE

These grow mostly on vines which run along the surface, though they can easily be trained to grow on a trellis or on wires on the side of a building, and they sometimes produce better fruit when trained in this way than when grown on the

ground. The common forms are squashes, pumpkins, melons of all kinds, and a round fruit, like a melon, sometimes called a citron. (The real citron looks very much like a large lemon and grows on a tree.)



Pumpkins in Field

3. VEGETABLES WHICH GROW ABOVE THE SURFACE

These are of several kinds.

a. **Salad plants** are those of which we eat only the leaves or the foliage of the plant. There are many of them in common use. They are lettuce, celery, asparagus ("grass"), cabbage, cauliflower, spinach, dandelions, chives, watercress, rhubarb (or "pie plant"). These are used freshly picked and are usually eaten in the form of salads. None of them will keep for any length of time except the cabbage. The others soon wilt and become useless. The leaves of some other vegetables, like beets, are often used as salad plants.

b. The vegetables which grow on their own stems are the tomatoes, red or cayenne peppers, egg plant, sweet corn, and okra.

c. The vegetables which grow above the earth but have to be supported are the beans, the peas and the lentils, the fruit of which grows as a pod and the part which we eat in most cases is the berry inside of the pod. Hops might perhaps be classed with these, for they grow in about the same way, and though not used directly as food, they are used as medicine and in other ways. The use of these vegetables varies also according to the place where they grow. The vegetables that grow below the surface are not usually digestible unless they are cooked, and are rarely eaten raw.

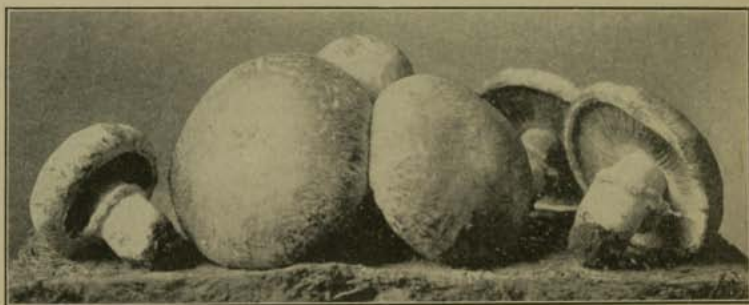
Of the second class, those that lie on the ground, the melons, are always eaten raw, that is uncooked, and the squashes are always cooked. The sweet corn might perhaps be eaten raw just at the moment that it is in the milk, but it would not digest easily, and is usually cooked by boiling or roasting.

The third kind, beans, etc., are of very great value, and they give more protein, that is tissue food, than any other kind of food we have. Baked beans, a famous old New England food, are very nutritious. The use of them has spread from New England to many other parts of the United States. Baked beans, "Boston baked beans," formerly were used on Saturdays only.

Vegetables, with the exception of potatoes, are usually raised near the markets where they are sold. Potatoes, however, can be shipped for long distances without injury. There are several reasons why vegetables are grown near their markets; first, the great value of the vegetable is that it gives to a man's diet a fresh plant food, and, therefore, should be eaten within a few hours after it is gathered. Second, the large amount of water contained in almost all vegetables, especially those which grow below the surface, makes it very costly to

send them long distances by freight, because the water makes them very heavy. The third reason why they are not shipped very much is because they are soft and pulpy when fresh, and would be seriously injured by being bruised in travelling from one place to another, unless they were carefully packed, so that most nations raise their own vegetables. We ought always to eat a considerable amount of vegetable food. There are so many kinds that we can find one or more to our taste.

The people of the Hawaiian Islands have a valuable vege-



Edible Mushrooms

table called the Taro plant. It is a kind of water lily and the roots are eaten. They are washed, sliced, dried, and pounded to a flour in a mortar. This is then mixed with a little flour made from the Papaia fruit and the mixture is called "poi."

Poi has been the principal food of the Hawaiians for a great many years, and it is very nutritious. It is for sale in the United States as one of the many valuable breakfast cereals now so popular.

Mushrooms are a very delicious kind of vegetable food, and when fried in butter taste sometimes like meat. Some kinds are deadly poison and you should not eat any unless

some one who knows them tells you they are good to eat. The common kinds are the meadow mushroom, which you see for sale in the markets. These you could raise in your cellar. The French put up one kind in cans, served at hotels often with beefsteak. The great brown puff balls are always safe to eat and the most delicious of all is a snowwhite mushroom called the "shaggy mane," because it is covered with a rough hairy skin.



CHAPTER VIII

SUGAR

THERE is one valuable food I have not told you about yet, one that you like very much. It is **sugar**.

The people you read of in the old days of Greece, Rome, and Egypt had very little sugar. They used it as a medicine and called it a "salt." They did not know what it was, and it is only within what we call modern times that people have learned how to make sugar. Yet ages and ages ago, when all sorts of strange animals were roaming over the earth, one small creature had found out that plants produced sugar, and spent a large part of its time in hoarding it up for use. This creature was the bee, that we call the honey-bee, and for centuries and centuries, the bees have gone from flower to flower and gathered the honey, which they took to their hives and stored away for food in the winter, or when the blossoms were gone.

Now honey is mostly sugar and water, and if you take sugar and mix it with water into a heavy syrup you will get a substance very much like honey, without the flavor which comes from the different plants and from the bee. The bee was the first to find the sugar in the plants, and after men grew somewhat civilized, they learned to hunt for the nests of the bees in the hollows of trees and to take away the honey-comb and eat the honey, while they used the wax for many purposes.

They learned to tame the bees, to accustom them to live in hives near the houses, where the people could easily get the honey-comb when the bees had filled it with honey from the plants. Through those hundreds of years, the people never seemed to think that they could do what the bees did, that is, find that sweet, pleasant food in the plant juice and make honey, until about 250 years ago, when men found



Taking Honey from Hives

that one of the grasses had a very sweet juice, and they learned to crush its stalk and get the juice and make sugar.

This grass or plant, that is now called the sugar-cane, looks a great deal like corn, and if you should go past a field of the sugar-cane, when it was partly grown, you would probably think it was a field of corn. The main difference is that it does not produce an ear of grain as the corn does, but has some little seeds at the top where the tassel ordinarily grows in the corn. The Chinese people cut off the

hard skin of the sugar-cane and chew and suck the sweet pith as you do a stick of candy. At the proper season you will find sugar-cane for sale in Chinese stores in our American cities.

Then, far away from us in Asia, and on some of the islands of the Pacific, men found that the palm trees had a sweet juice, and from that they learned to make sugar. When the Pilgrims came over to New England they had to depend for their sweets almost entirely upon the honey that they found, made by the wild bees in the woods and fields. If you have been in the country in the summer-time, you know the bumble-bee, that makes such a great noise as he goes from flower to flower, searching over great masses of yellow golden-rod or clover for honey to take to the hive. The bumble-bee makes a very delicious honey, but he hides it away in a hollow tree. The Pilgrims used to hunt for this wild honey and enjoyed eating it very much.

At last some people noticed, in the spring-time, when the sap began to flow from the ground into the trees, generally in March and April, that on the maple trees, when the bark happened to be broken, a sweet sap ran down the trunk and when it had dried, it left, at first, a sort of gummy substance which was sweet like honey, and then if completely dried was almost like sugar.

That made them think that perhaps they could get sugar from the juice of the trees, so they bored little holes in the maple trees and collected the sap through a spout. From that sap they made a sugar that we now call maple sugar.

Next they found, almost by accident, that the juice of one kind of beet was very sweet and that it could be boiled down into sugar. They began planting that beet and improving it in size and quality, until to-day it produces five times as much sugar as formerly in the same size; almost all the sugar that the people of Europe have to eat to-day is made from the sugar-beet.

The sugar-cane looks very much like the corn, and any one would naturally think that if the sugar-cane has a great deal of sugar in its juice, the corn ought to have sugar also, and so it has, though we get it in a slightly different way from that in the sugar-cane.

The corn sugar we get from the kernels of the corn itself, and not from the juice. It is not exactly the same as cane sugar, but it is very much like it in every way. There is another plant which looks much like the corn and the sugar-cane, and belongs to the same family of plants. It is called sorghum, from which also sugar is made. It is not very good however. Perhaps you remember that when you have eaten raisins, you have sometimes found little crystals of sugar that have dried quite hard; so men can get sugar from raisins and from some other fruits.

There is one other kind of sugar that some of you are quite familiar with, although you do not know it, and that is milk sugar. If you have ever been sick, and had the doctor give you medicine, you will remember that he gave you a little white powder or he gave you some white pellets or pills, that had a sweet taste. Most of those pellets are made of milk sugar with just a little bit of medicine mixed with the sugar, because if it was all medicine it would be too strong. Now this sugar is milk sugar, which is made from the ordinary milk that we drink and a very large quantity of it is made every year. It is not so sweet and will not dissolve so quickly as cane sugar.

Sugar has been made from a great many different things, such as sawdust and the hulls of small plants, but there is one substance that tastes like sugar, which is made from coal tar which comes from a piece of coal such as you burn in your furnaces. This is a substance called saccharine, and it is five hundred times as sweet as sugar.

Do you realize what that means, five hundred times sweeter

than sugar? It means that if you had one small piece of candy and should divide it into five hundred parts that that small quantity of saccharine would give you just as much sweetness as the whole piece of candy and that a bit of saccharine, as big as a pea put in a cup of coffee or tea would make it just as sweet as two or three lumps of sugar.

There is one thing that would interest you children in this saccharine, and that is that your parents would not be able to say that this would hurt you, as they can now of the candy that you want to eat, because saccharine is generally used for sick people who are not able to eat ordinary sugar. So you see we have these eight different kinds of sugar: **cane sugar, beet sugar, maple sugar, palm sugar, fruit sugar, corn sugar** (called grape sugar), **milk sugar**, and **saccharine**.

To these we should add the honey which we are very fond of and which, over a great part of the world, is the only sweet thing the people have to eat. Some years ago the writer climbed among the mountains of North Carolina, far up in one of those narrow mountain valleys where the people live on very scanty food and where they have little to eat the year round, but corn meal, bacon and coffee. Sometimes they are able to get sugar at the store which is many miles away, but generally they cannot afford it, yet there, among those poor people, in those tangled mountain ravines, we had some of the most delicious honey that one could eat, which was found in the trees where the wild bees had stored it.

1. HOW SUGAR IS MADE

With the exception of saccharine (which is not really a sugar) all kinds of sugar are made in the same way, and with the exception of milk sugar, they are all made from the juices or sap of plants. The various stages are these: first, the sap or juice of the plant is extracted in several ways. Second, the juice is boiled to drive off the water, and as the water

evaporates we get a sort of syrup or honey as it might be called. From this we get our various kinds of syrups, as cane-syrup, maple-syrup, or glucose, which comes from corn. If you take a quart of water and put in some sugar it will dissolve and make a syrup. If you put one pound of sugar in, it will dissolve. If you put in two pounds of sugar it will probably dissolve, but rather slowly, and you will have a thick syrup. If you keep on putting in sugar you will soon find a point where the sugar will no longer dissolve. When you get to that point you have what is called a *saturated solution*. It would be the same with salt or soda or any other substance of that kind.

That is, a saturated solution is water or some other liquid, which has taken up, or dissolved, all the solid substance it can hold. If you put more sugar into this solution, it will not dissolve, but will sink down to the bottom of the dish and stay there unchanged. You can get just the same result from your saturated solution if you heat it and drive off some of the water. You will then have more sugar than the water can dissolve, and part of it will drop to the bottom of the dish. If you keep on boiling, you will drive away all the water and all the sugar will be deposited on the bottom in a hard lump.

Now, that is exactly what we have to do in making sugar of any kind. We boil the juice, until we get a thick syrup and then if we want to use it as syrup, as in maple syrup, we stop the boiling right at that point. If, however, we want sugar and not syrup, we go on boiling the juice or syrup until the sugar begins to settle and this is called "sugaring off." We carry this process on until most of the sugar has settled down from the liquid. It is then strained or drained and the liquid which runs off from the sugar is called molasses.

The sugar which is left after the molasses is drained off

is called raw sugar, because it has various flavoring matters, some mineral, and some coloring, which comes from the plant from which the juice was taken. Before the sugar is ready to sell, it is necessary to take away from it these dark colors and these strong flavors so that we may get the bright, white crystalline sugar, which we know and want. This is obtained by *refining* the sugar. It is done in this way:

The raw sugar contains much dirt, and useless materials. It is first dissolved in hot water, and strained through bags which take out the dirt. The heavy syrup next passes through large cylinder filters, filled with charcoal made from burned bones. This is called "char." The bone char takes out the coloring matters and the unpleasant flavors, leaving the syrup white. This is boiled again to the "sugaring off" point, and passes into the centrifugal machines, in which the syrup is separated from the sugar.

If you take a string and tie it to a small stone and whirl it a few minutes and then let go, you remember it goes off in a rather funny way as if it flew off from the edge of a circle, or as the water will fly off from the wheel of a carriage after it has run through a puddle of water. This we call centrifugal (or "centre-shunning") action, and these centrifugal machines are built to apply that kind of action to the syrup. The syrup is put in these machines which are whirled very rapidly.

In the syrup the watery part is heavier than the sugar, and is whirled to the outside of the machine, from which it is drawn away by pipes, as syrup, leaving the sugar in the middle of the centrifugal, almost dry. This is the way our granulated sugar is made. When the sugar is dry, it is packed in boxes or in barrels, and sent to the stores where people can buy it. All sugars have to undergo these same processes, but there are quite a number of interesting points about the different kinds of sugar and we will take them up one by one.

2. KINDS OF SUGAR

(a) Cane Sugar

First, **cane sugar**: When the sugar-cane has grown about ten or twelve feet high, looking like an enormous cornstalk without any ears of corn, the canes are cut off close to the ground. They are then carried on men's shoulders to a cart or a car and taken to the mill. There the stalks are run through



Carrying Sugar Cane, Cuba

great iron rollers which crush out from the stalks all their juice.

The crushed stalk, after it passes the rollers, is called bagasse, and it is so dry that it can be burned in the furnaces that make the machines go, so that you see the sugar-cane really supplies the power to crush itself. The juice of the sugar-cane after it is crushed out by these rollers is very dark and nasty looking. You would not want to taste it. It would be hard in fact, to compel you to take any of it under any circumstances. It is almost black, it smells bad, it looks repulsive, and yet, within that black, unpleasant looking, sticky mass is the white

clean sugar that we use. This raw juice is boiled, passed through centrifugal machines and separated into raw sugar and molasses.

If loaf sugar is wanted instead of granulated, the sugar crystals after being refined while still moist, are run or pressed into a round pan and allowed to dry. This makes a block, which is called loaf sugar, and is about the shape of a loaf of brown bread as the bakers make it in the city. This loaf of sugar is sawed up into cubes, which we call loaf sugar, or into thin oblong pieces, which we are beginning to know as domino sugar because they look like the dominoes used in games. We use also confectioner's sugar and powdered sugar, which are finely ground.

The raw sugar is made from the juice of the sugar-cane on the plantations in Louisiana, Cuba, Hawaii, the Philippines, or where the sugar-cane is grown, but the raw sugar is not refined there. It is generally sent far away to some of the great cities, as Boston and New York, where the refining is done. You will be much surprised, as most people are, to be told, that sugar refining, according to the last census, is the chief industry of Boston, and represents more millions of dollars than any other industry in which the people of Boston are employed, yet the sugar refining of Boston is almost all done in one building. The largest refineries in the United States refine six million pounds of raw sugar every day.

(b) Beet Sugar

Second, **beet sugar**: Beets for sugar are grown in Europe, chiefly in France, Germany, and Austria, and in the United States in Michigan, Colorado, and Kansas. The process of making sugar from beets is as follows:

The beets are dug up and carried from the field to the mill, where they are washed in great tanks. A current of water carries the beets along from one end of the tank to the

other. The beets pass through a machine with revolving knives which cut them up into small pieces. These are soaked in water for a while until the sugar in the beet is dissolved by the water. This water or syrup, is pressed out from the pulp, and the pulp is used for feeding animals. The raw beet syrup is boiled, refined, and prepared just as cane-sugar is. The beet syrup has a disagreeable taste and smell, and is not used commercially to any extent.

(c) Maple Sugar

Third, **maple sugar**: If you could be in New Hampshire, Vermont, or Northern New York, in the middle or last of March, when the snow begins to melt, you would have one of the pleasantest experiences of your life.

There are a good many kinds of maple trees, but the one from which the sugar is made is the rock maple, also called the sugar maple. A grove of maple trees is usually called a sugar bush, or sugar orchard. You would see the farmers going about from tree to tree, boring holes a few inches deep into the trees and driving in a little metal or wooden spout, on which is hung a large tin pail or a wooden bucket.

Just as soon as the hole is bored, and almost before the spout can be put in, if it is a bright warm morning, the sap begins to run, to drip, drip, drip, into the pail, sometimes almost running a stream. It does this all day long until the sun goes down, and when it grows cold, it stops running until the next day. It keeps on running for a number of days, sometimes several weeks.

The sugar-makers like particularly to have weather that is cold at night and warm during the day, for then the sap is not running while they are asleep, and they can easily take care of it. When the buckets are full of sap, they are gathered in one of two ways. First, a man goes from tree to tree, takes the bucket full of sap and pours it into a barrel placed upon

a sled, drawn either by a man or by a horse. The barrel is dragged to the sugar-house, where the sugar is made. The other way, whenever the trees are situated on a hillside, is to use little V-shaped troughs, sawed from a solid piece of wood



Sugar House

Sugar Maple Grove

so that they will not leak. They are about twenty feet long and are run from tree to tree and flow into each

other and into a large trough, which leads directly down to the sugar-house.

This is much more convenient, because every bit of the sap, which runs from the trees, finds its way down to the barrels at the sugar-house, without any extra labor on the part of

the men in gathering it. In the sugar-house you will find a broad, open pan, into which the sap is put, with a hot fire burning underneath. In the modern evaporators the pan is covered with a sort of roof to keep out the smoke and dirt that might get in. The sap is boiled until the syrup is just ready to "sugar off," as we have described, and if maple syrup is wanted, it is then drawn off into tin cans, which should weigh just eleven pounds net. That means eleven pounds without counting the weight of the tin can, and all the best maple syrup will weigh just the same, so that if your maple syrup, that you have at home, does not weigh eleven pounds to the gallon, it is not properly made.

If maple sugar is wanted, the syrup is boiled until it begins to "sugar off," and is strained and dried to hard sugar. One of the most delightful things for children to do, is to take some of the syrup just as it begins to "sugar off," and to drop a spoonful upon snow, or a piece of ice. It will cool into a sort of waxy candy, somewhat like molasses candy, which is very delicious and very unlike any other form of maple candy that you ever had to eat.

You will usually find in the stores, early in the spring, little scalloped cakes of what is said to be maple sugar, but is usually merely brown cane sugar mixed with a little bit of old maple sugar. Often there is no maple sugar in it at all. There is one way you can always tell the new maple sugar, from the old maple sugar or cane sugar. The old maple, and all cane sugar, is hard and breaks with a snap and is brittle, while the new maple sugar is soft and it is almost impossible to get it to break with a snap. It is usually so soft that if you press it between your thumb and finger, it will crumble into granular particles and feel sticky.

It is not easy to make an imitation maple sugar act like this and it would cost too much to do so, so that you may know generally, whether or not you have pure, new maple sugar,

by testing it in just this way. The color of the real new maple sugar is usually a yellowish brown, whereas the imitation or cane sugar, so called maple sugar, is usually a light, whitish brown; after a little while you can learn to tell it by its color alone.

Whenever you see maple sugar for sale in the stores, remember this description and see if you can tell whether it is real or not. If you take maple sugar and refine it as you did cane sugar and strain it through the bone charcoal, you will get a white, crystalline, granulated sugar, which is the same as cane sugar, although made from a tree instead of from the sugar cane, the difference between the cane sugar and maple sugar being a little coloring matter and that peculiar flavor that comes from the maple tree.

Maple sugar is used chiefly, as you know, as a candy, but it can be melted with the addition of a little water into maple syrup again, which is very popular in the United States for use with griddle cakes. It will interest you to know, perhaps, that only about 10 per cent. of all the maple syrup and maple sugar sold in the United States is real maple sugar, the rest being made from cheap brown cane sugar.

(d) Grape Sugar

The sugar made from corn should be named corn sugar, but generally it is called, among the dealers, *grape sugar*, because it resembles somewhat the sugar which is made from grapes. It is made in this way: the kernels of corn are ground into a coarse meal or flour such as you are familiar with, from which you make hasty pudding or corn-cakes. This flour, as we have found in studying the cereals, is composed largely of starch. The flour is mixed with water, the starch settles to the bottom, and the liquid is drawn off leaving the starch.

The starch is heated with a little moisture, and turned into

a substance called dextrin. The dextrin mixed with water makes a syrup called glucose, a good deal like cane syrup, white, attractive, and nutritious. It is not nearly so sweet as cane sugar. We mean by that, that there is not so much sweetening (or sugar) in a gallon of glucose as there is in a gallon of cane syrup.

Glucose is used in making candies, and in sweetening beer and other liquids. Most table syrups are almost pure glucose. If the glucose is boiled like cane syrup until it "sugars off" you will get from it the corn sugar, which, as we have said, is called grape or sometimes brewer's sugar, because it is used like the glucose, largely in making beer. The starch from the corn which is used in the making of grape sugar, is the same cornstarch which you eat, and the cornstarch that is used in starching collars and shirt bosoms.

(e) Fruit Sugar

Fruit sugar is one of the forms in which sugar is found in nature. When grapes are dried into raisins, Nature herself evaporates the water in the juice of the grape and we find left behind the little lumps or crystals of sugar. We find it also in dates.

(f) Milk Sugar

Milk sugar is made as follows: You remember that from the milk we took first the oil or fat, which is called cream, from which we make butter, and had skim milk left. From the skim milk by the use of rennet we separate the casein which is in the curds that are present in the milk. A liquid called whey drains from the curds, and this whey is the substance which we begin with in the making of milk sugar.

Whey is boiled down until it becomes thick, but it is never used as a syrup. It is boiled and strained to take out the hard substances, is boiled again until it "sugars off" and the sugar is drained as usual. There is one quality of milk-

sugar that makes it especially valuable for use in medicine, and that is, if exposed to moisture in the air, it will not ferment and get sour and spoil as cane-sugar does. For this reason, it is better for sick people than any other kind of sugar.

SACCHARINE

Saccharine, as we have told you, is made from coal tar. From coal tar we get also many colors used in dyeing cloth, flavors, and perfumes.

3. USES OF SUGAR

There is one thing more to tell about sugar, and that is what we do with it. First, we mix it with food to give a pleasant taste. Cake, for example, is just a sweetened bread, and we put sugar into almost all our desserts, either when they are cooked, or when they are brought to the table. We use sugar in tea, coffee, and other beverages, as lemonade or fruit juice, and in soda water in the form of syrup. Sugar is used also to preserve fruits in the form of jellies and sauces, and candied fruits. In all parts of the civilized world the numerous forms of candy and confectionery of all kinds are made from sugar.

You have only to think for a moment of the enormous quantity of chocolate candies that are made and eaten in England and America, and to think that cocoa, mixed with sugar, makes the chocolate we buy, to see how much sugar is eaten in this way. Sugar, you will remember, is a heat food, and gives energy to the body, so that if used wisely, it is very beneficial. The only objection to it is that because it has such an agreeable taste, people eat more of it at once than their body can really take care of. That is, really, the only objection to sugar for most people. The reason why children are so fond of sugar is because, in their active bodies, they need a large amount of energy, not only for their actual living,

but in order to enable them to build the new cells which make them grow.

Germany, like the other great nations of the world, provides a considerable quantity of sugar for her soldiers to use every day in their rations, and it has been found that there is nothing which will rest tired, nervous, worn-out soldiers so quickly or so fully as sugar. Mountain climbers, who make their loads as light as possible, are learning to take with them just the plain crystalline sugar that is called rock candy crystals, as being the most nutritious and strengthening thing they can eat. It will interest you, perhaps, to know how rock candy is made, for you are all familiar with it in those pretty, transparent, crystals which glitter in the light almost like diamonds, either red or white. This is the way it is produced:

Pure cane sugar is dissolved in water until we have a saturated syrup or solution. Threads are suspended in this liquid, which is then gradually heated to evaporate the water, as we usually do in "sugaring off" a syrup. As the water evaporates the sugar crystals begin to separate from the liquid, but they settle as crystals around the threads, rather than fall directly to the bottom. Other crystals are formed upon these, and this process goes on until we have the strings of rock candy as you see them in the stores.

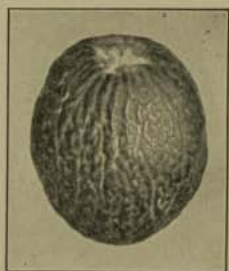
In order to hasten the crystallization, and make large crystals instead of small ones, a little acid is usually put into the syrup just before it begins to sugar off and this causes the crystallization as you know it. The loose crystals of rock candy, that are sold in packages in the store, are made in the same way except that the strings are not put in the liquid, and the crystals fall to the bottom separately.

Rock candy is pure cane sugar; if you take a piece of rock candy and grind it up you would not be able to distinguish it from the cane sugar which you began with.

CHAPTER IX

SPICES

IN man's search for food, as he tried the different plants and animals he found a good many things which he liked the taste of, although they were not food and would not support life. They helped to digest the food, and so man learned to use them, and we call them to-day spices and condiments.



A Nutmeg

The spices are all plant products, the most common being pepper, clove, nutmeg, cinnamon, allspice, and ginger.

The condiments are both vegetable and mineral and are both solid and liquid. The most common are salt, vinegar, mustard, and certain pickled fruits as pickled cucumbers, or, ordinary American "pickles," pickled olives, and various kinds of vegetables, put up separately or mixed.

In this list also belongs what are called sauces such as Worcestershire and Tomato catsup or "Ketchup." A modern addition to this list is celery salt, which is common salt mixed with ground celery seed.

Pepper is made from the berries of a plant which grows in the East Indies. Red or cayenne pepper is another plant, not a real pepper.

Cloves are the dried, half-opened buds of a plant. They are used either whole or ground.

A nutmeg when growing looks very much like a peach, with a thick pulp outside and a hard nut, which is the nutmeg, in place of the peach stone. The pulp of the nutmeg is not used. Next to the pulp and covering the nutmeg is a thin coat or skin which is of a blood red color. This is the *mace* of commerce which is taken off, dried and ground, and makes a very different spice from the nutmeg which it encloses. Nutmegs are of several varieties, but they all taste the same.

It was said many years ago that Connecticut used to make nutmegs of wood, color them like the natural ones, and sell them as real nutmegs. This was not true, but dealers used to plug up worm holes in the nutmegs with wooden pegs, and so started the story and gave to the State the nickname of the "Nutmeg State."

False cinnamon is the bark of the cassia plant, and is frequently known as cassia. The buds of the plant are sold as a spice, under the name of cassia buds. They are also coated with sugar and sold as a kind of candy. There is a true cinnamon bark but it tastes like cassia bark.

Allspice or pimento is a spice very commonly used. It is called allspice because it was thought to taste like a mixture of the other spices. It is used because it is cheaper than the others.

Ginger, one of the most popular of all the spices, is the root of a plant used in great quantities throughout the world. It is generally sold in its ground form. The Chinese have a way of taking the fresh root and preserving it in a syrup in such a way that the ginger is quite soft, very much like a piece of citron, and the sharp, biting sting of it is so mild in the preserved ginger that it makes a very delightful food.

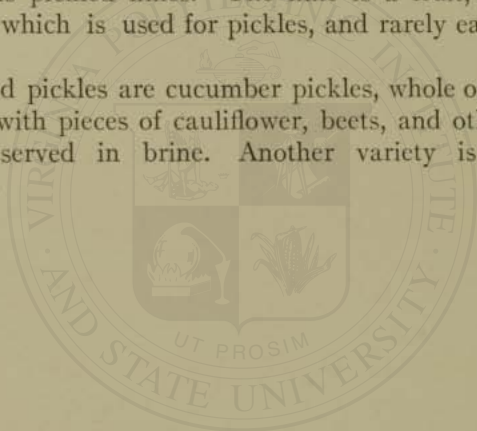
Almost all the spices we have mentioned are antiseptic in their effect on the body, that is, they kill disease germs. This very likely is the reason why people in hot countries, where the various spices grow, learned to use them to pre-

vent disease rather than because they cared for them with their food.

Pickles are usually small cucumbers, soaked in a brine composed of water, salt, sometimes spices and vinegar. Cucumbers of any size may be used, but generally they are picked when they are about as large as the finger, principally because of the convenience in bottling and handling them. Cucumber pickles about the size of a lead pencil in diameter are often called gherkins.

A common kind of pickled fruit on sale in the United States is pickled limes. The lime is a fruit, much like the lemon, which is used for pickles, and rarely eaten in the raw state.

Mixed pickles are cucumber pickles, whole or cut in pieces, mixed with pieces of cauliflower, beets, and other vegetables, all preserved in brine. Another variety is called sweet pickles.



CHAPTER X

STARCHES, GUMS, AND OILS

STARCHES

Most of our starch foods we find in wheat, corn, rice, and other cereals. Cornstarch is used to make puddings. Potatoes contain a great deal of starch. There are several other starch foods which we like and use, as the tapioca which is made from the root of a tropical plant called manioc or cassava; sago, which is made from the pith of a palm tree; and arrowroot which is a very good food for invalids and children. Most of the "arrowroot" sold is made from potato starch and is not real arrowroot.

GUMS

The world produces many kinds of gums, but the only one used much as food is the gum arabic, from which we make the candy "gumdrops."

Chewing gum which is so popular in the United States, is made from the pure gum of the spruce tree, from chicle gum, found in the West Indies, and from the paraffin wax made from petroleum.

With the exception of spruce gum, these gums are flavored with different extracts and put up in the packages in which you buy them. They are not injurious, in most cases, but they have no food or other value. Vegetable waxes are really gums but are rarely eaten.

OILS

You remember that besides the proteid (gluten), and the carbohydrate (starch or sugar), one of the necessary parts of our food is the fat.

The fat of foods that we eat is either a liquid, that is an "oil," or solid, that is a "fat."

Vegetable food fats are almost all oils, as olive oil, cottonseed oil, corn oil, peanut oil. Animal food fats are usually solid, as butter and lard. Mineral oils are not used as foods, but petroleum jelly or "vaseline" is of great value as a medicine.

Oils are of two kinds:

1. **Fixed** or **expressed** oils are those that we get by pressing the seeds or fruits of plants, as olive oil and most food oils.

2. **Essential** or **volatile** oils are those that are distilled from leaves or flowers of plants, as oil of peppermint. They are not used as foods, but as medicines. One of these is oil of cloves, a good remedy for toothache.

OLIVE OIL

The most valuable food oil is olive oil. Perhaps you are fond of the green pickled olives, or "Queen olives" which are very popular. The ripe olives are a purple black color, and are called "mission" olives, because they have been grown for many years at the old Spanish mission houses in Southern California. The use of the olive for food as a fruit and as an oil, is very old. The Greeks and Romans ate the oil, and it is the one usually mentioned in the Bible as used for food or for lights.

Olive oil is made from ripe olives. The olives are cut into pulp which is put into bags and the oil pressed out. The oil cake remaining is fed to cattle. Olive oil is used in Europe in cooking, instead of lard, and often instead of butter. In the United States we use olive oil mostly for salad

dressing. Olive oil, when pure, is a light green, attractive looking oil, but the olive oil that you generally see is a bright yellow. Whenever you see this yellow "olive oil," or "sweet oil" as it is often called, you can feel sure that it is not olive oil at all or is mixed with other oils, which are, in most cases, cottonseed oil or corn oil. The Greeks and Romans not only ate olives and olive oil, but they rubbed their bodies with it after their bath, not only to make their muscles more flexible, but also because the body will absorb olive oil and the tissues will get the benefit directly.

The olive tree was so valuable that crowns of olive leaves were given to victors in contests as a symbol of the most valuable thing the Greeks possessed. Italy produces the most olive oil, but California makes a great deal of the finest quality.



Branch of Olives

COTTONSEED OIL

This is made from the seeds of the cotton plant, from which we get all kinds of cotton for clothing.

Millions of gallons of cottonseed oil go from the United States to Europe, and much of it comes back in bottles labelled "olive oil," or "salad oil," because it is much cheaper than pure olive oil.

Fortunately it is a good, healthful food, next to olive oil in food value, so no real harm is done, but it is a dishonest thing to sell it and pretend it is pure olive oil.

Cottonseed oil is mixed with pure beef suet (or fat) to make "cottolene," much used instead of lard. Foods made with lard are hard to digest and cause much stomach trouble. Foods made with cottolene are easy to digest, and are superior to lard foods in every way. Cottonseed oil is a bright yellow oil as you see it in the sweet oil bottles. Corn oil, made from field corn, is used at times as a salad oil.

Peanut oil is now being sent to France and Italy to be used as a substitute for olive oil, because it is cheaper than cottonseed oil.

All of these oil seeds yield an oil cake after the oil is pressed out, which is good food for cattle.

There are many other oils, but they are not used as foods. From fish we get cod liver oil which is often given to sick people who need a good deal of fat in their food.



From a photograph, copyright, 1901, by Detroit Photographic Co.

Cattle at Drinking Place

CHAPTER XI

MEATS

WHEN plant food grew scanty, men were obliged to eat meat, and they tried all kinds of animals, so that the flesh of almost every creature that lives on the land, in the water, and in the air, is used as food by the people in some part of the earth to-day. The meat, however, used for food by man is largely obtained from animals raised by him, which are called domestic animals.

Domestic animals are raised by man as beasts of burden, for food, or for clothing. The beasts of burden are sometimes eaten when they become useless for work. A few animals used as pets, or for hunting, as dogs and cats, are not often eaten. Domestic food animals can be raised wherever grass lands are found with sufficient water.

From very early times, the wandering tribes of men have herded their cattle, and driven their flocks over the treeless prairies of North America, along the Andes, the windy steppes of Asia, and the great plains of Australia and Africa. When the wandering tribes became farmers and remained in one place the breeding of animals became much more important, and the animals were of greater value. The wandering tribes did not often raise beef cattle, because they walk very slowly, and soon get tired.

To-day almost all countries, excepting those devoted to manufacturing, as England, raise all the cattle, horses, and sheep they need. The United States raises more than is needed, and large numbers are

sent to other lands. The horse is most widely distributed over the earth, and is absolutely necessary for the herdsman to enable him to take care of the great herds of cattle and flocks of sheep.



From a stereograph, copyright, 1902,
by B. L. Lingley

Cowboy

This is a great and busy country, as you know, and from one end of it to the other the mills are going by day and by night, to supply the needs of the people of the United States. But the raising of live stock is the greatest industry in the country. The value of the live stock is over three billions of dollars. If you should add together the value of the wheat, corn, and other cereals; the sugar, molasses, fruits, and tobacco; the cotton, the wool, the lumber, and hay; or if you add the coal and petroleum, and building stones; the gold and silver, iron and copper, the sum would not equal in value, the amount of capital which is devoted to the industry of raising animals for man's use, most of them being intended for food. Did it ever occur to you what a very large share of the United States is devoted to the great ranges, the small pastures, the hay, corn, and oat fields, all for the raising of live stock?

The live stock industry is divided into three classes:

(1) **Stock raising**, *i. e.*, the raising of live stock for food or other uses.

(2) **Slaughtering**, or killing the animals, and preparing the flesh for food.

(3) **Meat packing**, which includes the various processes by which the flesh of the animals that are killed is prepared or preserved, for an indefinite time, by canning, drying, smoking, pickling, salting, etc.

STOCK RAISING

Stock raising includes two different operations:

a. Raising the live stock.

b. Marketing the stock when ready for use.

All the various animals used for food, or work, were originally wild and savage, as early man was himself. As soon as man began to be civilized, he began to tame and train animals, and through the long ages since, he has been improving the

breeds of animals. Stock raising deals with four classes of animals.

- (1) Animals for beasts of burden, or for work.
- (2) Animals for food.
- (3) Animals for hunting, or pets.



Ready for the Hunt, Italy

(4) Poultry, *i. e.*, birds kept for food, eggs, for feathers, and for pets.

The work animals are the horse, mule, ox, camel, reindeer, elephant, etc. The food animals are beef cattle, hogs, sheep, and goats. The animals for hunting, or pets, are dogs, cats, rabbits. The poultry in common use are hens, geese, turkeys, ducks, pheasants, and pigeons. Ostriches are raised for their feathers, and many of you have canary birds in your homes as pets.

As this book is to tell you about foods, there is no time

to discuss the work animals, or the hunting animals, except as they sometimes, like horses, are used as food in some parts of the world.

A large number of cattle, sheep, and hogs are raised on the separate farms in almost every State in the Union, but most of the beef cattle are raised on the great ranches, or ranges, in the Western States, where the animals can wander free for miles over the prairies, and graze upon the short grass, which is very nutritious, and which the cattle like best. The buffalo (or bison) used to prefer this sweet grass and, a century ago, the great plains were covered with hundreds of thousands of them. The buffaloes have now entirely disappeared. The cattle can graze almost all the year round, but in severe winters it is necessary to give them some food. The cattle are sold when about three years old. Years ago they used to be driven on foot long distances to the market places, but to-day they are usually shipped by train.

SLAUGHTERING AND PACKING

The slaughtering of the animals is chiefly done at a few prominent points in the country, which are conveniently near the plains where the animals are raised; these are Chicago, St. Louis, Kansas City, Omaha, and the names of the great packing houses are familiar to the people of this country, for they are the firms which control all the meat packing in the country, excepting the trade of local butchers.

The animals are sent to the great packing centres, allowed to rest for a day or two from their journey, and are then killed in various ways, so that they shall suffer as little as possible. This is done for two reasons: First, from a humane desire to keep the animal from suffering; and second, because the flesh of a frightened, or exhausted animal often becomes bad, and some times poisonous.

After the animal is killed, which is done with great speed, (for example, a hog is killed and dressed in two minutes, a steer in ten), the bodies are allowed to stay for a day in cool rooms, so that the natural heat may escape. The meat is then ready to be sold as fresh meat. It is cut up into convenient forms for use, and we have steak, roast beef, lamb

chop, ham, etc. The meat that is not sold at once is either kept in refrigerator rooms until it is needed as fresh meat, or else it is packed in cans. The meat is usually steam cooked before it is placed in the cans, which are sealed tightly so that the air cannot get to the meat. Carefully put up, the cans may be taken anywhere in the world, and the contents will not spoil.



From a stereograph copyright by H. C. White Co

Stock Yards, Chicago

Years ago we used to send away from the United States the cattle that we could not use for ourselves, and they were shipped in steamships to Europe and elsewhere. The poor animals suffered much from the journey, and when they reached the other side of the water they had lost many pounds in weight, and the quality of their flesh was poor. Since the invention of refrigerator cars, and refrigerator steamships, very few animals are shipped alive, *i. e.*, "on the hoof," as it is said. They are now killed at the packing centres near where

they are raised, and only the meat which is of value, minus all of the waste products of the meat, is shipped in refrigerator cars, or steamships, to every part of the world. For example: New Zealand sends a very large amount of fresh mutton to England in refrigerator steamships, and the mutton is so fine, and keeps so perfectly in the refrigerator rooms, in spite of the long journey from New Zealand through hot climates to England, that it sells for a higher price than the mutton raised fresh in England, or sent there by the United States.

BEEF CATTLE

Beef cattle furnish the largest part of the meat food of the United States. They are the bulls, oxen, and cows, and their flesh is eaten under the familiar names of roast beef, sirloin, tenderloin, rump, and round steaks, etc. The young beef



From a photograph copyright by Brown Bros.

Refrigerated Beef

animal is called a calf and its flesh is veal. Beef is sold in the markets either fresh, or as dried beef, or corned beef, which is meat preserved in a brine made of salt and water.

It is also canned in various ways, as canned tongue or luncheon beef. The stomach of beef animals is sold as tripe.

Every part of the beef animal is used commercially. In a steer of 1500 pounds weight, one-half of it becomes dressed beef, and the other half of it is waste material; *i. e.*, it is waste material so far as its use as a food substance is concerned, but it is of value for all sorts of manufacturing purposes.

For example: the horns are used for buttons, combs, and hair-pins; the head and feet are made into glue; the bones are made into handles for knives, tooth brushes, and buttons. The tails of horses and cattle are twisted into curled hair, which we put in mattresses. The bristles of hogs are the most valuable thing in the world for making brushes. The tallow and fat are made into soaps and glycerine. The short hair of the cows is mixed with plaster, or made into felt. The skins go to the tanner, and become leather.

PORK PRODUCTS

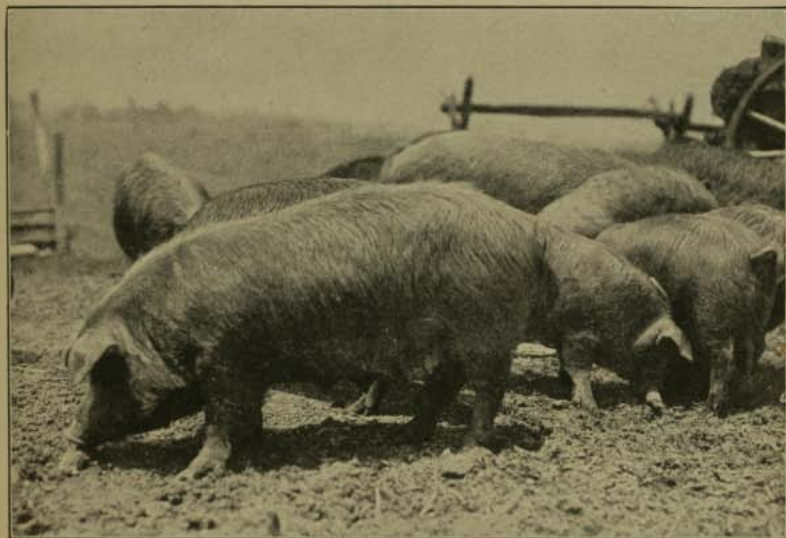
Hogs or swine come next after beef cattle in food importance, and they are one of the most profitable of all of the products of the United States. Hogs are grown in all the States of the Union, but mostly in what is called the "corn belt," or the States which lie along the Ohio river and extend west as far as Kansas. It is in these States of Illinois, Iowa, Nebraska, Kansas, etc., that the greater portion of the corn crop is grown, and three-quarters of the corn which is raised is fed directly to the animals which are grown in the same place, so that the farmers export their corn in the form of beef and pork.

There is no farm product which pays so large a profit to the farmer as the hog, and it is sometimes called "the gentleman that pays the rent and the interest on the mortgage."

Hogs are sent from the farms where they are raised to

the great packing centres. They are allowed to rest a day or two to recover from the effects of the journey. They are then killed and hung in the refrigerator-room for twenty-four hours before they are dressed. They are killed and dressed at a cost of only five cents per animal.

There are many commercial forms of meat food which come from the hog. The flesh of the animal is in general



Hogs

called pork, but different parts of the body have different names and uses. The legs of the animal are dried and smoked and these are called hams and shoulders. A strip is cut from the lower part of each side which, when smoked and dried is called bacon. The ribs with the flesh attached, which in a beef animal would be called the rib roast, in the hog is called "spare ribs."

The hog has usually, from two to four inches of almost solid fat on the outside of the body. This is cut into strips, put into brine and pickled, and is the ordinary salt pork of commerce. The fat on the inside of the animal occurs in curious large flakes which are called leaf lard. This leaf lard is heated until the fat becomes liquid. It is then strained

off and forms, when cold, the lard that is used in cooking. What is left is "scraps"—and is pressed into a biscuit for dog food.

Small pieces of the meat of the hog are chopped into a mince meat, put into cylindrical casings of skin or of cloth and this is ordinary sausage. (Sausage made of beef scraps is called "bologna.")

The meat of the hog is largely used in the United States and in Europe ex-



From a stereograph, copyright, 1905, by H. C. White Co.

Hogs in Refrigerating Room

cept among Jewish people. They refrain from using pork because their religion forbids them.

Pork is a very greasy kind of meat. Fat or grease in the human body yields heat or energy. In winter when the body needs much fuel, and the weather is cold, pork is healthful and nutritious. In summer, or in tropic lands, when the body does not need much heat, pork digests very slowly, and if much fat meat is put into the stomach at one time digestion is not perfect and various troubles in health arise.

The bristles of the hog, which is almost the only part of the animal which is not used for food are made into brushes.

Every part of the hog has a money value, bristles, skin, flesh, bones, and the by-products, that is those not food, pay a large profit.

SHEEP

Sheep are raised all over the world, and can live and thrive in places like mountain pastures where the grass is so short



Sheep Grazing

that larger animals, such as cattle, could not find food enough to eat, and where cattle would not be able to climb about because of their great weight. In the United States sheep are raised chiefly on the mountains in Montana, Colorado,

Wyoming, and Idaho—though they are raised in almost every State in the north and west of the United States.

The sheep has three great human uses, one for food and the other two for clothing. The wool of the sheep which is a textile fibre is made into woollen and worsted cloth. The skin of the sheep is made into leather, much used in book-binding and for shoes. The flesh of the sheep when killed is called mutton. The young sheep is called a lamb and its flesh has the same name.

The sheep that produces the finest wool, *i. e.*, the merino, is very small in body, and yields very little meat. The sheep that yields the largest quantity of mutton has usually a very poor wool, so that for years the sheep men have been experimenting, trying to raise a sheep which shall have a large body and give much meat and at the same time yield an abundant supply of wool of high quality. This object has been partly obtained, and to-day it is possible to have sheep that will produce good wool and much meat, at the same time. These sheep are called "crossbreds."

Sheep's milk is used in many parts of the world, where there are no cows. Roquefort cheese is made from sheep's milk.

GOATS

Although the goat is not very common in America, yet millions of goats are raised in Eastern Europe and Asia Minor, both for milk and for flesh, because the goat will live and thrive on scanty food where beef cattle would die in a few days and the sheep would starve in a few weeks.

Goat's flesh is almost the only meat eaten by the people who live among the Caucasus Mountains. They are descended from the people who were our ancestors and who founded the white, or Caucasian, race.

The flesh of the goat is used for food and is eaten in various forms.

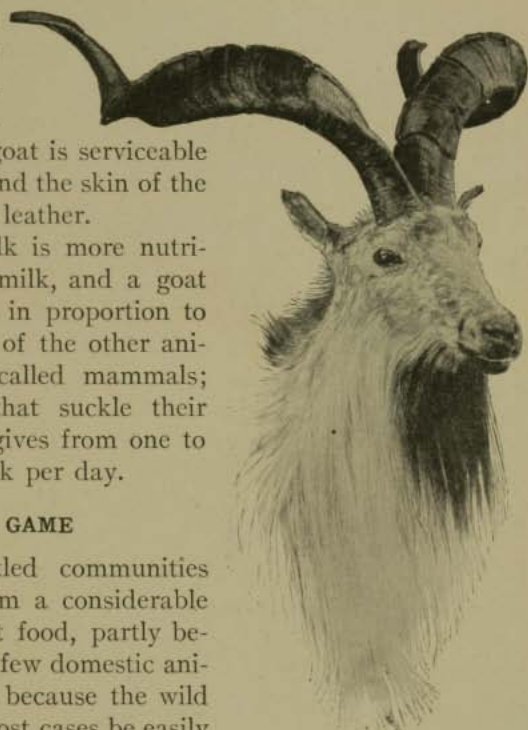
The hair of the goat is serviceable in several ways, and the skin of the goat is made into leather.

The goat's milk is more nutritious than cow's milk, and a goat yields more milk in proportion to its size than any of the other animals which are called mammals; that is, those that suckle their young. A goat gives from one to two quarts of milk per day.

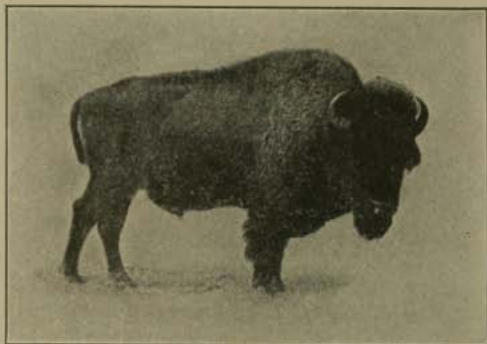
WILD GAME

In newly settled communities wild animals form a considerable part of the meat food, partly because men have few domestic animals, and partly because the wild animals can in most cases be easily hunted and killed. Wild game is common at certain times in the year in every land, although it does not appear on the market in great quantities at any time. In New England, the animal which is most abundant, and is therefore most often killed for food, is the deer. The flesh of the deer is called venison. It is a very delicious meat, but it has an odd "woody" flavor.

In the winter one sometimes finds in the markets the meat of the moose, of the caribou, and perhaps the bear. Several smaller animals such as the raccoon, the wild rabbit,



Head of Goat



Bison



Moose



Deer

and the squirrel, are sometimes sold. The flesh of other animals which eat plant food is usually liked by man and is healthful. These are the animals which graze, such as the deer, the bison, the moose, antelope, etc. Fifty years ago, there were on the western plains, great herds of buffalo or bison, which sometimes contained one hundred thousand animals at one time. These animals have been so cruelly hunted during the last fifty years, both for their hides which yield a valuable fur, and for sport in hunting, that there are no wild herds now known to exist, and the only bison living in the United

States, are the few which are scattered about in various Zoological Gardens or on some private estates. From experiments made with the animals during the last few years it has been found that they will do well and will breed in captivity, and because the animal is very large, giving several hundred pounds of meat, it is really worth more on the market than beef, so that the raising of bison in the future is likely to increase to a considerable extent.

Animals which do not graze, but which are carnivorous, that is, which eat other animals, are rarely or never used as food by mankind, in any part of the world. These animals are the lion, tiger, panther, wolf, etc., whose only value is their fur.

POULTRY AND EGGS

Among so many food products of which large quantities are raised every year, it is hard to say always which are the most important, and which the greatest, but certainly among the most valuable in the United States are poultry and eggs.

When ancient man was forced to eat the flesh of the animals about him, he found the flesh of birds to be especially good, and from that time to the present, they have been largely used. Some of the birds he has been able to tame and keep about him, and these we call domestic poultry. Other birds that he has not been able to tame we call game birds. Domestic poultry consists usually



Hens and Turkeys

of hens, geese, ducks, turkeys, and pheasants. Pigeons, which are used also as pets, are raised quite frequently for food. Young pigeons are called squabs.

When the Colonists came to New England, in the time of the Pilgrims, they found a great many wild turkeys in the



Geese and Ducks

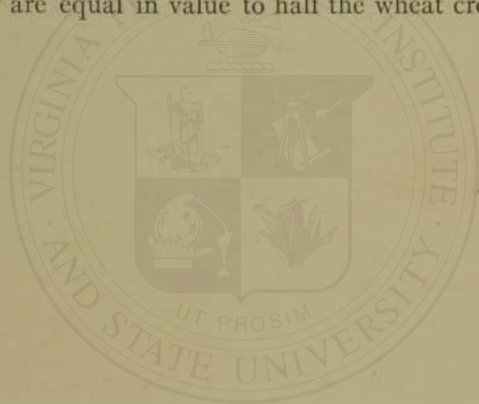
woods. These were the ancestors of our domestic turkey. In New England a Thanksgiving dinner would seem incomplete without the turkey.

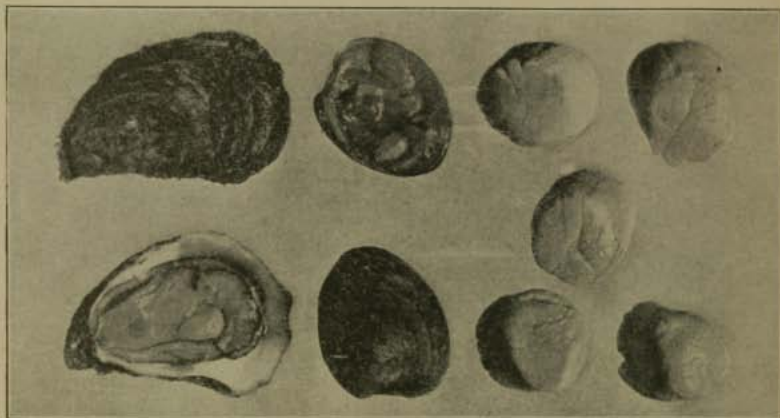
Within the last ten years, cold storage houses have become common, and enormous quantities of poultry of various kinds are packed in the fall when they can be bought cheaply, for use the following spring and summer when prices are high, though much of this food is not fit to eat the next year.

A large number of the great summer hotels which are located in the mountains or by the seashore have their own ice-houses, in which, in the fall, they pack away thousands of hens, turkeys, and geese, which appear on the tables the following summer as fresh Vermont or Rhode Island turkeys or fresh spring chickens.

Wild game birds are of many kinds, but the principal ones are wild geese, wild ducks, quail, and partridge, while a number of smaller birds, such as the bobolink, woodcock, snipe, etc., are killed in the hunting season and sell at high prices.

Ten billion eggs are produced each year in the United States alone. They are equal in value to half the wheat crop, great as that is.





Oyster, Clam, and Scallops

CHAPTER XII

FISH AND SEA FOOD

AFTER man had learned to eat the animals which roamed on the surface of the earth, and the birds which flew in the air, he turned to the pursuit of the creatures which live in the water—in the rivers, lakes, and ocean. These creatures are fish, shellfish, and large sea animals. The sea animals are not many in number and are not very popular with civilized people. They are the whale, the walrus, the seal, the porpoise, the dolphin, and some others.

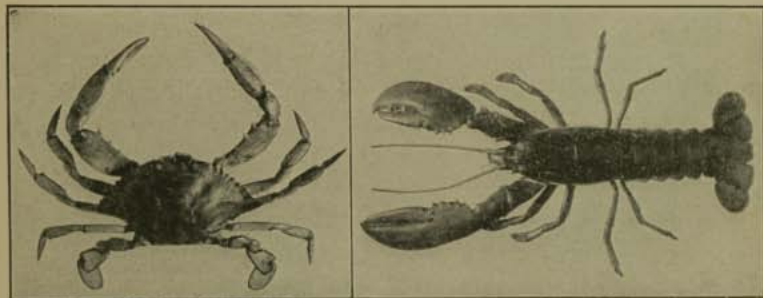
The principal reason why people do not usually like the flesh of sea animals is because it is so very oily; but for that particular reason, their flesh is considered delicious by the

Esquimaux and those who live within the Arctic regions. Living as they do in that very cold climate, the body can digest easily an amount of heavy fat or oil, which would kill the same person in a tropic land, so that the Esquimaux enjoy a nice piece of seal blubber or whale blubber (which is the fat flesh of the animal), as you might a box of nice chocolate candy.

The shellfish in common use among people are the oyster, the clam, the quahaug, and the scallop. The lobster and the crab, although crustaceans, are commonly called shellfish.

Oysters are found at a great many different places along the coast of the Eastern United States, by the shores of Long Island and Delaware, but chiefly in Chesapeake Bay, and during the season hundreds of fishing boats, called dredges, may be seen scattered about the bay.

The oysters are gathered by means of a dredge which resembles two garden rakes fastened together on a pivot and which open and close somewhat like a pair of shears. These are opened, dropped to the bottom of the water, shut together and then lifted up to the boat, bringing up the oysters, mud, and other things, which are on the bottom of the bay, just about the same as you would do if you scooped with both hands at the bottom of a stream. The large oysters are



Crab and Lobster

picked out and the small oysters are dropped back again to wait until they grow large.

Oysters decay rapidly and ought to be eaten soon after they are gathered; but by putting ice with them they can be kept fresh for several days and can be sent hundreds of miles from the place where they were found. Purchasers should always find out if possible how long since the oysters were gathered and refuse them if they are in any way suspicious, because a bad oyster is very poisonous, and will cause intense suffering and death as surely as the strong acids and other poisons.

The clam is a very popular shellfish in the United States. A very common way to cook them is to roast them, mixed with seaweed, over the fire, which gives them a peculiar and attractive flavor. The New England clambake is a very popular festival at the beaches.

Clam chowder, which is the stew made from the clam, is also a typical New England dish. The quahaug and scallop are sold on the market in considerable quantities, and are a sweet and delicious food.

Fish existed on the earth for millions of years, long before man appeared. About the time that the great tropical forests were growing, from which the coal was made, the sea was swarming with fish, and as there was no one to catch them, or to injure them, except each other, innumerable quantities died, sunk to the bottom of the sea, where they remained without decaying, and were gradually overlaid by droppings of mud which became rock.

Under the influence of the heat of the earth, the oil from the fish became liquid, and flowed into the hollows of the rocks. It was changed somewhat by the effect of the heat, but we get it today in the form of petroleum from which kerosene oil is made.

It was natural, therefore, that when man became hungry he was attracted to this supply of fish in the water, and he

learned to catch them by hook and line or by net from the shore. Later when he had boats and ships, he used them to fish at a distance from the shore, where the largest bodies of



From a photograph, copyright, 1905, by Detroit Photographic Co.

Fishing Schooner, Gloucester, Mass.

fish are usually found, in groups which are called "schools." If you should roam about the world you would find near the coast of every great populous nation a fleet of fishing boats, busily engaged in catching fish.

Among the regions where fish are abundant, one of the most famous is that called the Grand Banks of Newfoundland. A bank, as a fishing term, means about what it does on land, that is, a bank is a fairly level piece of land, which on one side descends sharply or quickly into deep water. So a fishing bank is a somewhat level sea floor, where the water is not deep, which descends on one side sharply or quickly into deep water. It is on level places like this, that fish are found in great numbers because they have abundant food in the small fish which live in the shallow waters.

There are many kinds of fish which are caught on the Grand Banks, but the most important, the most abundant of all, and the most valuable, is the codfish. It has been caught in enormous quantities for the last two hundred years in the same place, but there seems to be no sign whatever of its diminishing in number. Fleets of fishing boats come from France and England as well as from the United States to fish for cod.

The cod fish is preserved for future use in a very simple way. The fish is cut open with a long slit on the underside, and cleaned of the heart, lungs, and other entrails. It is then rubbed with salt and laid to dry on broad platforms made of strips of wood. These platforms are called "fish flakes." When the fish is dry it will keep almost indefinitely and it is a valuable food for many poor people who find it hard to get any food at all. Sometimes the bones are taken from the fish, which can be done very easily, and then it is sold as boneless codfish under various names given by the manufacturers.

With the codfish are generally found haddock, which are very much like the cod, and halibut, which is a large fish and very delicious. This is usually eaten fresh and is rarely preserved. To some extent it is smoked and canned.

The salmon comes next in value after the codfish. Many



Fishing Village, Newfoundland

fresh water salmon are caught in Canada and along the Maine coast, but the greater part of the salmon sold in the United States to-day comes from the Columbia river in Oregon and from Alaska. During the short season, two or three months only, thousands of men and women find employment in catching and canning the salmon. Some of the salmon caught are put on ice and hurried across the continent, and the fresh salmon which you buy at a market in Boston or New York, was in many cases, caught thousands of miles away.

Mackerel are very common in various parts of the world and are usually preserved by soaking in brine or pickle.

Herring is a small fish but is caught in large numbers and is generally dried. There is a fish from three to five inches long, called the sardine, which is canned, packed in oil in the flat boxes with which most of you are familiar. It is probable that a great many other kinds of fish about the same size, masquerade as sardines, because the supply of the true sardine is not equal to the demand or to the quantity that are packed each year and sold as sardines.

Two fishes of especially good flavor are the bluefish and the shad, which are very common in the Eastern United States during about half the year.

Among the freshwater fish which are caught in great numbers are the trout, the bass, and the pickerel. These are caught mostly by sportsmen for the fun of catching them, and do not often appear on the markets.

The oil pressed from the liver of the codfish, is a very valuable remedy for people who have consumption or any other disease where the body does not have enough nourishment and needs to be supplied with a particular kind of fattening food.

The principal objection to cod-liver oil is that, if it is not carefully prepared, it becomes rancid and has a very disagree-

able taste, but if the livers are taken from fresh fish as soon as caught and the oil immediately pressed from them, and then put up in glass bottles which are corked tightly, so that the air cannot reach it, the oil will remain in perfect condition for use and be almost tasteless. If any one of you has to take cod-liver oil, it will be well to remember that if you



Setting Seine for Fish

first eat a piece of peppermint candy you can take a dose of cod-liver oil without noticing the taste.

Fish are caught in several ways, one by a hook fastened to a line by which the fish are caught one by one; another by long lines which are stretched out, fastened at either end to a buoy; from these long lines, short lines are dropped which have a hook and bait. These are called trawls, and are usually set by the fisherman in the morning and left a number

of hours, after which they go to one end of the trawl and draw it up taking off the fish that may be caught on each of the short lines, putting on fresh bait and dropping the lines again.

In many parts of the world fishermen use large nets which are called seines. These are set very much as the trawls except that often they are put in the form of a semi-circle or almost a complete circle, so that the fish which swim in and are caught, as they attempt to get through the net, cannot escape.

An easy way of fishing, which is forbidden by law in most countries, is to fire off a stick of dynamite below the surface of the water. Water carries force as well as sound very quickly and the concussion of the water caused by the explosion kills or stuns the fish for hundreds of feet in every direction. As soon as the fish are stunned they rise to the surface of the water, and turn on their side, and all the fisherman has to do is to row along and pick them up from the surface of the water.

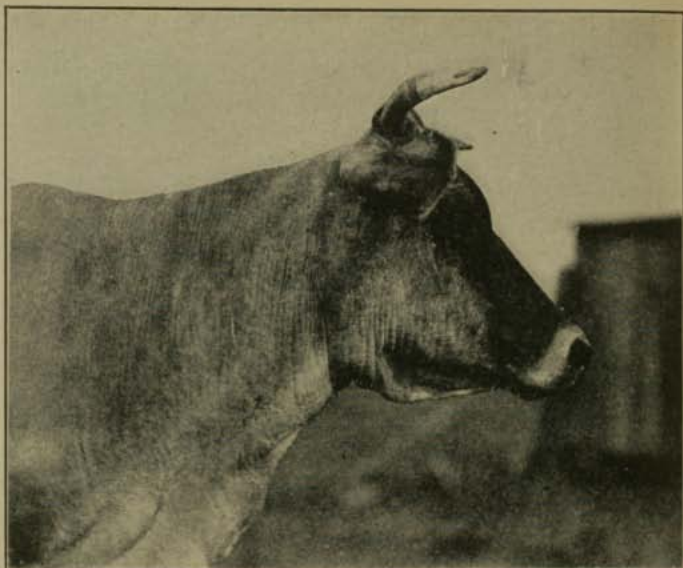
There is another method that savages sometimes use. They take certain substances from plants, and make little balls of food which they throw into the water. The fish are attracted by that particular flavor, eat the food and become stupefied or intoxicated with it, just as a man gets intoxicated from drinking liquor. The fish, in this case also, rise to the top of the water and are picked up by hand, but if they were left untouched for several hours they would recover.

In rivers by the sea, people sometimes make a network of sticks driven close together across the stream. The fish enter the river at high tide through gates which are left open purposely. When the tide goes out these gates are closed and the fish left behind in the shallow waters or struggling in the mud, can be easily gathered by hand. These sticks or traps are called weirs, and the colonists

learned to make them from the Indians, who had used them many years.

Some people believe that fish contain a large amount of phosphorus, and are especially good for brainworkers. This idea is wrong, because fish contain very little phosphorus, and a steady fish diet is not good for the brain.





Head of a Jersey Cow

CHAPTER XIII

DAIRY PRODUCTS

THERE is another very important class of animal foods, which we call dairy products. Dairy products are those food substances which we get from the milk of animals. The large animals on the earth are called mammals, because they suckle their young, *i. e.*, give milk for their young, and some of these animals have been tamed by man, and their milk is used for food. While the milk of all animals would undoubtedly be fit for food, that which man has found most satisfactory is the milk of cows, sheep, goats, camels, and in some parts of the world, horses.

MILK

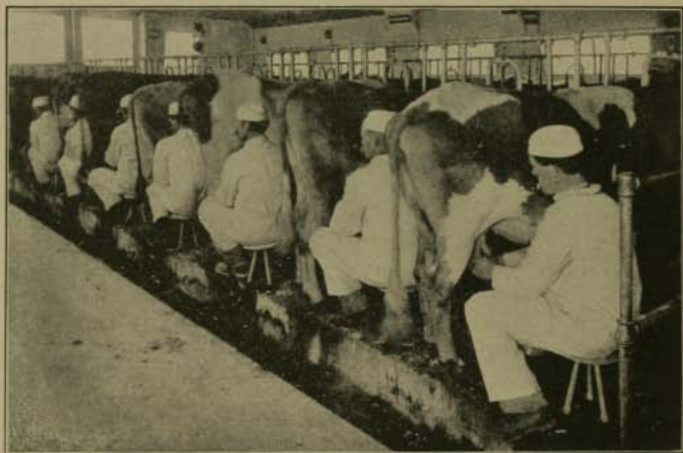
Milk, as we have said before, is a complete natural food, and man can live on it for a long time without having other food. For this reason it has come into very common use, and in all civilized communities is one of the most necessary things of life.

Of all the kinds of milk, cow's milk is the only one that is of commercial importance in the United States. You should remember, however, that many people who live in the mountains of Turkey, in Germany, and many other parts of the world, never have any milk but that of goats. Goat's milk is richer than cow's milk, and sells at double the price.

The milking of the cow and other animals is done by hand, but a machine has just been invented that will milk two cows at once. Cows are milked twice a day; early in the morning, and just about sun-down. Perhaps some of you have been in the country in the summer-time, and have had the fun of going out to the pasture to drive home the cows, and you may have been fortunate enough to see some bright, lively collie dog as he went chasing about over the hillsides, getting the cows together without anyone to help him, and then driving them along the road home to the barn. That is one of the memories that is always very pleasant for people who have been brought up in the country on the farm, and for any city boy or girl who has ever been into the country to visit.

Milk is used either as a liquid, as it comes from the cow, or condensed. Milk is fit for food from one to three days after milking or until it sours. This change is caused by bacteria or germs which float in the air, and settle upon the milk. If the milk is kept from contact with the air from the time it is milked, it will keep sweet and fit for use for many days. For example: A Boston doctor started from home

some years ago for a trip to Berlin, Germany. He took with him several dozen bottles of milk, and opened one bottle every day for three weeks. The last bottle opened in Berlin, Germany, was just as sweet as the first bottle opened the day after leaving Boston, and the reason for this was simply that the bacteria in the air had not been allowed to get to



Milking

the milk. Nothing had been done to the milk except to bottle it with great care.

BUTTER

If you take some fresh, rich milk, and put it into a jar and let it stand until it is cool, you will find a thick yellow skin upon the top. This we call cream and it contains the oily particles or fat of the milk. It rises because oil is lighter than water. If you examine the milk under the microscope you will find floating about in it, little globules, so small you cannot see them with your naked eye, which are composed of very tiny lumps of yellow fat, surrounded

by a thin skin of albumen, such as you see in the white of an egg.

If you break the little skin of albumen of several of these globules the lumps of fat will stick together, and that is exactly what is done when you make butter out of cream. By stirring the cream with the dasher of the churn the skin of albumen around the fat globules is broken, and the lumps of fat are beaten together. When a good many of them join together they begin to show as little yellow lumps of butter, and we say that the butter has "come."

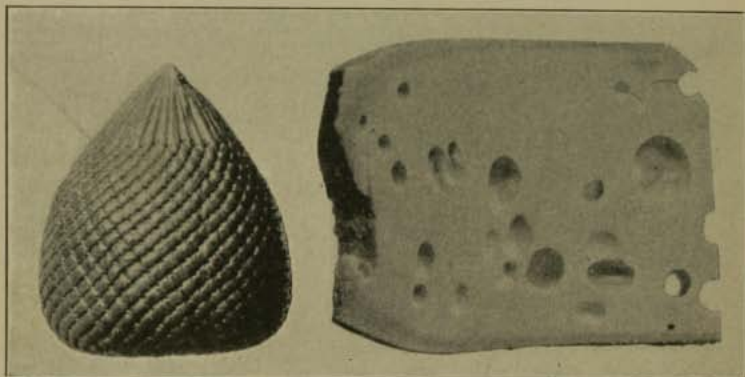
From that moment, there is nothing to do in the churning, but just to beat the small lumps together into bigger ones, and then drain off the liquid that is left. The butter is then usually salted to preserve it. This is the process of making butter everywhere in the world. The milk that is drained from the butter is called buttermilk, and many people are fond of it as a drink.

CHEESE

What is left in the jar from which we have skimmed off the cream is called skimmed milk, and has several valuable food substances in it. A large part of it, of course, is water, but if you heat it, and dip into it a piece of the stomach of a calf, which has in it a peculiar acid called rennet, a part of the skimmed milk begins to grow solid, like a heavy jelly, and separate from the rest of the skimmed milk. This substance is called curds. The liquid that separates from it is called whey, and you will perhaps remember that Little Miss Muffet, as recorded in the history of Mother Goose, was eating curds and whey, when the spider came to make her a visit to ask for food like a kind of insect tramp.

The curds are pressed together until all the whey is driven out, and in this form it is called cheese, which is made in a great many different varieties. From skimmed milk we get the Edam and Parmesan cheeses. You have seen,

I think, the dark red Dutch cheeses, or the yellow pineapple cheeses. These are made of skimmed milk. From milk which contains cream, the Cheshire, Cheddar, and Neufchatel cheeses are made. The substance which at the touch of the rennet turns into curds is called casein and corresponds to the gluten of wheat, the albumen of an egg, and the fibrin, or muscle tissue of meat. These are, you remember, the



Pineapple (Dutch) and Swiss Cheese

proteids with which we build the tissues. This casein is now sold in a dried form.

If we take the whey which separates from the curds in making cheese, we shall find in it another substance of great value and importance, that is the milk sugar. By evaporating the whey we get the sugar. It is used in making medicines.

The milk trade of the United States is very great, being about twenty-five gallons of milk a year for every person in the United States. The milk trade of the cities is mostly in the hands of a few firms which buy the milk from the farmer. The milk is taken from the farmer in the early morning, and sent by quick trains to the city, sometimes a hundred miles away. The farmer is paid about three cents a quart,

and the milk is sold in the city for seven or eight cents. The milk from different farms is mixed in the city, and sometimes bad milk coming from a single can, may spoil the milk from a hundred other cans, by turning it sour, or giving it an unpleasant taste. Scarlet fever germs are often carried about in this way.

CONDENSED MILK

Condensed milk is made by heating, without boiling, until the water is nearly evaporated, leaving the other substances of the milk, the cream, the casein, and the sugar, with a little water in a sort of a thick paste. To this, cane sugar is usually added to keep it from spoiling, because sugar is almost as good for preserving foods as salt, and is used almost as much in the civilized world to-day.

Condensed milk is put up in sealed cans, and this is so well done that it can be carried anywhere in the world, no matter how hot the climate, and kept until used without spoiling. Water mixed with condensed milk makes a liquid almost like ordinary milk. Milk is also sold as a powder. If you add water you have milk.

Condensed milk was first made in the United States and the process was invented by Gail Borden before the Civil War; but to-day Switzerland, France, and the United States manufacture it, and it is used in every country.

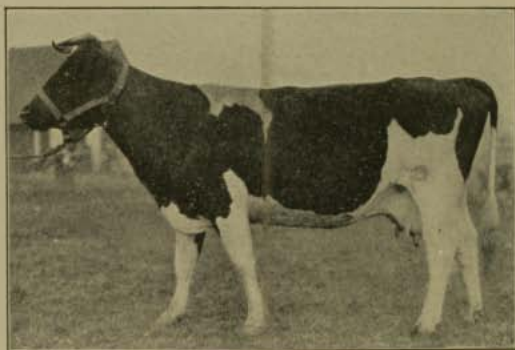
Condensed milk is worth very much more than natural milk. In 1902 the United States made \$12,000,000 worth of condensed milk. Of that amount \$5,000,000 worth was the cost of the milk, \$2,000,000 worth was the cost of the sugar, leaving \$5,000,000 as the profit, or about 40 per cent.

Pasteurized milk, or sterilized milk, is milk which has been heated to kill the germs in it. Pasteurized milk is heated to 165 degrees F., when most of the germs are killed. Sterilized milk is heated much hotter until all the germs are killed.

BUTTER MAKING

Butter is the fat part of the milk, as we have just told you. The churning in old days was by hand, and on the smaller farms the butter is still made in hand churns, but much of the market butter is made in factories called creameries. These are located at convenient places near the dairy farms.

The milk is taken by the farmer to the creamery, put into the "separator," and in a few minutes the skimmed milk is



Holstein Cow

returned to him, after the cream has been taken out. The separator is a machine which can be made to revolve very fast. The cream is lighter than the rest of the milk so that the skimmed milk is thrown out by centrifugal action, leaving the cream in the separator.

A new way of making butter is to pour the cream into boxes or tanks upon thick pads made of blotting paper. The milk is absorbed, the butter left on the pad. The pads are then rolled and the milk squeezed out, when the pads are ready for use again.

The butter is packed for market in two ways,—solid in

tubs, or put up in prints, or rolls. Print butter is more attractive to the eye, and sells at a higher price, when the market is near at hand. It is usually wrapped in paraffin paper. It is called print butter because it is stamped with ornamental figures.

Solid butter is put up in wooden tubs, or firkins. Butter is a pure cream fat except that salt is mixed with it to preserve it, and to improve its taste. Butter is naturally of a pale, whitish-yellow color. It is usually made a bright yellow by coloring matter, as people think the pale butter is not good.

There is not enough butter made to supply the people who would like it, and the cost therefore is rather high. This fact has led to the invention of different substitutes for butter, which are called either artificial butter, oleomargarine, or butterine.

Oleomargarine is made this way. Nice beef fat is taken, like the fat that you eat in roast beef, and beef steak. This is heated, and the liquid oil called "oleo oil" is taken from it, leaving the tissue behind. The beef oil is then churned with milk, to which a little butter is added, and the result is a substance that looks very much like butter, except that it is lighter colored, though by the use of the coloring yellow it can be made to look like butter. The poor grades of oleomargarine are made by using lard, instead of beef oil, mixed with cottonseed oil.

The law of the United States requires that this artificial butter shall not be colored, and shall have the name, "oleomargarine," or "artificial butter" stamped on the outside of every tub and package, so that the customer shall not be cheated into thinking that he is buying real butter. We sell an enormous quantity in Europe, about 100 million pounds a year.

CHAPTER XIV

MINERAL FOODS

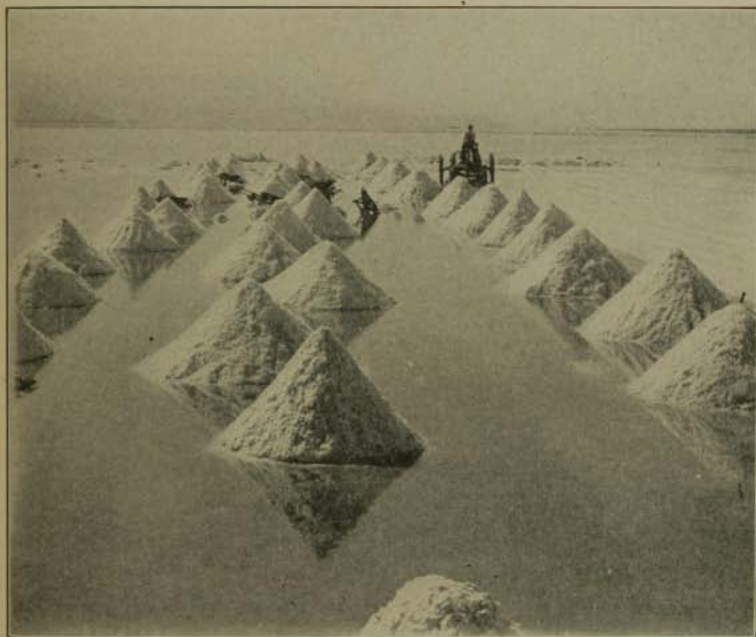
No mineral of any kind will support life, but the body must have for the bones and the teeth a certain amount of mineral matter. Among mineral foods are salt and the different substances which make up baking powder. Baking powders are usually made of bicarbonate of soda or baking soda, cream of tartar, powdered alum and some phosphates. These are of different values but they all serve one purpose. When mixed with water they form a gas which makes the dough rise, and then escapes into the air.

SALT

Salt is used for its pleasant taste and its tonic effect. It helps to keep the blood in proper condition and modern experience has shown that it has a similar effect upon the nerves. It is often said that man could not live without eating salt. This is true in a certain sense, but it is perfectly possible for a man to get all the salt the body needs by eating various forms of plant food in which the plant itself has stored up a certain amount of salt. Men, however, like the taste of salt and have learned to use it in large quantities. Salt is also given to the domestic animals, horses and cattle.

Salt is produced in three ways, one by mining it as rock from the earth, as we would coal, and grinding it to a powder for table use. This is rock salt. A second way is to drive artesian wells down through the earth to great salt-beds.

Water is pumped into the wells and dissolves the salt into a brine. The water is then pumped from the wells into great tanks and is evaporated, leaving the salt behind. The third method is that followed in southern California where salt springs or lakes exist below the surface of the soil.



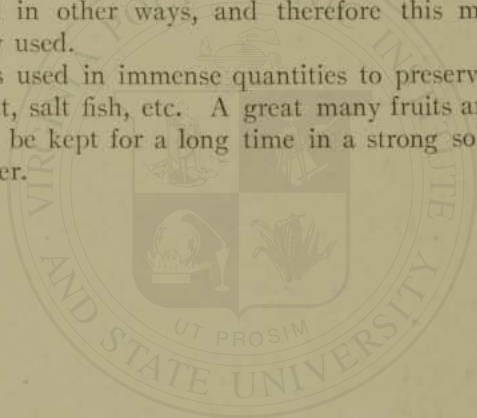
Gathering Salt, Salton, Cal.

Under the influence of the hot sun shining upon the earth, the salt water is brought to the surface where the water is evaporated, leaving the salt behind as a fine sand or powder. This is scraped up by machines into piles of almost pure salt, which is packed and shipped to various parts of the earth. The great field where this salt is obtained, looks like

a sheet of ice, and the light is very dazzling as the sun shines upon it, so that it is usually necessary to wear colored glasses, because otherwise one would be blinded by the constant glare. Salt wherever it is found, whether it is a rock, or in the salt-beds of New York, or in the plains of California, comes from one source. The salt was left by the evaporation of the large bodies of salt water which once existed in those places.

Salt can be obtained by evaporating sea water, but there are several other chemicals usually mixed with sea water which have an unpleasant taste and therefore must be separated from the salt. To do this makes the salt more costly than that obtained in other ways, and therefore this method is not generally used.

Salt is used in immense quantities to preserve food, as in salt meat, salt fish, etc. A great many fruits and vegetables also can be kept for a long time in a strong solution of salt and water.



CHAPTER XV

BEVERAGES—MEDICINES

THE things we drink are, in some ways, quite as important as the things we eat, and equal them in quantity, or should be equal in amount to the food that we eat every day. Things that we drink are called **beverages** and are of many kinds. Naturally they are liquids, because a thing must be liquid, or nearly so, in order that you may be able to drink it.

Did you ever try to pour a cupful of fine sugar into your mouth just as you would a cup of water? If not, try it and see the result. You would suppose that the fine powder would go easily down your throat, just as if it were a liquid; but you will find that it will not do so. Before you can swallow any sugar at all, you are obliged to moisten it with saliva; and you would soon be choked by the sugar, if you kept on with your experiment.

The greater part of what we drink is plain water, and a very large part of every beverage is composed of water. In fact, we might almost say that we do not drink for food or pleasure any liquid but those largely composed of water.

Beverages are divided into the following classes:

First: Water; natural, mineral, and ice.

Second: Aromatics, or non-alcoholic beverages; that is those liquids which do not have alcohol in them. These drinks are tea, coffee, cocoa, chocolate, and maté.

Third: Natural fruit juices, such as raspberry shrub, lime juice, sweet cider, grape juice, and lemonade.

Fourth: Alcoholic liquors, which are of three classes.

(a) Fermented liquors made from fruit juices, "wines."

(b) Malt liquors, such as beer and ale, made from grain.

(c) Distilled liquors, such as whiskey, brandy, rum, etc.

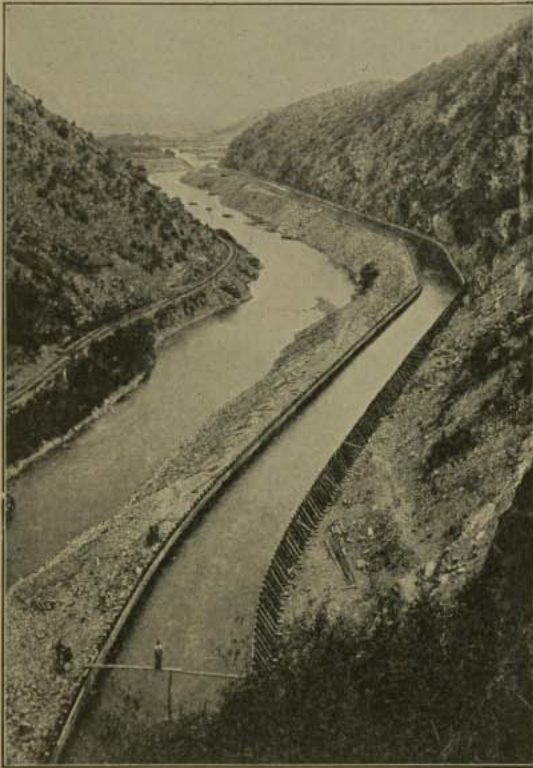
Fifth: Foods which are made from liquids and really belong in this list. These are ice creams and sherbets, which are very popular among the people of the United States where ice is abundant and cheap.

WATER

Water is the drink of the whole world. It is found everywhere in the world that people are able to live, whether in fertile plains, or on the steep mountain slopes. We say that certain parts of the earth are deserts and barren because we cannot find water there. Almost always if we could take water to those desert lands, in sufficient quantity, we would find that the soil would be fertile, and that plants would soon grow over the surface just as they do anywhere else. So the United States is planning to reclaim millions of acres of desert land in the West by means of *irrigation*.

Irrigation is the process by which water is taken from a stream or reservoir, and carried to barren lands where it is distributed in the fields through ditches of various sizes, so that the water may flow around the roots of the plants. Wherever this is done, men are enabled to raise abundant crops, because they are able to give the plants all the water they need and no more, just when they want it. At the same time, the plants are all the day exposed to the sunlight without which no plant can grow, and there is no danger that they will rot or die from want of sunshine in long periods of cloudy or rainy weather, as often happens in other parts of the country.

You know that the camel goes in long caravan trains across the Sahara desert in Africa. These camel trains could not make their journeys across the desert, if they were not



Irrigating Canal, Platt's Canyon

sure of finding here and there along their route springs, around which trees have grown forming a green island in the midst of the desert. Such a place is called an oasis, and is looked forward to with great eagerness and delight by men and animals, hot, tired, and half-choked from the fine dust which blows across the desert.

In olden times, men described a very desirable piece of land where they would like to live as being a well-watered,

pleasant spot. They spoke of the water first, because they knew that, if there was plenty of it, almost any kind of plants could be grown in the land, and because without water or drink, both men and animals of all kinds would die in a few days from thirst, with terrible suffering.



Camel in the Desert

USES OF WATER

If water is so necessary to us all, we should consider why we need it as a food, and what use it serves in the body. When we began our study of food, we learned about the different kinds of foods which were needed in the body, such as proteids (tissue builders), carbohydrates (heat and energy foods), fats or oils, and a slight amount of mineral. Now we might have those foods dry in unlimited quantity

but, if we did not have water to drink, we should die of starvation.

Starvation means the condition the body is in when the tissues, which wear out, have not been furnished material to build new cells with, and so break down and cannot do their work. The purpose of water in the body is chiefly that of carrying the particles of food or repair material to the parts of the body which need it, and this is done by the means of arteries, which carry the blood to the tissues. If the old material from the worn-out cells was not taken away, it would clog the body and make us ill. Therefore the water takes away this waste material by means of the veins.

Water is needed also in the body to moisten the surfaces of the delicate membranes, such as the mucous membrane which lines the mouth, the eyes and the stomach.



Drinking Trough

A third use of water appears when you perspire or sweat. This means that either owing to exertion, or to the heat of the air about you, a large amount of water and waste material is thrown off through the pores to the surface of the skin and so helps to keep the body well. This water evaporates to some extent all the time, but in large quantities under the influence of heat, and, by this evaporation, keeps the body from being injured by the heat, just as you sprinkle a sidewalk, or a floor in the summer time, in order to cool the air by the evaporation of the water. In this way a man can remain safely for some time in a temperature where meat is cooking.

Another very important use of water is for bathing. If the pores of the skin are filled up with dust and dirt, they cannot act as they should, and a great many illnesses result.

About four-fifths of the body is water, and perhaps you know that if the human body is burned, as happens when it is cremated after death, there will be left from a large body only a double handful of ashes or mineral matter. The rest, a hundred pounds or more, has been turned into steam by the heat and driven away, or been turned to gas and burned. Now if you have a clear idea in your mind of the need we have of water, we will consider what it is, and the different kinds that we use.

Water is composed of two gases, **oxygen** and **hydrogen**, having twice as much hydrogen as oxygen. We express this composition of water by the chemical symbol H_2O . The very word hydrogen means water maker, and is taken from the Greek word which means water. From this Greek word we get a number of English words, such as hydraulic, hydrate, as we have in carbohydrate, and the word hydrophobia which means fear of water.

Water is present in nearly everything in nature, for water has the power of dissolving almost every kind of mineral or substance with which it comes in contact. Even the toughest minerals or the hardest granite are dissolved slowly when they come in contact with water. When water has these minerals in solution to a *large* extent, we call it mineral water. Some mineral waters are very pleasant to the taste, and are very beneficial as medicines, and others are tasteless and are of no use as foods. Because substances dissolve so easily, water in streams and wells is not usually entirely pure, but almost always has in it a certain amount of mineral.

If water has only a small amount of mineral in solution we call it a *soft* water. If it has a great deal of mineral in it, we call it a *hard* water, and this is usually the case where

water flows over limestone rocks. Perhaps you remember that your mother has said sometimes that the water was too hard for use in washing clothes. That meant that there was so much mineral in the water that it could not dissolve the soap, and make a good lather as soft water would do. Rainwater is soft, and, in many parts of the world, people collect it in barrels or cisterns for washing or for cooking. You cannot make good tea or coffee with hard water because you need to extract the flavor from the coffee, and you cannot do this well if the water is already filled with mineral.

The water in the rain which comes from the clouds was evaporated by the sun and drawn up from the sea, or from the rivers and lakes on land. The fine particles of water when evaporated collect in the air as clouds, which are driven about by the winds from place to place. When the clouds get too dense, that is, when the fine particles of water are driven very close together, they unite and form heavy drops which fall to the ground as rain. If the air through which the rain falls is very cold, the drop becomes a snowflake. If it is not cold enough for that, it may become a bit of sleet or hail. When the snow falls to the ground in thick layers, and is pressed together by its own weight, as it is on high Alpine summits, the snow becomes ice as in glaciers, so you see that rain, hail, sleet, snow, and ice are all different forms of water.

There is only one other form of water, and that is steam. If you heat water until it boils, that is to 212 degrees Fahrenheit, steam is given off. What you see at the end of a pipe, or in a volcano or geyser, and call steam, is not really steam but water vapor, for steam is a gas and is invisible. When it comes in contact with the cold air, it changes again into water, and becomes a little cloud. You know in the winter time, when the air is cold, that people look strange as they walk

along the streets, for they blow clouds of vapor from their mouths and their noses, just like the animals which you have read about in fairy stories. The animals which gave rise to



Geyser

these stories were probably real and just as harmless as the people are who breathe out this water vapor from their lungs in cold weather. They were seen by people of warm countries who went to the north and then told their adventures at home, and from these stories the fairy tales were made.

Breathing water from the lungs is one of the ways in which too much water in the body is thrown off.

The water which has been evaporated by the sun, blown about in the clouds, and falls to the earth as rain or snow, is almost entirely pure. Sometimes it absorbs a little ammonia gas which may be in the air, but it has no mineral matter at all, so that, if you catch

rain water as it falls, or if you melt snow, you will get an almost pure water. The water, however, which is generally used for drinking or for cooking, has minerals in it, and

you like it better, because the minerals give it a sort of sparkling taste. If you have ever tasted rain water, you have probably said that you did not like it, because it tasted "flat." That is because you missed the taste of the minerals to which you were accustomed.

If you heat water until you drive it off as steam, and then collect the steam in pipes and cool it, you will have what is called distilled water. This is an absolutely pure water, and is used in making medicines, but you would not enjoy drinking it because it has no taste.

The water that we use comes generally from springs, streams, or wells. When the rain falls upon the earth, it soaks down into the soil until it reaches the surface of the rock beneath and collects there in the hollows. When the hollows are filled, it forces its way up to the surface of the earth, and oozes out in what we call a spring. Usually springs are quiet. When we find air or gas escaping from the water we have what we call a bubbling spring. This is usually true of hot springs.

The water from one spring flows along, joins with water from another spring and makes a brook. The brooks unite to make rivers, the rivers flow into the sea, and so, after a journey that may last some months the water gets back again to the sea where it started.

When we dig a well, we merely dig a pit down into the earth until we strike an underground spring, which was unable to force its way up through the earth; but when the weight of the earth in the well is removed, the water rises up part way in the well, and can be drawn or pumped out in various ways, perhaps by an old oaken bucket.

People in the country get their water from springs, or wells, but people in the city cannot do this for several reasons. First: Where a great many people are crowded together, and the entire surface of the ground is covered with buildings, it

is hard to dig wells. Second: A great many poisonous liquids, which are called sewage, flow down through the earth in cities and make the water unfit to drink.

There is one kind of well called an Artesian well or driven



An Old Oaken Bucket

well, so named from the village of Artois in France, where these wells were first made. An Artesian well is made by driving a pipe down through the earth until it strikes a spring of water. It is merely a well which is very long and narrow.

The water sometimes rises to the surface, sometimes it has to be pumped. Men have learned how to dig Artesian wells by boring to a great distance in the earth, sometimes several thousand feet deep. Artesian wells in cities, may be driven so far down that the water is perfectly fit to drink, but they are quite expensive, and the quantity of water which they yield is not enough to supply the need.

For this reason, the people in the cities, usually go a long way off into the country, and take their water from some large lake, or make an artificial reservoir, by building a dam of stone across a stream. They bring the water from that reservoir through great pipes or aqueducts to the city, and there distribute the water through small pipes to the houses where it is needed. In this way, the people in the cities are able to get plenty of pure, sweet, wholesome water, if the pipes are made of the proper kind of metal.

Lead pipes are often used in houses because of the great ease with which they may be bent in different directions. If the water is allowed to stand in these lead pipes, a poisonous substance forms in the water, and if people should drink much of it, it would make them seriously ill. Therefore every morning, whenever you have not drawn any water from the pipes, during the night, you should let the water run a few minutes before you use it to drink or to cook with. There is no danger in using it in washing your faces or hands, or for any other purpose unless the water has stood a very long time.

Sometimes some mud or other matter gets into the pipes, and, while this is not harmful, it is disagreeable; this may be caught by putting a filter on the end of the faucet from which you draw the water; and all water used for drinking, or for cooking, or for making tea or coffee, should be filtered before it is used. The filter should be one that can be reversed, so that it can be cleaned easily, and it should

be reversed every day, so that what has collected in the top of the filter during one day's use of the water, may be washed out in a few minutes after you have reversed the filter. So necessary is it that the people in the city should have plenty of pure water, that great cities like Rome, London, or New York often go scores of miles away until they can find lakes or reservoirs large enough to supply all the water they need.

Boston has one great reservoir fifty miles away from the city that is thirty-five miles in circumference and took three years to fill. It holds billions of gallons of water.

Water from streams or wells into which any house drainage or sewage could possibly flow on the surface or underground, should never be used for drinking or cooking. Country people are very careless about this, and think it does not matter, but the germs of the dangerous disease typhoid fever are usually spread by means of drinking water which has become infected from sewage. If a mountain or forest stream, no matter how bright and sparkling it is, has flowed through a lumber camp, the water below the camp is always unfit to drink.

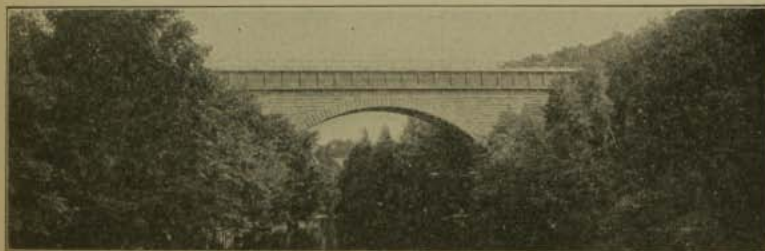
MINERAL WATER

There are two kinds of mineral water in common use, natural and artificial. The natural mineral water comes from natural springs in the earth, as at Saratoga, N. Y., Hot Springs, Ark., and various springs in the Yellowstone Park, in America, and the springs at Baden Baden, Vichy, and elsewhere in Europe.

Mineral springs are found where the earth is filled with chemicals of various kinds, which dissolve easily as water flows through the earth. The substances which are most easily dissolved in water are common salt, and compounds of sulphur, calcium, and soda. Mineral waters are usually of value because of their medicinal qualities, but they do not

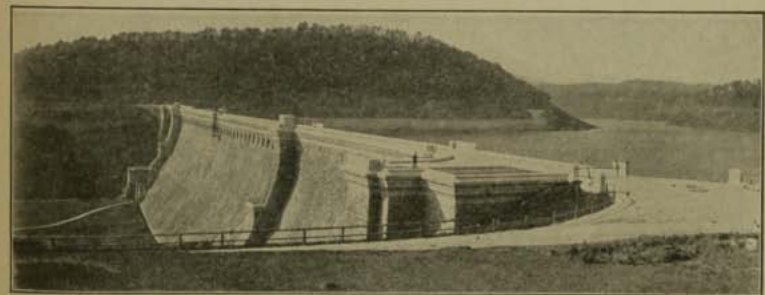


Ancient Aqueduct, Nimes, France



From a photograph, copyright 1901, by Detroit Photographic Co.

Modern Aqueduct, Newton, Mass.



Croton Reservoir, New York

have a pleasant taste, and people drink them because they need them, not because they like them. It has been the custom in Europe and America for a great many years for people to go in summer time to these springs, partly for the rest, and partly for the medical help which the waters of the springs give them.

These springs, popular at first because of the water, have become famous in many countries as great social resorts, and the majority of people who visit these watering places, which, in Europe, are often called spas, go there for social enjoyment and as a matter of fashion, rather than to drink the water. It is, however, a custom which is generally observed that everybody at these springs shall occasionally drink the water.

Sometimes the water at these watering places, is of one kind only, as at Sulphur Springs in Virginia, or at Richfield Springs, New York. In other places, as at Saratoga, you can get three or four different kinds of water, within a stone's throw of each other, which will produce exactly opposite effects upon the body. Sometimes, when people, who do not know this fact about the springs, go from one to the other and drink a glass of each, they become quite ill.

The Yellowstone Park is a region of perpetual surprises in every way, in the scenery, the geysers, and in the mineral springs. One can drop a hook and line into a river and catch fish, and, without moving from his place, drop the fish into a boiling spring and cook it. You can put your hand into one bright, clear spring, which is cold and sparkling, and, if you turn around and dip your hand into the spring behind you, the water would scald you. You can drink a glass of salt water from one spring, and, by taking two or three steps, you can get a glass of sulphur water from another spring, and, a little farther on, one of water charged with magnesia and Epsom salts.

Mineral water is used not only as a drink by invalids, but also to bathe in, and the results are sometimes as beneficial in one case as in the other; because the body has the power of absorbing both food and medicines through the skin, as well as by means of the stomach, though much more slowly.

A large quantity of the mineral water from these various springs is put up in bottles, shipped all over the world and sold. So we find in the market Apollinaris, Vichy, Lithia water, and many others. Chemists, nowadays, are able to analyze the water of any mineral spring so as to determine just what mineral substances are in the water, and in just what quantity they exist; and then by taking the same proportion of minerals, and mixing them together with water, they get an artificial mineral water, which, in many cases, is nearly as good as the natural one.

There is one kind of water, which is really a mineral water, of which an enormous quantity is made and sold every year, that is, soda water or "soda," as we usually call it. This is probably sold in every city, town, and large village in the United States, and, to a very large extent, in Europe. Soda water is made by dissolving marble dust with acid. This gives off a gas called carbonic-acid gas, or carbon-dioxide, of which we have spoken before, as being the gas which plants breathe and from which they make carbon. This gas is driven under pressure into copper tanks partly filled with water, and the water is mixed with it until it is highly charged with the gas. These tanks are then attached to pipes which run into soda fountains, from which the water is drawn off as needed. You know that when you get a glass of soda, the clerk takes a tumbler, puts in the bottom a little syrup of the flavor that you wish, and then turns a very fine stream of water into the tumbler, which stirs up the syrup and makes a lot of foam; then by turning the faucet a different way, he lets some water which does not foam go into the tumbler.

It is the force of the gas in the water which stirs up the syrup. The tanks which contain the soda water are made usually of copper or iron, but are very stout, because the pressure of the gas inside is enormous. Soda water is also put up in large bottles called siphons, which have a valve at the top, from which one can let the water come out as from a soda fountain.

There is a modern way of obtaining soda water, which is as follows: Little bulbs, about the size of a bullet, made of metal, are filled with compressed carbonic acid gas, and then the bulbs are put in a chamber, attached to the top of a siphon bottle and a sharp needle is driven through one end of the bulb, making a small hole through which the carbonic acid gas escapes into the bottle, where it charges the water and makes it ordinary soda water. If you let a glass of plain soda, which is soda without any syrup, stand awhile uncovered, the gas will escape from the water, and it will taste like any common water.

ICE

Ice is of two kinds also, natural and artificial. Ice is frozen water, and water will begin to freeze when the thermometer goes down to 32 degrees Fahrenheit. Water in freezing expands considerably, and that is one reason why the ice will crack on the rivers and ponds on a cold winter's night; because the ice swells as the water freezes. Ice is a curious solid, because a piece of ice floating in water only shows above the surface one-eighth of its whole mass. That means that if you should see in the ocean a large iceberg, which might project 60 or 100 feet above the water, there would be seven times as much ice below the water that you do not see.

The ice that we use is generally cut from rivers and ponds in winter time, and stored away in ice-houses to keep until summer. Ice houses are only large sheds, in which the ice

is packed in great blocks, just as you see them in the ice-cart. Snow is usually put between the blocks, and a thick layer of sawdust or shavings is put on the top and around the sides. If this is properly done, ice will keep for a very long time before it melts. The ice is usually cut in blocks 18 inches square, and as thick as the ice may happen to be when it is cut, which is at least a foot or more.

People used to think that when water froze, all disease germs would be kept out of the ice. This has been found



Ice Cart

to be wrong, and, therefore, you should never use ice to put into your drinking water or refrigerator, which has come from streams or lakes that are not perfectly pure, or into which any house drains or sewers could flow.

Artificial ice is made by expanding ammonia gas around tanks filled with water. The expansion of the ammonia gas is so rapid, that it makes the walls of the tank very cold and the water freezes. Bunches of fruit or vegetables are sometimes frozen in the artificial ice factories in the middle of a

clear block of ice as a curiosity. In the North there is not much demand for artificial ice because it is cheaper to cut the ice in the streams, and to store it in the ice-houses. The



Putting Ice into the Ice-Chest

process is much used in tropical countries, because it is very difficult to carry ice from the North, no matter how well it is packed, without having most of it melt before it reaches its destination.

We use ice in a great many different ways: We put ice into

water to cool it, and we have what is called ice-water; we use it in refrigerators to keep the food from spoiling; we use it mixed with salt in freezing ice-cream and sherbet. The ice-cream liquid is generally composed of cream, or milk mixed with eggs, sugar, and flavoring extract. Sherbet is a mixture of water, instead of milk, mixed with sugar and flavoring. The so-called Philadelphia ice-cream is supposed to be made of pure cream without any milk mixed with it.

A very popular drink or food, nowadays, at the soda fountains, is what is called a "college-ice" or "sunda." To make this, the clerk takes a spoonful of ice-cream, which has little or no flavoring, puts upon it a tablespoonful or so of flavoring syrup, or some crushed fruit juice, and then adds a little soda-water, just enough to give the whole a sparkling taste of soda.

TEA

With the exception of water and perhaps of milk, there is no other drink so popular as tea, and millions of people in the world, young and old are in the habit of drinking tea of some kind. Tea is made from the dried leaves of a plant that looks something like a camellia or an orange tree, and has a fragrant white blossom, which looks a great deal like a small, white, wild rose; and it may be that the tea-rose was so named because the fragrance was so much like the tea blossom.

The tea-plant will grow, if allowed, to be a small tree, but it is generally pruned to a height of from three to five feet. The tea of commerce is made from the young, tender leaves, which are picked from the plant before they have completely unrolled or shortly after. Several crops of tea can be picked from the same plant every year, with two or three weeks' interval between the pickings.

Tea will grow in many parts of the world, but the tea that

we use comes mostly from China, Japan, Formosa, India, and Ceylon. It is picked usually by women, or children who are just about as large as you who are reading this book.



Ripe Tea Seed, India

Good tea is raised by Dr. Shepard, at Summerville, South Carolina. The United States would raise its own tea if labor cost only a few cents a day here as in China and Japan.

There are three kinds of tea usually on sale; these are green tea, oolong and English breakfast, both black teas. These are all made from the same plant. The main difference is in the length of time the tea-leaf is withered, the green tea not being withered at all.

If you should take some leaves from the plant and try to make tea from them, you would not succeed, because there is nothing pleasant in the odor or the taste of the green tea-leaf, and you would not care for a beverage made from it. When men learned to prepare tea as we do to-day, to bring out its full flavor, we do not know, but it was certainly as early as the sixth century, A.D.

In preparing black or oolong tea, after the tea-leaves are picked from the plant, they are spread out under an awning for a few hours. They wilt as most plants do when picked in hot weather, become limp, ferment and turn dark colored; they are rolled together into large balls, which are squeezed to drive out some of the water; the balls are then broken to pieces and dried. Tea-leaves dried this way are rolled by hand or by machines, just as in the dried tea with which you are familiar, dried again and packed in boxes or chests, which are covered with sheet lead to keep out the moisture and the air. These chests are covered with matting to protect them and are ready to be shipped to any part of the world.

In making green tea the leaves are not allowed to ferment at all, but are steamed and dried in five or six hours after picking. Sometimes Japan tea-leaves are put in shallow baskets and dried in the hot sun, and this tea is called "basket-fired," or "sun-dried."

English breakfast tea is made by carrying the withering process farther than with the oolong tea, and the leaves are left to wilt and ferment several days, perhaps, even a week or so, before it is finally dried or fired. It is not so strong

tasting a tea as the others, because the long process of drying has driven off some of the strong flavor of the leaf. It was called English breakfast, because years ago before teas were sent to Europe from India, this kind of tea was very popular among English people, and black tea was called English breakfast to distinguish it from green teas.

All oriental countries produce fine tea, but the highest priced comes from Ceylon and India. Tea comes to us by ships from Asia. Tea pressed into hard cakes is used as money in some parts of Asia. It is called brick tea.

You may have seen a kind of black tea, which has a little yellow tip on each leaf. This tea is called pekoe or orange pekoe. It is made from the two or three youngest and topmost leaves of the plant, which have not yet become entirely green on the end, and though that passes through the same process as the other teas, it is rolled so lightly in making that the end remains light colored.

Tea ranges in price from a few cents a pound to several dollars a pound. This price depends very largely upon the flavor, due to the care with which the tea is prepared, and the selection of the leaf.

Tea is a good thing for grown people to use, but children or young people who have not yet stopped growing, ought not to drink it. Tea helps the tired nerve to recover itself, and many people who do severe muscular labor are refreshed by a cup of tea. It does more good if taken alone without food.

Merchants who deal largely in teas have one particular clerk whose duty it is to taste the tea that comes to them, which he does by steeping a little of the different kinds. He is called a "tea taster," and he becomes very expert in detecting the fine differences between teas. Very frequently he mixes together various teas of different flavors, in order to produce a nice tasting tea, and this mixture of tea is called a "blend."



Picking Tea in India

These blends of teas are given special trade names, which indicate the particular tea, sold by that firm.

COFFEE

Next after tea as a popular drink comes coffee. Coffee also can be grown in many different parts of the world, but only in tropical countries. It is thought that coffee was first used by the Arabs near the Red Sea. From Arabia it spread eastward to Java, and westward to the new world, where it grows to-day from Brazil to Mexico. The two names with which people are most familiar are Mocha and Java. Your Mocha coffee is grown in Arabia and a large part of it grows wild on the hillsides.

The wandering Arabs pick it when it is ripe, put it in small bags, and hand it over to the sheik (or chief); when he gets a considerable quantity of the coffee together, he carries it down to some seaport, and exchanges it for clothes, ammunition, or other things that his people need. Of course, the supply of Mocha coffee obtained in this way is very uncertain, though the quality of the coffee is of the best. There are also plantations of excellent Mocha coffee grown near the Red Sea in Africa. The best Mocha coffee comes to the United States; England and France rarely having anything but second grade.

The coffee which grows in the Islands of Java and Sumatra, is Java coffee. The Island of Java is under the control of the Dutch government, which grows a great quantity of coffee on its plantations. This coffee is called "Old Government Java." There are many private plantations on the island, on which some of the finest coffee is grown, and this coffee is called "Private Growth" or "Private Estate" coffee. The flavor of Mocha and Java is quite different, and many people like a mixture of the two kinds, and this is what you should get when you buy what is called "Mocha and

Java." Good coffee also grows in the Philippines and in Porto Rico.

A long time ago, before any coffee grew in America, a merchant believed that in the rich soil, and moist climate of Brazil, coffee could be grown successfully. He took a couple of dozen plants with him, and set sail for Rio Janeiro. On the way, an accident happened, the ship was injured, and delayed several weeks. The supply of water on board ship ran short, so that each person could have but one quart of water per day.

The merchant shared his quart with his coffee plants, dividing up the pint of water among them as well as he could. At last he reached Rio Janeiro safely, but all of his coffee plants but two had died for lack of water. Those two plants were cared for, thrived, grew strong, and from them most of the coffee plants which are grown in Brazil to-day have descended, although afterwards, other plants were sent from Asia to Brazil successfully. There is a great deal of coffee grown in Mexico, and other parts of Central America, but most of it is from plants descended from those two first adventurous coffee plants.

Nearly three-quarters of all the coffee that is used in the world to-day grows in Brazil, and yet most people will tell you that they use Mocha and Java coffee. What they drink is really Brazilian coffee, which generally comes on the market under the name of "Rio" or "Santos" coffee, or the mild coffees from Central America. Coffee names are given, because the coffee is generally shipped from these ports, though it may have grown hundreds of miles away in the interior. Coffee is for sale in the market as "Brazilian" or "Mexican" coffee, under its own names, but most of it is sold as Java. Fortunately for the people, this fraud is a harmless one, because the Brazil coffee is in most respects as good as the Arabian, or the true Java, so that the health of people is not

injured. They pay more however for the Brazilian "Java," than they would for straight Brazilian.

The coffee plant has a thick, glossy sort of leaf, a good deal like the tea plant, though the leaves are of no value whatever. The coffee berry is really the seed, which is inside a sort of pulp, just as a cherry-stone is inside the cherry, though the pulp on



Drying Coffee, Brazil

the coffee berry is not so thick as on the cherry that you see in the markets. The coffee berries are picked and spread in the sun to soften the pulp which is removed. The berry is then dried and shipped. Before using it must be roasted.

Inside the pulp of the coffee berry you usually find two coffee beans which are flat on one side and round on the other. This is the usual shape of the coffee bean, as you have all seen it many times. Sometimes, however, the two beans grow together into one round berry. When this happens

it is called from its shape the peaberry or maleberry. The name maleberry does not have any meaning of sex, but it came from a mistake of a clerk who was reading a letter written in a foreign language. He called a Dutch word *mal*, meaning "pea," the word male. Very often such simple mistakes as this will give a name to some article of commerce. The peaberry is usually of better quality than the other kinds, because it is on the new growth of the plant. It contains the essential oil which gives the taste to coffee in the highest degree.

USE OF COFFEE

Coffee is of great value to those who have to do heavy work, where they are exposed to severe weather, whether cold or hot, wet or dry. Coffee gives a stimulus to the muscle and enables a man to do more by its use than he would be able to do without it. To produce this effect, coffee must be a stimulant, and every stimulant produces a stimulating effect, that is an exciting effect, upon the heart and the nerves by means of which the extra work is done. Whenever the heart is excited by any food or drink it has to endure a corresponding depression or weakness just as every flood tide in the sea is followed by an ebb tide.

The only question in the use of a stimulant is whether it excites the nerves so much that the reaction which follows is injurious. There have been many disputes with regard to the effect of coffee, but it seems to be proved that while coffee produces this excitement in the body, the reaction passes off safely during the time that the person rests after the work is done. It would be difficult, if not impossible for the soldiers of the modern day to carry on a campaign, and bear the exposure without the use of coffee. Coffee is bad for children and they should not be permitted to drink it.

Coffee is also a powerful antiseptic, so that people who

drink coffee constantly rarely have contagious diseases, even though they may live in unhealthy districts.

Coffee is prepared for drinking usually in two ways: First, by **boiling**. A sufficient amount of coffee is added to boiling water. This mixture is boiled for several minutes longer until the water becomes charged with the flavor of the coffee. Coffee made in this way is very strong and contains not only the good but the bad qualities of the coffee. Second, by **filtering** or **leaching**. For this method the coffee is ground much finer than for the former, and is placed in a coffee pot upon a filter made of cloth or wire gauze. Boiling hot water is next poured upon the coffee and is allowed to drain or filter through it, which takes only a few minutes. To get the full strength of the coffee it is generally desirable to pour the liquid coffee through the filter a second time, after which all the valuable part will have been extracted. Coffee made in this way has a richer and more delicate flavor, and contains all the valuable food qualities of the coffee, while there is left behind in the filter a great deal of the injurious part, which it requires the boiling of the first method to extract.

Coffee is used by people the whole world over, whether they are wanderers of the desert, laborers digging on great railroads, explorers in the icy North, or negroes picking cotton in the south lands.

COCOA AND CHOCOLATE

Another very popular beverage and food is cocoa, or chocolate which is a form of cocoa.

Cocoa is made from the seeds of a tropical plant called cacao. The cacao plant is raised chiefly in South America and in Venezuela, but it grows to some extent in the East Indies. It can grow anywhere in a tropical climate where there is rich soil and moist air.

Cocoa is made from the seeds of the plant which are com-

mercially called **cocoa beans**. The plant produces a pulpy fruit of a light yellow color, about 10 inches or a foot long, which resembles a young summer squash. The fruit is picked when ripe and laid upon the ground for a day or two; it is then cut open and the seeds taken out. The pulp is useless. The beans are stacked in heaps for a few days until they ferment slightly, in order to give the proper color and flavor. The seeds or beans are then put in bags ready to send away.

This work is done by the Indians of South America who are very unreliable as regards work, because if some holiday happens to come on while the cocoa crop is waiting to be picked, they will stop work, though the entire crop may spoil.

This happens sometimes when a heavy rain washes gold dust down from the higher mountains into the rocky streams. The Indian help will then leave the plantation to hunt for gold along the streams, because they can get several dollars a day from the stream, while they would earn much less in the field. When they have spent this money, they will go to work again and harvest the crop if the cocoa beans are not spoiled by that time. It is useless for the planters to try to get other laborers, because white men will not work for the wages that are paid to the Indians, and the cost of gathering the cocoa would be too great for profit.



Cocoa Pods

When the cocoa beans have reached the mill where they are to be manufactured, they are sorted into two kinds, light and dark. These are equal in food value, but they make a different colored cocoa. The beans are first washed and then the light, thin shell is taken off. This is the "**cocoa shells**" of commerce. The kernel or bean itself is then crushed into pieces about as large as grains of wheat. These are called **cocoa nibs**. The nibs are ground into a paste.

There is a great deal of oil in the cocoa bean, so that when the nibs are ground up, the paste is sometimes almost a liquid. This paste is either light or dark according to the color of the beans themselves. The paste is pressed or strained, and the oil extracted from it. This oil is **cocoa butter** which is a light yellow solid, about the consistency of lard or cottolene. It is used for food and as a salve or cosmetic for the face.

What is left after pressing out the cocoa butter from the paste, is the **cocoa** of commerce. It is then in irregular lumps. These are ground up and we have the ordinary cocoa as you buy it for use. If you take the paste without taking out the oil, you have the **chocolate** of commerce, which is sold in two ways, either bitter chocolate which is made by cooling the paste after grinding, or sweet chocolate which is bitter chocolate mixed with sugar and flavored with vanilla. Very often it is mixed with milk or cream and then you have some one of the many milk chocolates.

You know already most of the ways in which chocolate is used. It is made into a drink by mixing it with hot water. There is so much fat or oil in it that it is bad for children to drink, because it puts too much fat in the stomach at one time for the stomach to digest. For this reason cocoa, from which cocoa butter has been pressed, is safer for children to drink.

It is used in America more than in any other country for

covering candies in various forms. Chocolate creams and chocolate caramels are known throughout the entire United States, and a great many millions of dollars a year are spent in the manufacture and purchase of chocolate in its many forms.

MATÉ

There is another drink which is used by millions of people, and yet probably most of you never heard of it. This drink is maté, called also "Yerba maté" or "Paraguay tea," which is used almost entirely in South America, and it is more popular among the people who use it than tea or coffee in other parts of the world. It is made from a kind of holly leaf and it possesses all the qualities which make tea valuable, both as an herb food and as a stimulant, and in some respects is superior to tea, because it does not have so much tannin, which is the injurious part of tea.

So common is the use of maté in South America, especially in Argentina and Paraguay, that business can hardly be transacted without it. For example: if you had occasion to deal with a merchant in Buenos Ayres, and went to his office expecting to talk business in the ordinary American way, you would be very much surprised, and perhaps annoyed at the method you would have to follow. Before the merchant would talk any business at all, it would be necessary that you should drink a cup or two of maté with him. When you finish your errand you must drink another cup. When business hours are over and the men are at their homes or at the clubs, they drink innumerable cups of maté, so that one of the principal memories you would have if you visited southern South America would be that you drank a cup of maté before you did anything else, first, last and all the time.

Maté is really a delicious, fragrant, and nourishing drink, and where it has been tried for a while by people in the

north they generally come to prefer it to the real tea. It is on sale in Philadelphia and a few other places. Americans are peculiar and do not like very well to try new kinds of food or drink. In every other way they are quick to appreciate improvements and new devices that are of value and are ready to try them, so that undoubtedly in the future our people will learn to use and to like maté.

SUBSTITUTE TEAS AND COFFEES

There are a good many other plants in the world from which people make tea such as sage tea, catnip tea, and thoroughwort tea. These were common and popular drinks two hundred years ago in America, both for pleasure and medicine. People in all parts of the world have found that many of them are of value, but they never have been developed enough to become of commercial importance, and it is not worth while for you to learn anything about them.

There are also a number of substitutes for coffee. Someone has very wisely said that "one man's meat is another man's poison," which means that a food that is perfectly healthful for one person may be poisonous and injurious for another, as, for example, strawberries, which we consider one of our most useful fruits. Most people can eat strawberries without any trouble, but to some people the strawberry acid acts like a poison, and injures the health in many ways. For people who are not able to drink coffee, and desire something to take its place, or those who are very fond of coffee and drink it in such excessive quantities that it injures them, the various substitute coffees are good and healthful.

There is one substance, chicory, which is used largely to adulterate coffee, because it is much cheaper than the coffee, and it is sometimes used by itself alone. This is injurious. The imitation coffees made from cereals, as wheat,

barley, rice hulls, peanuts, malt, etc., are healthful and good in themselves, but are not as good as real coffee, and should not be taken with any such belief. The best cereal coffee is made from rye grains, roasted, ground, and boiled like real coffee. Any one can make it.

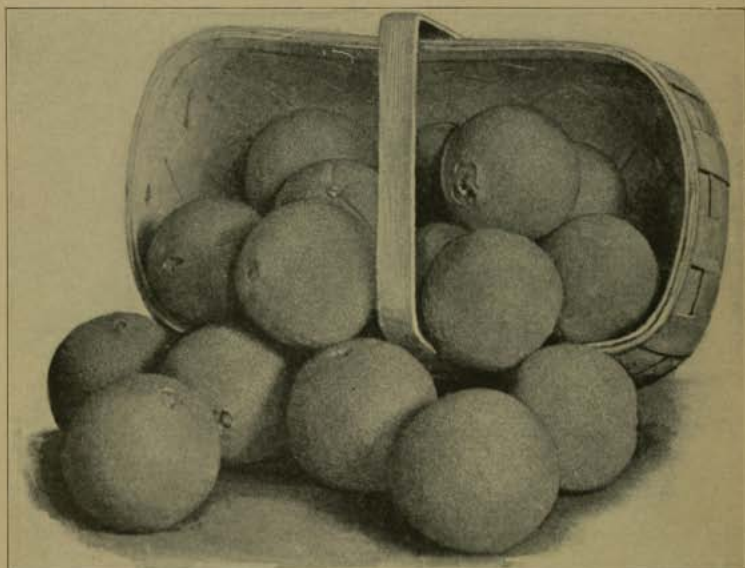
One thing remains to be said about these various beverages, such as tea, coffee, chocolate, maté, and similar drinks which are in any way stimulants. They should not be used much by children or young people who have not finished growing, because it is a fact, that everything of this kind has a tendency to stop the growth of the body, and weakens it while it is growing, but after the person is grown up, and the body has hardened and toughened in muscle and nerves, the use of these beverages produces little injurious effect unless they are used in excess.

FRUIT JUICES

Fruit juices are made by taking fresh fruit of various kinds, as strawberries, raspberries, pineapples, oranges, and pressing them to squeeze out the juice, which is used at once, before it has time to ferment or to sour. They are very healthful, and very delicious to drink, and are becoming more and more popular each year. A glass of fruit juice mixed with cracked ice makes a refreshing drink in summer.

Lemonade is really a fruit juice, only it is generally mixed with water because the pure acid juice just as it comes from the fruit is a little too sharp for most people to take into their stomachs. Mixed with water and sweetened with sugar, it is a very delightful and popular drink, and no summer drink is more cooling or more beneficial. Not one of all the fruit juices has the power to kill disease germs in the body so quickly as lemon juice, and, for that reason, it is especially good for people to drink who are suffering from fevers, which are due to some kind of disease germs. Orangeade,

which is very common, is merely orange juice mixed with water like the lemon juice. Raspberry shrub is raspberry juice. Lime juice is from limes which are a kind of lemon.



California Oranges

ALCOHOLIC LIQUORS

There is another kind of drink that is very common in the world, and that is what is called liquor. It is worth while that you should know something about it, because so much of it is made and sold in the world, and because in some cases your own people use it. I want you at first to understand clearly that the use of alcoholic liquor is **not necessary for any person** in good health. For the young who have not obtained their growth it is always unnecessary and always

bad, because the use of alcoholic liquor not only prevents the growth of the cells, but it often breaks them to pieces and destroys them, so that young people should not drink them at all, for any purpose, at any time.

Thousands of people earn their living, however, in making and selling liquors, and you ought to know how they are made.

Liquors are of three kinds, **wines**, **malt liquors**, as beer, ale, and malt, and **distilled** or strong **liquors**, as whiskey, brandy, rum, gin, etc. Wines are made from grapes, beer and malt from barley. Champagne, claret, and sherry are kinds of wine.

Whiskey is made from grains such as wheat, rice, corn, barley, rye, etc. Any kind of a cereal will yield a whiskey, but the kinds which usually appear on the market for sale are made from rye or corn. A very fine whiskey could be made from wheat, but the wheat is of more value for food than for drink, and so it is made into flour.

The moonshiners in the mountains of North Carolina and Tennessee are so called because they make whiskey by night, in the moonlight, in remote ravines of the mountains. Making whiskey without a license is forbidden by law, and punished severely.

Brandy is made by distilling the juices of fruits, such as cider from apples, perry from pears, juice of the peach, apricot, and similar fruits. Rum is made from molasses, by allowing the sugar of molasses to ferment. Gin is made of a kind of alcohol made from grains by adding juniper berries which give the peculiar taste.

Rice is made into a drink called saké, which corresponds to whiskey, and people in other parts of the world use many kinds of liquors that you do not need to know about.

Fermentation produces alcohol, whether the fermentation occurs in the stomach or in making a loaf of bread. The

process is this: the starch of any substance under the influence of heat and moisture turns to dextrin, this to grape-sugar or dextrose, which, if the process is allowed to go on, becomes sugar. The sugar, if set fermenting (usually by a germ) turns into alcohol. This happens in making a loaf of bread, though the alcohol in the bread turns to vapor and escapes from the loaf during the baking. This process is used in making beer, as you learned in the chapter on barley.

MEDICINES

You would hardly think of medicines as belonging to foods or drinks, but they really belong under that title. Foods are those substances which we take into the body in order to keep ourselves in health and strength, and so sometimes when we have so carelessly or ignorantly disobeyed the laws of health that we become ill, we eat or drink various things to make ourselves well. These are called medicines. Generally, if the illness is slight, very little is needed but that we should eat *lightly* of good, nourishing food, and nature herself, will cure the trouble. Frequently, however, we are too ill for this and the body must be nourished or stimulated to a certain extent, that is, *held up*, while nature works the cure. For this purpose medicines are used.

There are many kinds of medicines, both solid and liquid. Some of them while very valuable are powerful poisons, and are given only in small quantities. A teaspoonful of these medicines or drugs would cause death. For example: some of those in common use are aconite, belladonna, and strychnine, all of which are deadly poisons. In tiny doses, however, they act as a stimulant, and help the body over the time of illness. Also, because they are powerful poisons, they will kill the bacteria or germs to which many diseases are due. There are other remedies in common use, such as opium, camphor, sulphur, quinine, and witch hazel or hamamelis. To tell you

about these various medicines would take an entire book; but the subject of physiology, which you ought to study will tell you how to care for your body and how medicines act.

One thing remains to be said about medicines. It is this: in former times, men used all sorts of drugs, chemicals and extracts in the cure of diseases, but very little medicine is given in the modern practice. Doctors find out what food substance the sick person needs, whether proteids or tissue building food, carbohydrates and fat, heat and energy foods, and by prescribing these substances in just the necessary quantity and form, build up for the sick person a healthy body without really using much medicine.

You must not, however, get the very wrong idea that people who are sick do not need medical care and medicine at all, either in the form of drugs or of foods, because people are frequently dangerously ill, and if they do not have the care of some skilful doctor who has studied years to learn about the body and its needs, they will die. In illness the mind is often affected by the pain and one is not able to judge either what is the matter or what kind of care is needed. Therefore, whenever you feel seriously sick you should consult some good doctor, and do as he directs, if you want to get well.

Millions of people use tobacco, either to smoke, as in pipes or cigars, or to chew, or in some parts of the world as snuff, which was much used in Europe two hundred years ago.

Tobacco never does anyone any good and is often very harmful. It is just a bad habit, and cigarette smoking is very dangerous to growing boys because it is likely to injure the heart and make it weak. When this happens, it never gets well and strong again, and the boy grows to be a man, who is always unable to take any hard exertion safely, just because when he was a boy he thought it nice to smoke cigarettes which never in the slightest way did him any good.

CHAPTER XVI

PREPARATION OF FOOD AND SERVING

MARKETS AND STORES

NEXT, after the kinds of food, we must consider the places where foods are sold, and how they are prepared for use.

In farming communities people raise most of their foods themselves. If they have any surplus products they exchange them with each other or at a store, often several miles away, for foreign products. Thus farmers exchange butter and eggs at the store for sugar or coffee. In larger communities, some special day in the week is called "market day," when those who have food to sell gather together at some appointed place where goods are displayed for sale and where people who need them can go and buy.

This is called a market-place, or a market, and the people who go to buy are said to go marketing, that is to buy food. As the villages become towns these markets are held daily, and the market place is roofed over into a kind of building in which the dealers have their separate places which are called stalls, and the people go daily to buy food. At this market are found such foods as meats, fruits, and vegetables, that soon spoil, and must be sold at once. Cereals are usually sold elsewhere, because their nature does not require them to be disposed of quickly.

At first, all the food is sold in the same market, then as communities extend, fresh markets are established, at convenient distances from the scattered groups of people. To-day

we expect to find in a market the following foods: meats, fruits, and vegetables of all kinds. Markets are said then to deal in meats and provisions. Fish is usually sold by itself, in what are called fish-markets.

Grocery stores are really food stores. You will always find for sale in groceries, flour, tea, coffee, spices, etc. They often,



Street Pineapple Seller

however, sell fruits, and vegetables, that is, provisions, and in some cases meats. In larger cities the division of labor goes further, and we have separate fruit stores, grain stores, and so on.

In Europe it is a common custom for the mistress of the house to go personally to the markets, and select the food

needed by the family for the day. This food she carries home in a basket or it is carried home for her by servants. The custom exists to a great extent in the United States, but grocers and provision dealers, in order to extend their trade, have adopted a plan of going from house to house in the morning to take orders for food, which is delivered later in the day, so that the housewife is not obliged to go to the market. Very often a servant is sent to the market to order the food.

The delivery system is very convenient for the householder, but it has some defects. It saves the time and strength of persons who have a good deal of work to do at home. On the other hand, when the housewife herself does not go to the market, but trusts to someone else to select the food desired, there are frequent mistakes. Very often, also, in families of wealth, a distinct system of cheating exists between servants and market men. The market men charge a higher price than is fair for the food supplied, and divide this extra money, which is really stolen from the purchaser, with the servants.

Another form of what might be called a travelling market is in common use in cities and towns. That is men drive about with wagons filled with vegetables and fruit, and peddle them from house to house. We do not feel that summer has come in the city until we hear the cry of "Strawberries, two quarts for a quarter," or "Macker-ell, fresh macker-ell," from the street pedlers. In the country the people depend on the travelling meat cart. Except that sometimes these dealers are poor and are unable to buy the best quality of meats, fruits, etc., it is one of the most practical and sensible of the methods of selling foods, because once more it brings the mistress of the house in direct trade with the market men and enables her to see what the food is before she buys it, and to know what a certain amount of food is going to cost.

Market day in a European city is very interesting to a

stranger. Crowds of oddly dressed men and women fill the market place (usually in the centre of the city) with their carts and baskets full of fruits, vegetables, meat, poultry and eggs, flowers, butter, and many other things.



Street Fish Dealer

The pushing about of the people who come to buy, the noisy bargaining of buyer and seller, over the price of goods, the housewife's big basket piled high with the goods for the day, all make a picture that lingers long in the memory.

PRESERVATION OF FOODS

Food may be prepared or preserved for use in several ways:

1. **By drying.** This is the easiest and the simplest. It is the application of heat to the food, but this heat is usually that of the sun, so that very little labor is required. For example, meat in hot, dry, climates, if cut into thin strips, can be dried by the air so that it will keep indefinitely and can be used when needed. These dried strips of meat, called on the plains "jerked beef," resemble strips of hard leather to some extent, but by softening them in water they become palatable and nutritious. Vegetables are often dried and can be used when needed by the addition of water. These are called "desiccated vegetables." Fruits can be dried by cutting them into small pieces and exposing them to the sun or the heat of an oven, so that we have dried apples, dried peaches, etc. Before the invention of the air-tight fruit jar now in such common use, like the Mason jar, a great many kinds of berries were dried for use in the winter, such as dried blueberries, dried currants, etc. The currants that you buy at the store are not dried currants but small dried grapes. Such fruits as figs and dates are usually preserved by drying in the sun.

2. **Drying and smoking.** Certain meats like ham, bacon, and dried beef, are prepared by drying them slowly by the application of heat, and exposing them to the smoke of wood and other substances which gives them their peculiar and distinctive taste, and at the same times serves to repel any insects which might otherwise injure the meat. Fish are also dried and smoked, either with or without the addition of salt.

3. **Salting.** As we have said before food is preserved by being covered with dry salt or being soaked in a brine made of salt and water.

4. **Preserving.** Fruits, such as peaches, pears, pineapples, and berries of various kinds are usually preserved by canning, that is, they are partly or wholly cooked and are then put into a jar, a liquid made of sugar syrup is poured about them until the jar is filled, and the top is then put on so tightly that the air cannot enter. Fruits like citron are soaked in a saturated solution of sugar and allowed to dry. As they dry a coating of sugar is left on the outside of the fruit which preserves it from decay. Preserved ginger and orange peel are made the same way.

FOOD ADULTERATION

When we say that a food is adulterated, we mean that it is not pure. Something has been added to it. This is done to make it cheaper and so give a larger profit to the maker. Examples of adulteration are these:

Cottonseed oil is mixed with olive oil, and the mixture is sold as pure olive oil. Chemicals are put into meat to keep it from decay. A large part of the sugar sold as maple sugar in the United States is made of brown cane sugar and coloring matter. Butter is mixed with cheap lard and sold as high grade butter. Most of the fruit flavors we use are made of chemicals in a laboratory. Used up tea leaves are mixed with new tea.

FOOD WASTE

One important problem connected with foods is the disposal of the *waste food* left from the preparation of the food or the fragments left from the meals. In the country, on the farms, this waste food called garbage or swill, is fed to the hogs. In the cities it is collected in wagons from day to day, and either burned up in great furnaces or carried far away from the city and deposited in places where its decay cannot

injure the public health. In cities on the seacoast, like New York and Boston, it is usually loaded into scows which are towed miles out to sea, and there the garbage is dumped into the ocean, or is burned in furnaces and so made harmless. It is of the greatest importance that all waste food be



Cooking School, Boston

disposed of promptly, because all decaying matter whether animal or vegetable is injurious to the health.

COOKING

In ancient times, savage man ate his food just as he found it, without cleaning it or cooking it. Modern man cooks his food, and a very long step forward in civilization was made when man first learned to cook.

It is very important that people should know how to cook well, and cooking schools are provided in many large cities so that grammar school girls may learn to cook.

Cooking is the preparation of food by means of heat. This can be done in several ways.

BOILING

There is an interesting way to make water boil for the preparation of food, which is in use by many savage tribes to-day. They fill a large jar with water. Stones are then heated in a fire and dropped into this jar, and the heat which they give off makes the water boil and cooks the food.

Among civilized people, the method is this: To boil a food of any kind, the meat or the vegetables are put in a kettle and completely covered with water. The water is then heated until it boils, that is, it begins to give off steam, at 212 degrees Fahrenheit, and the heat of the water penetrates to every part of the food. The effect of the heat at first is to harden or coagulate the albumen in the meat or the gluten in the plant food. If the boiling is continued longer, the substance is gradually dissolved by the water so that it breaks up into small particles and everything that is soluble is taken up by the water, leaving only a little mass of fibrous tissue which is of no value as food. We then say that the food is boiled to pieces. Ordinarily in cooking meat by boiling, the process is stopped when the heat has thoroughly penetrated the food and the jelly like substance has hardened.

The other method of boiling the food until it is dissolved is used in making soups. Consommé is a clear soup prepared by boiling meat until all the nutritive quality is extracted. A stew is made by mixing together several foods, as meat and vegetables of different kinds, and boiling them until they are tender. The New England boiled dinner is cooked in this

way. All over the world boiling is a common and popular method of cooking food.

Another process of preparing meat, bread and other foods is

BAKING

In this process the food to be cooked is put into an oven of some kind and subjected to dry heat. This dry heat evaporates a considerable part of the water which is in the meat or vegetable, causes the same hardening of the albumen as in boiling, and makes on the outside of the food what in bread is called a crust. Baking is a very general and popular method of cooking.

BROILING

Broiling is a process whereby meat, as a slice of steak, is exposed to a sharp, quick heat, which cooks the outside instantly, and keeps the inside juicy. In "toasting" bread we produce a similar effect.

ROASTING

Roasting is broiling applied to a larger piece of meat, and continued a longer time. It is baking done in the air and not in a closed oven. "Roast beef," as we have it, is really baked, not roasted.

Among pioneer communities food is frequently cooked on the hearth, in a fire place, or beside an open fire. Except for its method, the result is the same as in baking in an oven. Centuries ago, before the invention of stoves, this was the only way that meat could be cooked even in the houses of the wealthy people. They used a metal point or rod called a turnspit upon which the meat was placed, and then the turnspit was made to revolve slowly, so that the different sides of the meat might be exposed to the heat equally. When camping, roasting is the most convenient method of cooking meat.

FRYING

Frying is a process somewhat similar to broiling, although the food is not put directly in contact with the flame or the heat, but is placed in a frying-pan made of thin, tough, metal which heats easily, so that the result is almost the same as if



Old Fireplace

the meat were broiled on a gridiron. Meat is usually fried with fat, which prevents the meat from sticking to the bottom of the dish and so burning. If very much fat is used, more than is necessary to keep the meat from burning, the meat is likely to become soaked with the fat and rendered indigestible for weak stomachs. This is the objection to ordinary fried foods. Griddle cakes, so popular in this

country, are practically fried upon the thin sheet of iron on which the dough is placed. Foods which are fried or broiled must be turned over one or more times so as to bring both sides of the food in contact with the heat, and then the middle of the meat cooks slowly.

There is a method of frying, so called, which is really a boiling in fat, used in making doughnuts and croquettes. That is, a kettle is partly filled with oil or lard and placed over the fire. This fat becomes very hot. The croquettes or doughnuts which are to be cooked are then dropped into this heated fat. The heat produces the same effect upon the food that the heat in frying would do and the fat forms a crust or shell on the outside of the food. In order to cook by this method properly the fat must be very hot. If it is not very hot the food may cook after a time, but it will be entirely soaked with the fat and become unfit to eat.

A popular utensil for cooking, for a light lunch, is the chafing dish. The cooking is usually done on the table while the guests wait, and is only suitable for a few foods, like Welsh rarebit. It is really a frying done over a lamp on the table and does not differ in effect from food fried on the stove. Its convenience, however, makes it popular.

STEAMING

Another method of cooking sometimes used is that of steaming. It is frequently done by the use of a double boiler. Water is put in the bottom of this, and allowed to boil until it sends off steam. In the upper part of the double boiler, the food is placed that is to be cooked. The steam rising from the water penetrates the food and cooks it thoroughly.

Sometimes a food which could not be cooked at all by one method, can be made by another into a very delicious article of diet.

The various ways of preparing or making the food ready for cooking are so many that it would need an entire book to describe them. These books are numerous and are called **cook books**. They contain usually hundreds of recipes which are directions how to prepare bread, cake, puddings, pies, etc., and give minute directions as to the quantity of the different food substances and the way they should be put together.

The cooking of food has another value which is, that no disease germs can live after being subjected to a baking heat, so that if in the food there are any germs which would tend to cause sickness, they are sterilized (*i. e.*, all germs are killed), and so the food is made harmless by thorough cooking. In the same way, water, no matter how impure, even if it is from infected streams, by boiling and straining can be made perfectly harmless and fit for use. It would be well if all drinking water were boiled before it is used and so be made safe.

FREEZING

There is another way of preparing food that is the direct opposite of cooking. That is the method of **freezing** used in the preparation of ice cream, sherbets, and other frozen dainties. Ice cream is made as follows: A liquid, composed of milk, sugar, and flavoring, is poured into a metal can placed in a tub called an ice cream freezer. The tub is then filled with small pieces of ice mixed with coarse salt. Salt makes ice melt, but causes, at the moment of melting, a very intense cold which freezes the liquid in the can. If the can is kept still the cream will freeze to a solid lump like artificial ice. The can, however, is made to revolve steadily, and the liquid cream is beaten about or stirred by a paddle while freezing, so that the liquid freezes in separate particles like fine snow and we have ice cream as you know it.

Sherbet as you learned before is made from water flavored

with fruit juices and frozen. It is often called "water ice." "Frozen pudding" is an ice cream that has in it pieces of fruit like a pudding.

Harlequin ice cream is a mixture of several different colors, like the coat of a jester or harlequin. There are many other frozen dainties like Biscuit Tortoni, etc., but they are all ice creams with slight differences of flavor and making.

COOKING UTENSILS

A utensil is a thing that you use, so that cooking utensils are the dishes, the spoons, and various other implements by which the food is made ready.

Early men had few dishes of any kind to cook with, and even to-day a large part of the cooking in savage communities is done by putting the food upon a flat stone before the fire or upon a piece of wood or bark. The more civilized men become, the more ways they devise to improve the preparation of their food, so that to-day every household, where the people are in comfortable circumstances, possesses dozens or scores of dishes, which the richest people in the world a few hundred years ago were unable to buy at any price.

Most of the dishes which are used in cooking foods are made of metal, because earthenware is liable to crack under the influence of heat. The most common metals in use are iron and steel, but copper is the best of all, because the metal retains heat longer than any other. Copper dishes or those made of brass, which is partly copper, must be kept free from rust, for the rust of copper, verdigris, is a poison. Within the last few years a method has been discovered by which the metal aluminum can be produced at a low cost, and the use of it for cooking utensils is increasing with great rapidity. The value of aluminum is, that it is very light, does not tarnish or rust in the air, holds heat almost as well as copper, and is of a bright, attractive, silvery color. It has apparently

all the good virtues which a cooking utensil ought to have and very few faults.

ALADDIN OVEN

Some twenty years ago, Mr. Edward Atkinson, a man who has devised more scientific methods of cooking than any other American, invented the Aladdin Oven, which is a double-walled box, with the space between the walls filled with some substance that does not conduct heat. With this one can cook a dinner for a whole family by the heat of an ordinary kerosene lamp.

It takes several hours longer than a stove, but the food is more perfectly cooked. Mr. Atkinson proved that "long, slow, cooking, makes the food most healthful," and very little heat is needed during the cooking.

FIRELESS COOKING

Some poor people in Europe carried these cooking experiments further, and found they could cook their food with no fire at all for part of the time. Their method was to bake or boil the meat or vegetables about one-third of the usual time. Then they put the kettle into a closed box with hay packed about it and left it some hours. When the box was opened later, the food was perfectly cooked. From this has been developed an apparatus called the "Fireless Cooker," where an insulated box, as in the Aladdin Oven, is used instead of the hay. The U. S. Government has recently (1906) adopted it for use in the army.

It is a very valuable invention. If boys and girls want to try it, they can take two boxes, of different sizes, put the small one into the large one, and fill the space between with hay or old newspapers. Then have something cooked for 10 or 15 minutes that usually takes an hour, put it in the inner box, shut down the covers and leave it for two or three hours.

You will soon learn how long the different foods must stand before being cooked, and how easy it is to cook them.

TABLE DISHES AND IMPLEMENTS

Savage man used his hands to tear his food apart, and to put it into his mouth. Civilized man uses knife, fork, spoon, and many dishes.

In old English days, several hundred years ago, the food was served to the rich people on dishes of gold and silver: to the poor people or servants on dishes of wood or "trenchers." Since that time men have learned how to make dishes of china and glass at a low cost, which has made it possible for even the poorest people in our land to have dishes to use.

Knives have been possessed by men for ages, spoons for a very long time, but the fork is a modern institution and used to-day by a comparatively small part of the people in the world. You have sometimes heard the remark, "Fingers were made before forks," and even the remark itself shows that the use of the fork is a very recent invention. The other forms of tableware are merely variations of these three types, knives, forks, and spoons.

It has been very truly said that the excellence of man's table manners (that is the ways in which men eat their food), is a test of man's civilization.

Food is the first need of man, the one from which he never escapes during his whole life. Its production and preparation occupies the largest share of human labor. Throughout the world whenever men desire to make a great celebration for themselves or their friends, they prepare a dinner, and they provide at that dinner the best varieties and qualities of food that they have the money or time to procure.

In addition to the dishes and implements which we call cutlery, modern custom demands the use of tablecloths and napkins. The napkin is a reminiscence of the time when

men did not have knives or forks for each person, but cut or tore off their portion from the food upon the table, and ate it from their fingers.

Because the hands and face were soiled by eating in this way, the custom arose of carrying around the table after the



New England Dining Room

dinner a basin of water, that the guests might wash their hands and faces, and cloths or towels for them to use in drying their hands. This custom exists to-day in the use of the finger bowl which is placed upon the table after the meal.

When the custom of hand washing at the table passed, the towel or the cloth to wipe the hands was still a necessity,

and from it comes the table napkin which to-day serves the same purpose. The modern well-trained person is supposed to be able to eat his food in such a way as to make the use of the napkin almost unnecessary, except in the case of accident.

Another ancient custom is worth mentioning. In the old days of Greece and Rome, men did not use chairs, but couches, very much like a lounge, on which they lay beside the table and either took the food themselves from the table, or from servants, who passed it to them. Later, in Europe, where men had to work hard and did not have much time for their meals, they used chairs as we do.

WHEN WE SHOULD EAT

The amount of food that a person needs during the day varies of course with individuals. The number of times per day one should eat also varies somewhat with the work that he does and the part of the world that he lives in. In this part of the world three meals a day are usually considered necessary. In England they have four and sometimes six, and in some parts of the world they have only two or one.

Of the three meals which we usually have in the United States, the first in the day is called breakfast, because at that meal we "break the fast" of a number of hours, during which time we have been asleep. This fast or interval is the longest during the twenty-four hours.

The other meals in the day are called dinner and supper, or lunch and dinner, according to circumstances. The heaviest meal of the day is generally called dinner, which among laboring men is eaten at noon. In this case the night meal is called supper, and is taken after the day's work is over. The breakfast and supper are light meals, or ought to be.

Among brain workers, however, and for all those whose work does not permit them to stop long in the middle of the day to eat, it is the custom to eat a light lunch at noon and

the heavy meal of the day, the dinner, after the day's work is done.

There are two reasons why the six o'clock, or night dinner is the best so far as health is concerned. First, after one has eaten a hearty meal, the blood goes to the stomach, to help digest the food. If one turns immediately after eating, to heavy muscular or brain work, the blood is drawn away from the stomach to the muscles or the brain, and an insufficient quantity of blood is left to digest the food, and various troubles result. If, however, the hearty meal of the day, that is the dinner, is eaten at night after the day's work is over, and the evening is spent in amusement or rest, the digestion becomes more perfect and the bodily health is better. A six o'clock dinner also gives an opportunity for the various members of the family to meet each other and talk over at leisure the events of the day, which is not possible at noon in the hurry of our modern life, so that the night dinner benefits the intellectual and the moral part of our natures as well as the physical.

The only evil connected with the night dinner is that it extends the work of the servant (or family) into the evening, and makes a long day.

One thing you should remember, is this: The American people eat much more food than they need or is healthful. The men who do the hardest kind of mental work, who work far into the night when other men are asleep, eat much less than other men. As people begin to grow old they do not need so much food as when younger, and should eat sparingly.

HOW WE SHOULD EAT

There is just one thing more to be said about your food, and that is the way you should eat it. Dentists who care for our teeth say that the habit of eating in a hurry, without chewing the food properly, is bad for the teeth for two reasons.

One is that we need to chew our food and bite hard to keep the teeth and gums in good condition. The other is that if the food is swallowed in lumps it does not digest well, and acids are formed that affect the teeth and make them decay. So the dentists at the Harvard Dental School in Boston have made some rules, which you should learn and remember. If people will follow these rules strictly they will have very little trouble with their teeth during their whole lives. The rules are these:

First.—Never eat at all unless you are so hungry that plain bread and butter will taste good.

Second.—Drink a glass of water before you eat a meal.

Third.—When you are hungry, and do eat as in rule one, eat the food you care most about.

Fourth.—When you eat, chew the food until it is soft enough to be swallowed without effort. Until you do this, you will never know how good food can taste.

Fifth.—Eat some hard food that will make you bite hard.

Sixth.—Drink plain water by the glassful, at once, if you wish, as it has no taste, but drink all liquids that have taste, as milk, coffee, lemonade, etc., by small sips or mouthfuls.

Do these things and you will have sound stomachs and good teeth, clear heads, and strong bodies; for the food you eat will nourish you, and you will be able to do your work in the world successfully, whatever that work may be.

CHAPTER XVII

WHAT THE WORLD EATS

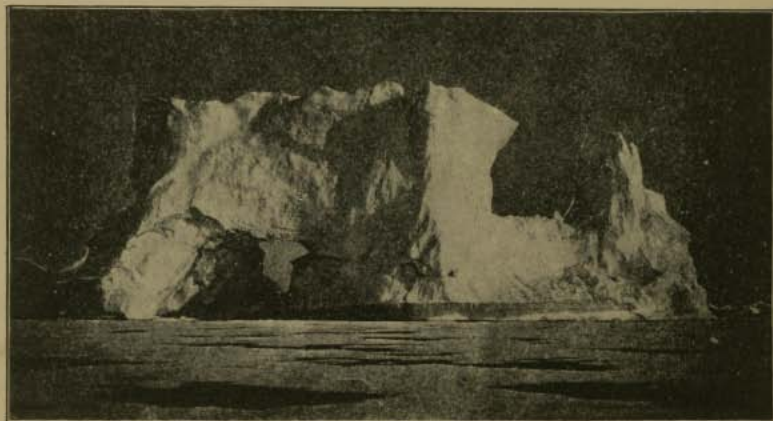
WE have been talking together about foods for a long time, and we have learned what the principal foods of the world are, where they are produced and how they are used. Before we say good-by to each other, let us take a make-believe trip over the world, so that you can see just what kinds of food the people on the earth really eat when they are at home.

Some Arctic explorers are planning to use an airship in their attempts to reach the North Pole. Let us imagine that we, too, are in an airship and can look down and watch the people of the earth as they live and work. We also will begin our journey by going to the Arctic lands.

As we speed northward above the great forests which cover upper North America, we see the pine trees and spruces grow small and disappear, until the mosses and lichens are the only plant life left. Soon those are gone and we have come to the land where ice and snow stay all the year round. Six months of the year it is a long, sunny day, and the sun's rays flash and reflect on the ice and snow like the spokes of a great wheel, as the sun which never sets, during the six months, moves from east to west around the earth in a circle.

Then for six months it is night; the sun never shows itself above the horizon, while the people live, hunt, eat, and sleep in a twilight or half light which comes from the moon and the stars.

The people in these Arctic lands are called Esquimaux, and they get their food entirely from animals or fish. Let us look down: we see below us a collection of odd dome-shaped huts built of rocks or snow. The Esquimaux, clothed in heavy skins and furs, are hunting. They have for game, the fierce white polar bear, the walrus, and the seal, and a few other wild animals. They raise no crops and depend for food on



A Large Iceberg

the flesh of the few animals about them. Because the air is cold, and the body needs so much fuel or heat from the food, the Esquimaux will eat, enjoy, and digest many oily foods that we could not live on, such as the tough, greasy blubber of the whale and seal. In this climate, at least, meat food alone will support men for long periods. The Esquimaux travel in sledges, drawn by a team of Esquimaux dogs, and they hunt the walrus in boats, called kayaks, made of skin. The skins of animals yield the leather for sledges, boats, and huts; the furs are made into clothing; the sinews

furnish cords, and the flesh provides food of exactly the right kind to keep men alive and well in the icy North.

We pass over villages of Laplanders in northern Europe, with their herds of reindeer, and reach the stormy waters that dash upon the shores of Newfoundland and Labrador. The hardy fishermen, who begin fishing when they are children, toss about in their frail dories, a few miles from shore, always fishing, fishing, fishing, that the women and children at home may have their daily food. Just as the Esquimaux live entirely on meat, so here is a people, who live almost entirely on fish food.

We float on again, and let the world turn round beneath our airship, while we move slowly south.

Beneath us whirl the grain fields of the world, like a patchwork blanket, green, yellow, and brown. The wheat fields of Dakota, the rye farms of Russia, the oats and barley and millet of China and India pass beneath us, with the millions of men who sow and cultivate, who reap and grind the grain that makes the bread of the world. Their food, like their work, is almost entirely of the cereals or grains.

A journey of a few more hours in our swift-gliding airship and we see the snowy fields of cotton in Georgia, Egypt, India, and Peru, and watch the dark-skinned people pick the cotton as no white man is able to do. Side by side with the cotton, to supply the food that the laborers must have, grow the abundant fields of white and yellow corn. When ground into coarse meal it makes the "corn pone" and corn bread; when fed to the hogs, who wander through the streets in many southern villages, it yields the ham and bacon, the common foods of the cotton and corn belt.

The air grows warmer, as we sail on, and soon we are in tropical lands, with the sun directly overhead.

Beneath us we see the rich fields of sugar cane in Cuba, Porto Rico, and Louisiana, and in the far-off Sandwich

Islands. Millions of bananas, oranges, pineapples, and other luscious, delicious fruits grow in the hot, moist climate, and make the air fragrant while the rice swamps rival the wheat fields in their abundant crops.

We are far away from the cold lands where fuel food is necessary and here the people eat little meat and their food



Pineapples Growing

is mostly rice and fruits, which keep the body cool and yet sufficiently fed and nourished. We must not forget the coconut palms, which lift their graceful columns beside the blue seas and follow the equator around the world. They produce an enormous amount of valuable food.

We cross the equator and see with surprise the North Star

and the Great Dipper, which we have always seen unchanging in the north from our childhood, sink beneath the horizon, while in the south there rises the new, mysterious, blazing Southern Cross.

We come next to another belt of food lands. We see the cocoa fields of Venezuela and the coffee plantations of Brazil,

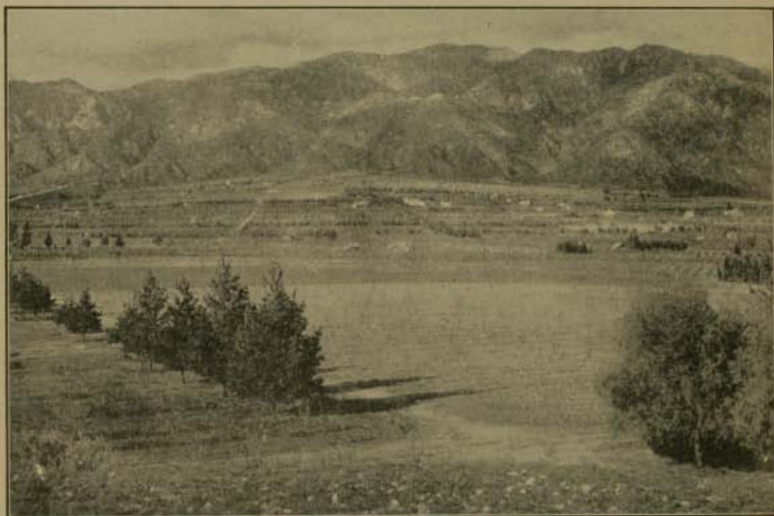


Tea House in Japan

that produce three-quarters of all the coffee in the world. On the other side of the world in the same belt, are Arabia, Java, and the Philippines, the other coffee-raising lands. Near them are India, China, and Japan from which the world for centuries has bought its tea, sometimes to rest the tired workman, sometimes to while away the idle hours of king or noble, but once, we know, to fall into Boston Harbor at night, and make a tea from which the New World drank Patriotism and Independence.

But we must sail on—a few more swift hours and we watch the vast herds of cattle on the plains of Argentine and South Africa. Thousands of flocks of sheep graze on the slopes of the Andes and over the endless ranches of Australia and New Zealand.

The people in these lands like those in the North Temperate zone live largely on meat foods. But our southward journey



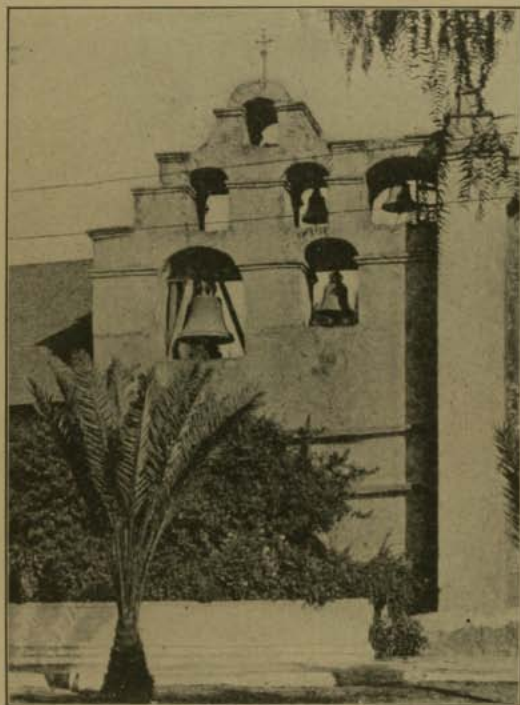
Fruit Orchard, California

must stop for the great icebergs of the Antarctic, which defend a dead and barren icy land, send upward their cold winds and make us shiver.

We round Cape Horn and make a swift flight to warmer climates and more kindly seas. We glide over hundreds of sunny islands in the blue Pacific, past ancient China and rest awhile from travel in quaint old Japan.

We spend a dreamy evening in a Japanese tea garden,

sipping fragrant tea from dainty cups, and watch the silken-robed Japanese girls as they dance in the moonlight under the wistaria blossoms, or snowy cherry trees and learn that even food has a beauty and charm in such a lovely place.



Mission Bells, California

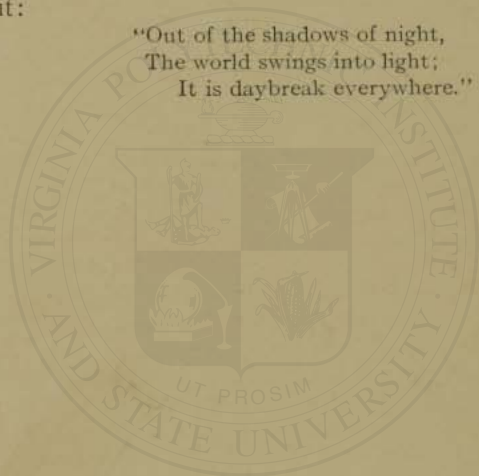
Once more we take our ship and sail homeward past the Hawaiian Islands hearing the soft farewells of the kindly natives shouting "Alóha," "alóha," "Love to you," "Love to you."

We see the sunset light turn the distant mountains to a

rose color as we pass over the Golden Gate of San Francisco and float south once more to the fruit gardens of the world in Southern California.

Groves of oranges, plums, and almonds, vineyards and rose gardens everywhere, please our eyes, delight our hearts, and rest our minds, and we let our airship gently sink to the earth, and we say good-by to each other, while among the old olive trees the bells of the missions of San Diego or Los Angeles ring softly a farewell greeting, as Longfellow heard it and wrote it:

"Out of the shadows of night,
The world swings into light;
It is daybreak everywhere."



APPENDIX

USE OF SPECIMENS, CHARTS, ETC.

A reader which describes commercial products and human industries, no matter how interesting it may be, or how abundant the illustrations, will not attain full success unless the pupils see actual specimens of the products described in the book. Therefore, the author advises that the teachers, who use the books of this series, should try to get the specimens needed, should let the pupils actually handle them, and so complete the picture in their minds that the book begins.

Specimens of the important food products, as cereals, fruits, nuts, vegetables, can usually be obtained in any fair-sized town, from the provision stores and the farms in the neighborhood. Foreign products, as tea, coffee, chocolate, tapioca, spices, sugar, are for sale in all country stores. Fruits, fresh and dried, native and imported, are piled on every fruit stand.

Domestic food animals are familiar to every country child and to many city ones who spend their vacations in the country. Therefore the scholars can easily bring in a collection of the chief specimens needed, leaving only a few links in the chain, mostly processes of manufacture for the teacher to supply.

Once a year, in the early fall, the teachers of every grammar school in a town should unite in holding a "school food exhibition," at which should be shown specimens of all the kinds of food products easily procured, especially those grown on the farms of the town. The interest of the public in such exhibits is always very great. Country fairs or "cattle shows" always have exhibits of farm cattle and farm products. The school food exhibit, if held immediately after such fairs could usually have the use of many of the prize fruits and vegetables. The author cannot urge too strongly the value and use of such a food exhibit and its great educational value to pupils, parents and teachers.

Each school should have its *permanent* museum of various commercial products, as foods, textiles, woods, etc., for constant reference.

Specimens may be kept in bottles of various kinds. The square 2 oz., 4 oz., 8 oz., and round 2 oz., 4 oz., 8 oz., 16 oz., with aluminum screw caps are the best. A still more convenient and durable form of specimens suited to class work, reflectoscope projection, and museum use, light, air tight, insect and dust proof, are the "Commerce Cassettes," devised by the author to satisfy the needs of his own classes.

The author uses also in his own work some "Commerce and Industry Charts," on which are located the places in the town where food products are grown—areas of industry—cleared and forest lands, etc. Something of this kind should be used by every class.

Once a month, at least, a school recitation should be taken, for an *unmarked* review of the subjects already studied, descriptions of specimens brought in, and the display of lantern slides, stereographs, and photographs of the foods and food industries studied.

FOOD GARDENS

Each class in the spring, should plant as part of the school garden, the various food plants which can be easily raised. These will be of use to the class that begins the study in the fall, and for the school food exhibit.

They should also plant in a separate plot, a "Cereal Garden" which should contain wheat, corn, rye, oats, barley, buckwheat, millet, and in mild climates, upland rice—the eight cereals of the world. The sight of the "food grasses" growing side by side, is always of interest and value.

LIST OF SPECIMENS AND PHOTOGRAPHS WHICH ARE HELPFUL

VEGETABLE FOODS

Cereals—Wheat, corn, oats, rye, barley, buckwheat, rice, millet—showing the raw grains, processes of manufacture, finished flour, breakfast foods, etc., and by-products, as the starch, sugar, glucose, and oil of corn.

Fruits—Photographs of perishable fruits, tropic and temperate, Specimens of dry, canned, and preserved fruits. Banana flour. Guava jelly. Candied fruit.

Nuts—Specimens of all commercial nuts, as walnuts, pecans, chestnuts, cocoanuts, Castane (or Brazil) nuts, peanuts, with samples of by-products, as copra, shredded cocoanut, peanut butter, peanut oil, etc. (The peanut in trade is called a "nut").

Vegetables—Photographs of perishable products. Specimens of food seeds like beans, peas, lentils, caraway seeds—and of seeds of common food plants as squashes, melons, sugar beet, turnips, lettuce, etc.

Sugar—Specimens of raw and refined sugar of all commercial kinds and photographs showing the plants, as sugar cane, sugar beet, maple tree, and the industries by which sugar is produced.

Starches and Gums—Specimens of starches made from common food plants as wheat, corn, and potato starch, and starches like tapioca, sago, arrowroot, specimens of gum arabic, gum chicle, spruce gum, etc.

Oils—Grain oils, as from corn; fruit oils as from olives; nut oils as from cocoanut and peanuts, seed oils, as cotton seed oil.

Spices—As cloves, cinnamon, ginger, nutmeg, pepper, mustard, etc. Leaves of flavoring plants, as sage, mint, thyme, etc.

ANIMAL FOODS

Mostly shown by photographs and lantern slides. Specimens of foods preserved as dried beef, smoked bacon, salted fish. Animal by-products as lard, gelatine, cod-liver oil. Dairy products as cheese, butter, milk sugar, condensed milk.

MINERAL FOODS

Salt—Rock salt, and fine table salt. Baking powders, common mineral drugs.

BEVERAGES

Photographs of water in all forms, ice industry, mineral springs, artesian wells. Specimens of beverage plants as tea, coffee, cocoa, maté, in different varieties. Photographs of vineyards and wine making, "soda water."

FOOD PREPARING AND SERVING

Photographs of kitchens, and food cooking, markets, cooking utensils, etc.

REFERENCE BOOKS ON FOODS

Food Products of the World.....	M. E. Green
Food and its Functions.....	J. Knight
Food We Eat.....	J. M. Fothergill
Food of the Future.....	H. W. Wiley
Food and Feeding.....	H. Thompson
Foods.....	R. Hutchinson
Food Supply.....	R. Bruce
Science in the Production of Food.....	E. Atkinson
How We Are Fed.....	J. F. Chamberlain
Story of a Grain of Wheat.....	E. Edgar
Corn Plants.....	J. L. Sargent
Book of Corn.....	H. Myrick
Cereals of North America.....	T. F. Hunt

(This List is not complete. Many others are of great value.)

U. S. DEPARTMENT OF AGRICULTURE

Pamphlets on wheat, corn (maize), rice, nuts, milk, dairy products, meat supply, meat packing—the Superintendent of Documents, Washington, D. C., will send on application, a catalogue of government publications. There are many of the highest value which should be obtained.

AUTHOR'S NOTE

This book begins a series of industrial readers. Their purpose is to describe for pupils in the upper grammar grades the things of every-day life, the foods, clothing, buildings, etc., and the industries by which men obtain them.

The author wishes to thank all who assisted in the preparation of this book, but especially, Mr. Myron T. Pritchard, of the Everett Grammar School, whose wise advice and kind approval is gratefully acknowledged.

Teachers using the book are invited to write to the author and state their criticisms and experience.

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 Boston, Mass.



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