PHYSIOLOGY AND HEALTH

BOOK ONE

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BOOK I

PREFACE

It is becoming more and more fully realized that ignorance and misinformation in regard to the laws of health are responsible for the failure of so large a number of children to grow into healthy adults. Under the artificial conditions of modern life many unfortunate habits are acquired by children which interfere with the development of a robust body. One has but to observe a new-born baby acquiring in its first few days of life regular habits of living — if it is given half a chance — to realize how readily the young body falls into a regular routine. Many habits are formed in a child's early years. Sometimes these are useful and sometimes detrimental to health, but whatever they are they become so firmly fixed in the developing mind that it is very difficult subsequently to overcome them. No age is too young, therefore, at which to begin to teach the value of health, dependent upon proper care of the body. While a study of technical physiology is hardly suited to the young child's mind, the study of a few principles of life upon which health is dependent cannot be begun too early.

The mother who properly brings up her children tries to inculcate lessons of correct health habits, beginning even in the first three weeks of the child's life. But in many homes the child is left with practically no instruction in very important health matters; and often, though he may have had some training, he has no idea *why* he should do such things as brush his teeth, eat at regular hours, or wash before meals. It is

manifestly one of the functions of the school as well as of the parents to instill correct ideas of living into the child's mind in the formative years and to show him why some ideas are correct and others incorrect.

The aim of this book is to set forth in simple language, intelligible even to the young scholar, the more important facts concerning his life, which will help him toward a more intelligent formation of life habits.

In the revision of this book, the subjects treated and their arrangement have been left unchanged. The text has been altered, however, to make it conform to the latest research and development in the sciences which contribute to the subject matter of physiology and health. In such cases an attempt has been made to secure greater clearness of thought by whatever changes seemed necessary for scientific accuracy and by such additions as seemed desirable in view of the present conception of the aims and motives involved in teaching this subject to children.

The new material added to the last four chapters deals with problems of public health and of personal hygiene in their relation to public health. It is hoped that this additional material will be of value to teachers who are desirous of inculcating in the minds of their pupils a right attitude toward the solution of these problems.

The exercises at the ends of the chapters have been constructed with the aim of making the child do more thinking for himself, to the end that he may apply in his everyday life the knowledge gained from such reflection.

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PHYSIOLOGY AND HEALTH

CHAPTER I

WHY WE NEED TO CARE FOR OUR BODIES

HAVE you ever seen in the woods, among the straight, tall trees, one tree that had grown crooked? The strength of ten men would not be sufficient to bend the tree back the way it should have grown. If you had watched this tree growing from a small sapling, very likely you would not have noticed for some time that anything was wrong. By and by you would have seen that it was just a little crooked, but you probably would not have dreamed that this crookedness would be so noticeable in a year or two that the tree's beauty would be completely marred.

Now if, when you had first discovered that the young tree was not growing as it should, you had driven a stake into the ground close to the tree and had tied the trunk firmly to it, it would have grown straight and tall like the other forest trees.

Our bodies are very much like this sapling. If we want strong, well-developed, healthy bodies when we are grown men and women, we must watch them while we are young and see that they "grow straight."

Teaching a Tree to Grow Straight.

Have you ever placed a board or stone over a patch of green grass and then watched what happened? If you turned over the board within a day or two, you found the grass to be somewhat crushed, but still green. But if you waited several days and then turned it over, the grass would have turned white. This was because the board had shut away the sunshine that the grass needed to prepare its food. The grass was starving.

Likewise, you may fail to give your body pure air or nourishing food or exercise and think for several days or perhaps several weeks that you are doing it no injury. But some day you will suddenly feel very uncomfortable. You may have to stay in bed for a week or more because you did not give your body what it needed to keep well and strong.

If our bodies were so constructed that they made us uncomfortable *the minute* we did any one of the many things we may thoughtlessly do to hurt them, we should not need to study physiology. We should learn very quickly by experience. The trouble is that these bodies of ours are so long-suffering that we may not find out until it is too late that we have been injuring them. Like the tree, we shall have "grown crooked."

Physiology teaches how the body grows and how it works. **Hygiene** teaches how to take care of the body so that it may be strong and active. We need to study physiology and hygiene together, for the one helps us to understand the other.

We shall all agree that the person who is the happiest is the one who is strong and vigorous, who can work hard and play hard and is never sick. In learning how to take care of our bodies and thus

keep well and strong, we are learning how to get the most out of life.

EXERCISES

1. Look about your schoolroom. How many boys and girls are bending over their books? Is any child sitting on one foot? Are any of the pupils at the blackboard standing with the weight of the body resting on one leg? If any boys or girls are doing such things, are they helping their bodies to grow straight or crooked? Why?

2. Can you think why the healthiest and happiest boys and girls are always those who like best to play out of doors in the sunshine?

3. Do you remember the last time there was a bad storm and mother had to keep you in the house all day? Toward the end of the day did your head feel heavy or ache? Next time, remember that the reason you felt so uncomfortable was because the storm had prevented you from giving your body some of the things it most needed. What are they?

CHAPTER II

WHY WE NEED FOOD

Live Things Need Food. — Everything that is alive must have food. The wild animals spend most of their time hunting for their food. They know what is best for them to eat, and if they can get their own kind of food, they will not eat anything else. Plants too have their food, which they take from the air and from the soil in which they grow. If they are put into the right kind of soil, they always take from it just the right amount of food.

This is a matter concerning which people do not show as much good sense as do animals and plants. People often choose the wrong kind of food and they often eat too much. There is no way in which we make more mistakes than we do in our eating. Since most of us eat three meals every day, let us start our new study with "Food." First we must find out why we need food.

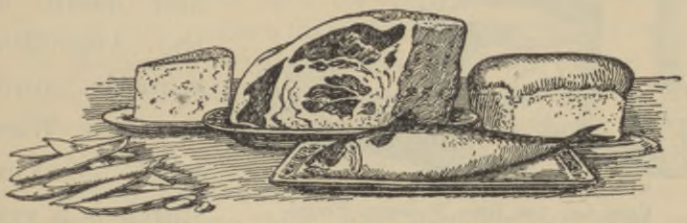
What We Get from Food. — Most things that are alive grow. We see plants grow from week to week, but they would not grow well if we put them into

sawdust instead of soil. The sawdust does not contain the things needed to make them grow. Puppies could not grow if they were fed hay; it is not the right kind of food to give them nourishment. Nor could children grow if they tried to live on cake and candy. That may sound like a very pleasant way to live, but no child could grow taller or larger on that diet. Those foods simply could not build his body. So one thing that we need from food is **building material.**

Who would be satisfied with food that only made him grow? Nobody wishes to stand still and grow the way a tree does. We want to move about, to run, to use our hands and arms. That is, we want food that will give us energy to move our muscles. Or to say it in just two words, we need food that **gives power.**

The boy who skates and swims and is the best runner in his class is making and using a great deal of power every day. To make this power, his body is burning up food, and this burning process also gives **heat,** which keeps his body warm. If he broke his leg, he would have to keep still for a few weeks to let the bone knit together. Then most of the food which he ate would be used for **building material** and to give **heat.**

Building Foods. — How fast a baby grows! For the first year his food is chiefly milk; on that he grows larger and gets stronger. Evidently milk must have plenty of **building material** in it. Oatmeal is also a food that provides building material. All the *cereal* foods, like cracked wheat, corn flakes, and shredded wheat, give us building material. Other



Some Building Foods that Make Bones and Muscles.

foods that help us to build up our bones and our muscles are lean meat, beans and peas, and eggs.

You see your father and mother eating these same foods, and yet they are not growing taller as you are. There is another kind of growth that we call **repair.** Our clothing wears out as we use it; so do our bones and our muscles, and all the other parts of the body. As fast as there is wear in any part, then some repairing must be done there. So grown people, too, need building food.

Foods for Power and Warmth. — Our bodies are always working. Even when we lie asleep in bed,

we keep on breathing, and the heart keeps on working. It takes power to do this work, so the body must keep getting food that gives power.

Sugar is one food of that kind. *Starch* is another food that furnishes our muscles with power and keeps us warm. Bread, potatoes, and nearly all the vegetables contain much starch. When well cooked, starch is a very good food.

FATS ARE THE BEST WARMING FOODS.

SUGAR AND STARCH ARE FOODS THAT GIVE US POWER AND HEAT.

Fat is another food that gives us power and warmth. Meat usually has fat in it, and there is fat in butter, and in any food that contains oil. Fat is the best warming food, and it also furnishes our muscles with power. In winter we should eat fat, so that we shall not feel the cold. In summer we need little fat; it would be likely to make our bodies too warm.

Children who live far away in the cold regions of the north need to eat a great deal of fat. Eskimo boys or girls would much rather eat a tallow candle than burn it. They would regard the candle as a greater treat than a box of the finest candy.

EXERCISES

1. Writing one word below the other on the left-hand side of a sheet of paper, make a list of the things you had for breakfast this morning. Now try to decide what each kind of food can do for you — whether it helps you to grow; gives you power to do things, work or play; or keeps you warm. When you have decided, then write after the name of each food either "growth or repair," "power," or "heat." Are there any of the foods which you think might serve for more than one purpose? If so, name them.

2. Now make a similar list of the things you had for dinner and for supper last night.

3. Older girls and boys often use more food than grown persons. Can you tell why?

4. Perhaps you have been sick yourself and can remember how hungry you were when you were getting well. Explain.

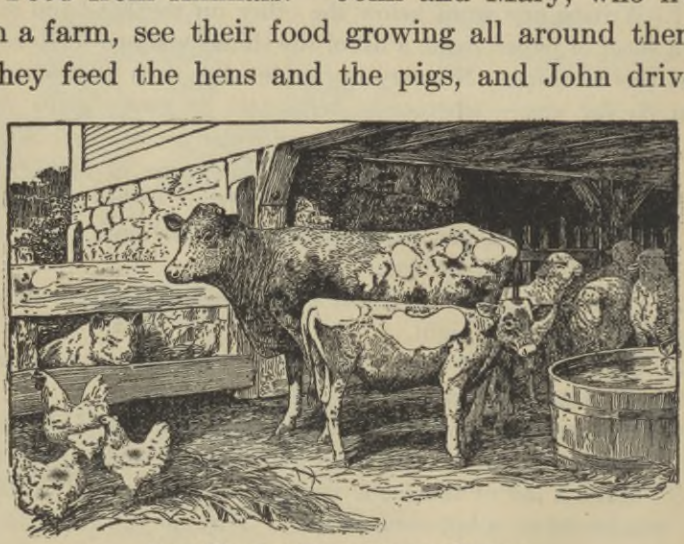
5. Make a list of the foods which you think would be bad for you to eat on a hot summer day. Why do you think they would be bad? What foods would be best on such a day? Why?

NOTE: Keep this list of foods for future reference.

CHAPTER III

WHERE WE GET OUR FOOD

Food from Animals. — John and Mary, who live on a farm, see their food growing all around them. They feed the hens and the pigs, and John drives



Some Building Foods in the Making.

the cows to pasture. He also goes with father to the fields where the sheep live. The hens often keep Mary busy hunting for the eggs they lay. The cows have to be milked twice a day. Hens and cows give us certain foods while they are alive; and when they

are killed, they give us meat. We get meat too from sheep and pigs. Who can give the names of all the foods provided by those four animals? Tell what animal furnishes us with each of the foods in the following list.

ANIMAL FOOD

Milk	Beefsteak	Chicken
Eggs	Pork	Lamb
Butter	Mutton	Veal

Food from Plants. — On the farm, Mary and John see fields planted with wheat and oats and corn.

WHEAT, CORN, AND FRUIT GROWING.

Then there is the potato field into which they are sometimes sent to help dig the potatoes. In mother's garden, which is also Mary's delight, there are many vegetables growing — beets and

peas and string beans to be eaten fresh. Then there are beans, to be dried for us in winter, and peas to be dried; and turnips, squash, and carrots also for winter use.

Around the edge of the garden are bushes on which berries grow, and Mary was allowed last year to have a strawberry bed all her own. How proud she was when she could bring in berries for the family to eat. John cares more for the orchard, where the apples and pears grow; and he has some young nut trees from which he hopes to gather nuts soon.

We could not name all the plants that might be raised on a farm, but no matter how many we may mention, each will fall under one of the groups given below.

PLANT FOODS

Grains	Fruits
Cereals	Nuts
Legumes (beans, peas)	Honey
Vegetables	Sugar

Mineral Foods. — We all need certain minerals in our food, and all but one of these mineral substances is furnished us by plants. The one exception is salt; plants do not contain as much salt as we need. Fortunately there are large deposits, or mines, of salt in the earth.

Mixed Foods. — We must remember that many kinds of food are *mixed foods.* That is, they contain different kinds of food materials, which are used by the body for different purposes. A dish of oatmeal and milk looks like a very simple food; but the oatmeal is a cereal, the milk is an animal food, and the sugar we may sprinkle over it is another plant food.

Cutting a Crop of Sugar Cane.

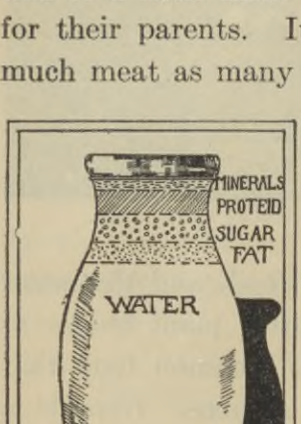
Bread and butter is another common food that comes from several different sources. Here is a list of the things that make up a slice of bread and butter. Tell the source of each. (The yeast does not stay in the bread if it is well made.)

Flour	Lard	Salt	Butter
Milk	Sugar	Water	

What We Get from Animal Foods. — Our animal foods consist largely of meat, fat, milk, and eggs. From the meat and the eggs, we get *building material*

with which to make the body grow and to repair it. Fish also is very good building food. We need some such food every day: either one of the animal foods, or some of those plant foods which, as we shall see later, also give the body building material.

Meat of most kinds is easily used by the body, and so a little meat is good for children as well as for their parents. It is a great mistake to eat so much meat as many people do in this country, because too much meat sometimes causes indigestion and other troubles.



MILK CONTAINS BUILDING FOOD, POWER FOOD, AND WARMING FOOD.

Milk is a food, not a simple drink, like water. There is little danger that children will take too much milk, if they remember that milk contains building food, power food, and warming food in nearly equal quantities. So when you drink two glasses of milk with your breakfast, you should eat less of other foods. Those who want to grow large and strong do well to drink milk; it is a food that the body uses readily.

Fat and *butter* are forms of animal food from which our bodies make heat to keep them warm. Some

people do not like fat in any form. If they eat no fat, they need to eat more starchy foods than would be required by those who enjoy butter and the fat of meat.

What We Get from Plant Foods. — *Cereals*, like oatmeal, corn flakes, and various forms of wheat, are rich in building food and in the food that gives power and warmth, which we might call fuel food.

PLANT AND ANIMAL FOODS AS WE SEE THEM IN THE MARKET.

Flour, with which bread and muffins and cake are prepared, is usually made from wheat. So it contains both kinds of food we need. Graham and whole wheat flour are better than white flour; for they contain all of the goodness of the wheat.

Beans and *peas* have more building food than cereals, and plenty of fuel food too. They would be used very generally in the place of meat if only it were not so difficult for the stomach to take care of them. They are good foods for people who live and work out of doors.

Potatoes are full of starch, which is one of our chief fuel foods. We need to eat with them a building food, like meat, or beans, or cheese; milk also goes well with potatoes. Few of the other vegetables have much real food value. Most of them contain little fuel and still less building material, but they have some of the minerals that the body needs; and they are useful in other ways as we shall learn later.

Fruits contain little food, but their juices supply us with substances that the body needs. When we think of the foods needed to keep the body growing and working, we do not usually include the fruits or many of the vegetables. Still the body works better when we eat plenty of them, for they act in such a way as to make other food of more service.

Nuts contain much building and fuel food. If we eat a few of them at a time and chew them *very fine*, they are good for us. It is hard to believe that they

contain so much food, and so we often eat too many of them.

We have talked about the various kinds of foods — plant foods, mineral foods, animal foods, — and we have seen that all these come from farms, truck gardens, and the salt mines. That is, we have seen that the animals we eat, the vegetables, fruits, grains, nuts, milk, butter, cheese, etc., are produced by the farmers in the country, but after all we have not yet found where our food really comes from. Would it surprise you to know that it all is made out of minerals, air, and water, and that only the green plants can make it with the help of the sunshine? First they make their own food and store it away in the form of leaves, stems, and roots. This plant food is eaten by animals, and forms, when digested, the tissue which we eat as meat.

The animals depend upon the green plants for their food and we depend upon the animals for meat. The green plants therefore supply the food for all living things on the earth.

EXERCISES

1. The table of foods (p. 9) should read like this:

FOOD	PURPOSE	SOURCE
Bacon	Heat and growth	Animal

2. Add to this table as many kinds of food as you can.

CHAPTER IV

WHAT TO EAT

How Shall We Choose Our Food? — Every day we need to eat building food and fuel food. We have seen that these foods are supplied to us both by plants and by animals. Still we have not yet learned why certain foods are better for us than others. Why are children frequently warned against eating too much candy, and not against eating too much bread? Why is milk so good for children? Why should we not eat what we like best?

Shall We Follow Need or Taste? — It would all be very simple if we liked best to eat the kind of food that our bodies need most. Or if the food we ate had no taste at all, we should choose with greater ease what we needed to keep us well and strong. Then when mealtime came, Henry and George and Grace would sit down to table and laugh and talk while they ate just the right amount of food. They would not think of eating between meals, and there would be no disagreements about food — George

wanting baked potatoes for dinner, while Henry and Grace were not pleased unless the potatoes were boiled. You would never hear them teasing for candy, or asking for more cake than was allowed them.

Nearly all the difficulty in choosing food comes from this matter of *taste*. Most people let taste or a pleasing odor tell them what to eat, instead of finding out what the rest of the body wants. The muscles do not care at all whether the mouth is wholly pleased with the dinner you eat. They want food that will give them power to move and to grow. If Grace makes her midday lunch, between school sessions, on olives, pickles, bananas, and soda water, her muscles are not satisfied, though the lunch may have tasted very good to her.

The Only Danger in Sugar. — For the same reason, children have to be careful about eating candy; it tastes so good that they are tempted to eat too much. Sugar is a good fuel food; it gives power and warmth, but it could never help a boy to grow. A little sugar is just as good for most children as a couple of potatoes. But when they have had the potatoes, they are satisfied and do not ask for a whole dish full of potatoes. When they begin to eat candy, they sometimes want all the candy in the box.

Sugar, then, is a good food for those who can eat just enough and then stop. The time to eat sweets and candies is at the end of a meal, when we have had other food. Then there is less danger of our eating too much. Too much sugar makes a boy fat, but it does not make him strong.

Why Simple Food Is Best. — Did you ever have a stomach ache after you had eaten too much of something mother told you was too rich for you — like mince pie or crullers? Our stomachs usually have trouble with food that is rich or made of a great many different things. They are obliged to work till they are tired before they can get the goodness out of such food. The result is that children do not grow as well on such food as they do on simpler food. Some of the simple foods are cracked wheat, rice, corn flakes, oatmeal with milk; graham bread and butter; eggs; a little meat or fish; vegetables and fruits. To such food two or three pieces of candy might be added or a piece of simple cake.

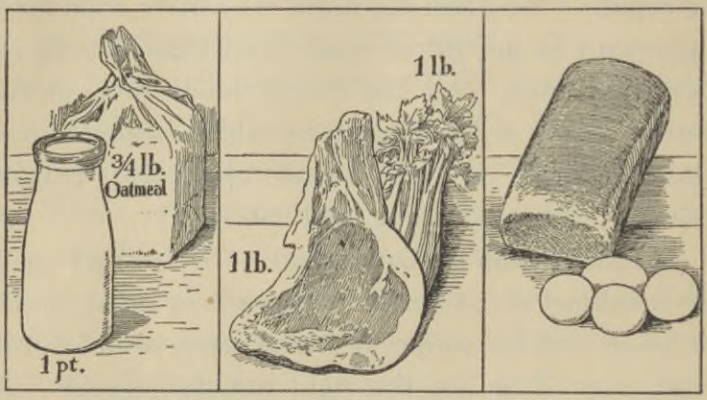
Why We Need Coarse Food. — Graham bread is better than white bread, we have learned, because it contains all the nourishing substances in the grain. It is also better because it is coarser than white bread. We need to eat some coarse food at

every meal. Men who study the way the body works find that coarse foods are useful in caring for the rest of the food. Such foods also help the body to remove all the food that is not used for building or repair. We shall see later why it is even more important to get rid of waste food than it is to eat the right food. All the coarse foods help in this work. Some of the vegetables which belong to this class, because of their coarse fibers, are carrots, celery, turnips, parsnips, and cabbage.

Several Foods at One Meal. — If brother made his breakfast of oatmeal without milk or sugar, dinner of meat, and his supper of bread, that would not be wise, even if he ate the right amount of each. At each meal it is best to eat some building food and some fuel food. Which would he fail to get in such a dinner? We need variety for another reason. When we eat only one kind of food, we give part of our digestive system too much to do and other parts too little. That is another reason why too much sugar is bad; it makes a part of the system overwork.

Foods That Cost Too Much. — Many people think that food which costs the most must be the best. But we have seen that no food is good unless it gives the body what is needed. Often people who spend

ten dollars for a family dinner do not get as much nourishment from it as another family would from a dollar dinner. The trouble is that they choose the wrong things. They give their bodies too much



THREE GROUPS OF FOODS, EACH OF WHICH FURNISHES ABOUT THE SAME AMOUNT OF NOURISHMENT. WHICH GROUP COSTS THE MOST? WHICH IS THE CHEAPEST?

meat and burden them with a great deal of very rich food. Their stomachs have to work hard to try to get some real nourishment out of that rich mass of food which it takes them so long to pull apart. In the end the ten-dollar dinner may cost the stomach so much effort, and give the body so little of what it needs, that it is indeed a very costly dinner. Food that is simple, consisting largely of such things as those named on page 58, is of the greatest value, for such food gives the body what it wants.

EXERCISES

1. Look at your list of foods. Place a star in front of the names of the foods which are best for children.
2. Put an "A" (for always) in front of the names of foods we need all the time.
3. Place an arrow in front of the names of those best for summer.
4. Now put a circle around those best for winter.
5. Why should we not let our taste choose for us?
6. How do the needs of the muscles and the demands of taste differ?
7. Can a child eat too much sugar? Why?
8. Why do we require a variety in our food?
9. Plan a nourishing breakfast for three children. Plan a dinner; a supper.

CHAPTER V

HOW MUCH AND WHEN TO EAT

When Not to Eat. — The body needs a certain amount of food every day. Too much food is as bad for it as too little, and when there is plenty of food on the table, many people eat too much. It is very hard to tell how much some one else ought to eat at any one time, but we can teach our appetites to guide us in eating. If your mother is willing, start with this plan. Do not eat unless you are hungry. But if you feel, when you get to the breakfast table, that you want no breakfast at all, something is the matter. Every healthy child should be hungry in the morning. Going without breakfast one morning would do no harm, but if your appetite does not return by the next day, your mother should find out what the trouble is. Children should not get into the habit of going to school without eating breakfast.

When to Stop Eating. — It is wise to stop eating when you do not care for any more substantial food. Do not continue to eat after you feel that you have had enough, simply because you like the taste of the

cakes that come at the end of the meal. If you wish to finish the meal with some cake, save room for it; that is, stop eating other things before your hunger is quite satisfied. Nobody ought ever to eat until he gets up from the table feeling "stuffed."

A boy who eats too fast generally eats too much. The food disappears down his throat as fast as he can manage to swallow it, and he has no idea whether he has taken much or little. His appetite, even if it has been well trained, does not have a chance to tell him when to stop. After such a meal, he wonders why he feels uncomfortable.

Children sometimes go to the table hungry, and then sit there with sulky faces, refusing to eat good wholesome food because they do not particularly like the taste of the food they see. It is not necessary to tell them to stop eating, because they do not begin. What they need is to stop "fussing" over their food. People who are really hungry can enjoy any wholesome food. When one is lost on a mountain in summer, or snowed up on a train in winter, one learns how good a piece of dry bread can taste, even without butter. No healthy child will be injured by going hungry for a while. Try it, and see how much "fussiness" is cured by real, honest hunger.

How Much Food Is Needed. — A child does not need more than two-thirds as much food as a man. An inactive man, one who is in the house all day, studying or figuring, needs much less food than the man who is working hard outdoors. The boy who runs and plays all day needs more food than he would if he stayed in the house, reading or even studying. His sister who helps in the work of the house may need just as much food as he does. An invalid, or

A Day's Ration.

a person who has some slight illness, may need less to eat than one who is perfectly well, but a person while he is getting well after a serious illness needs more food than he will after he has recovered.

Perhaps you thought that when we studied about foods it could all be made very clear, by saying that every day we ought to eat so many potatoes, and so many glasses of milk, and so much cereal. As it happens, we do not need to eat the same amount

of food every day, so a list of that kind would not be of much use. The best guide to the amount we should eat is a well-trained appetite. Remember, too, that it is safer to eat too little at any one meal than to eat too much. If one overloads the stomach, the food in it will not properly digest, and illness may follow.

Why We Should Be Prompt at Meals. — Some children like to eat whenever they feel like eating, just as we all drink water whenever we feel thirsty. But that way of eating does not work well at all. The fact is that our bodies do best when we are regular in all our habits. We know that a clock runs better if it is always wound at the same time. We can see that the clock keeps better time when it is given proper care. The same thing is true of our bodies, although in them we cannot see the results of irregularity as we can in the case of the clock.

So the first thing to be said about when we should eat is — eat your meals at the same hour every day. If breakfast is at half past seven, be ready to eat it every day at that time. You will have to watch the clock and do some planning to get ready for breakfast every morning at just that hour. Remember that your body has its own clock and gets ready, without any thought of yours, to take

food at the time selected. If you keep it waiting, then the food is not taken care of so well, and so does not do you so much good.

This is hard to understand, for often we would much rather sleep half an hour longer in the morning, and let breakfast wait. That is a bad plan for several reasons. One is because it upsets the body's plans. If you watch a baby, you will perhaps see how that is. The baby cannot read a clock face, cannot tell whether it is seven o'clock or ten o'clock. The body clock, however, works for the baby just as it does for us. If baby is fed every three hours, that body clock marks off the time, and when the end of three hours comes, the baby begins to cry if food is not provided. Our bodies too are disturbed if their food is not forthcoming at the regular hour. They get ready to take care of it then, and that is the time when they ought to have it.

How Many Meals to Eat. — The American custom of eating three meals a day is a good one — breakfast in the morning, luncheon or dinner at noon, and supper or dinner at night. It does not matter much at what hour we have breakfast, if we have it at the same hour every morning. When possible, it is best to have the meals at least five hours apart; that gives the stomach a chance to

rest between the meals. So if William has his breakfast at seven o'clock, his second meal should not be eaten before twelve o'clock, and his third meal should not be eaten before five o'clock.

For breakfast, oatmeal or some other cereal with milk and sugar makes a good beginning, followed by bread and butter and fruit. At breakfast is a good time to eat uncooked fruit, apples, oranges, etc. People who work very hard may also want an egg with their bread and butter, or even a heartier meal, depending upon their work.

For dinner, we need something more substantial, like soup, meat (or beans), potatoes and other vegetables, bread, and a simple pudding or several pieces of candy. The meat gives us building food, the bread and potatoes give us power and warmth. The sweet pudding or the candy also furnish power and warmth.

It is better for children to have dinner at noon than at night. Then there is plenty of time to digest their food. The stomach works better when we are awake, so it should not have the hearty meal at a time when we are about to go to sleep. Then, too, the stomach, like the other parts of the body, needs to rest at night.

Supper for the children should come early enough

so that they need not go to bed for an hour after eating. If they have a chance to hear a story and to play some quiet games after supper, they will sleep better. A good supper for children is bread

SUPPER FOR THE CHILDREN SHOULD COME EARLY AND BE A SIMPLE MEAL.

and butter, milk, or crackers and milk, stewed fruit, and a plain cake or a custard.

Eating between Meals. — How many lunches between meals could you take if you were careful to eat at the same hours every day and to give your stomach five hours between every two meals? Suppose you got up early and had breakfast at six

o'clock, when could you get time for a lunch? With breakfast at six, you could have dinner as early as eleven o'clock, and supper as early as four o'clock. It would not be time for another meal until nine o'clock, which is past bedtime; and eating then would give your stomach work to do when you ought to let it rest.

If we eat breakfast, dinner, and supper, there really is no good time for taking lunches; they make too much work for the stomach. Milk and fruit give it less trouble than any other kinds of food. So a glass of milk taken at the same hour every day makes the best luncheon. If one feels hungry in school, at recess time, an apple or an orange is much better than other food. Often all one needs is a glass of cold water. When we are busy in school, we often think we are hungry when really all the body wants is water, not food.

Since the stomach needs rest periods at regular times, you can easily see why it is not wise to be constantly eating candy, munching apples, or even chewing gum. There is still another reason why we should not keep nibbling at candy. The child must have plenty of building food in order to grow. If he eats candy between meals, he has no appetite for the kind of food he really needs.

A FEW GOOD RULES ABOUT EATING

1. Eat slowly, chewing your food well.
2. Eat at regular times every day.
3. Eat enough to satisfy your hunger, and no more.
4. Drink plenty of water, either with your meals or at other times.
5. Do not eat candy between meals.

EXERCISES

1. The furnace must have coal before it can heat the house; father's automobile must have gasoline before it can start on a trip; your body needs its breakfast before it begins its day's work. Can you tell why in each case?
2. Copy the first of the five rules given above and then write down the reasons why this is a good rule for every one to follow.
3. Do the same for each of the other four rules.
4. Would rule No. 5 also apply to other foods besides candy? Why does candy eaten between meals do harm?
5. What will make a child very hungry?
6. Which needs the most food, the child who has been coasting or the one who has been reading? Why?
7. Why should one eat at regular times each day?

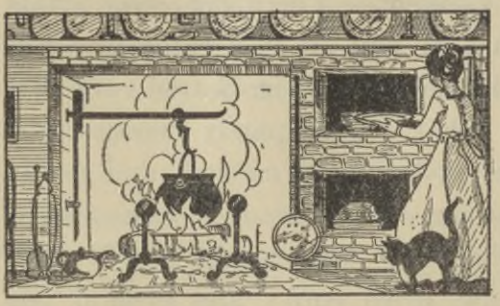
CHAPTER VI

COOKING AND PREPARING FOOD

Why Food Is Cooked. — There are some fruits and vegetables that we find are best eaten raw, but most of our food is cooked (that is, heated very hot) before we eat it. That is done partly because food tastes better after it has been cooked, and partly because the body can make use of it more easily, for building or for fuel. You would find it very difficult to eat raw, dried corn; and even if you chewed it fine, your stomach would have to work very hard to get nourishment from it. When the corn is cooked, all that is changed.

How Food Is Cooked. — We have many different dishes, for there are many ways in which meat and vegetables may be prepared. Beef tastes different in a stew from the way it does when roasted, and we may like cake better with one flavoring than with another. But with all the differences in flavoring there are just three ways of cooking food. We can boil it in water or some other liquid; bake it in hot air; or fry it in hot grease. The three ways of cooking are, then, **boiling**, **baking**, and **frying**.

Sometimes food is cooked in two of these ways. If the chicken does not seem tender, your mother may decide to *boil* it for a couple of hours, and then put it into the oven to bake in the hot air there. Or meat may be cooked over a bed of hot coals; we call this *broiling*, but it is a form of baking, since the meat is cooked by the heat that rises from the coals.



Cooking in Colonial Times.

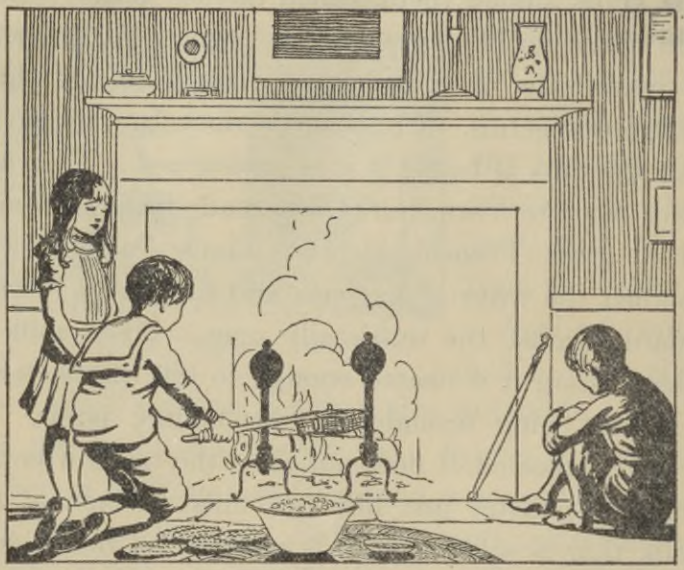
Boiling and *baking* are the best ways of cooking, for they give us food in a form that the body can readily use. Frying is a quick method of cooking, but fried food is not easily taken care of by the stomach. So broiled beefsteak is a more nourishing dish than fried beefsteak. We may like the taste of fried food, but it is hard to digest.

What Cooking Does to Food. — *Meats* should be thoroughly cooked, not only to make them taste better, but to make them a safe food. Sometimes raw meat contains tiny living animals, which may grow in our bodies and cause severe illness. If meat is thoroughly cooked, there is no danger.

Milk is also much safer to drink after it has been heated. This is because milk contains minute living plants, called **bacteria**. Most of the bacteria in milk are harmless; but sometimes there are dangerous kinds among them, called disease germs, which will make us ill if we swallow them. So the milk is made safer if it is heated enough to kill these dangerous germs. This can be done by boiling it; but the milk is better if it is *pasteurized*. That is a hard word to learn, but it was made from the name of a great French scientist, Louis Pasteur, who studied the ways of bacteria and taught us how to guard against the unfriendly ones. When milk is pasteurized, it is heated enough to kill the bacteria, without being brought to the boiling point. So when it is cooled, it does not have the taste of boiled milk, but tastes just like raw milk. Much of the milk that is sold in cities is pasteurized before it is sold, in order to make it safe. Drink pasteurized milk if you can get it.

Eggs are best with the least possible cooking. Raw eggs really make a better food than cooked eggs. The harder we boil them the tougher they become, and the more difficult to digest. Hard-boiled eggs should be very thoroughly chewed for this reason; and it is much better to eat soft-boiled eggs.

Vegetable foods are usually cooked for the purpose of making them more easily digested. All grains, like *wheat* and *corn* and *rice*, contain a large amount of starch. We know that potatoes and the other



What Has Caused the Hard Kernels to Burst Open and Become Light and Crisp?

vegetables also are largely made up of starch and water. The starch is in solid little lumps called *starch grains*. The raw starch grains are very hard; the heat used in cooking makes them swell and softens them so that they are easier to digest. Therefore vegetable foods are more healthful after cooking.

If pop corn is put into a popper and shaken over a hot fire, the hard kernels burst open and become light and crisp. What has caused this change? Can you see why rice swells so much when it is cooked?

Oatmeal is an excellent breakfast food when it is well cooked, but it should not be prepared in a hurry. It ought to cook in a double boiler for three hours, and five hours is better still. All the cereals are improved by long cooking. Bread too should be thoroughly baked; otherwise it is not a good food.

Peas and *beans* are also vegetable foods which contain much starch. You could hardly eat them raw and dry, and you would not like the taste of them if they were simply soaked in water. Cooking gives them a better flavor, besides making them easier to digest. We should remember then that it is particularly important that all vegetable foods should be thoroughly cooked.

The vegetables that are eaten raw — lettuce, cucumbers, radishes, and celery — are not so wholesome as the vegetables we cook. Most of those which we commonly eat raw contain little nourishment and are eaten as a relish, not as a food. Ripe fruits are good for us; but all unripe fruits, such as green apples, should be cooked before they are

eaten. The heat of cooking brings about many of the changes in them that would have taken place if they had stayed on the tree in the sunshine until they were ripe.

Good Cooking. — A good cook knows how to make dishes that are both appetizing and easily digested. Some of us ask even more; we think a cook should know how to take inexpensive foods and make them delicious by cooking them very carefully. Why not expect that of a good cook? A good workman can get more boards out of a pile of lumber than a poor workman can.

Food that is well cooked should be nicely served. When it is well arranged on the plates and platters, it looks so much more attractive than when it is thrown on, just as it would fall. Every girl and boy ought to know how to make the food on a dinner table look tempting. Every girl, and every boy too, should learn how to cook the simplest dishes, like meat and potatoes, eggs and muffins. Try learning to do one thing very well, and then attempt another dish. Perhaps your mother will let you begin by making toast; she will show you how thick to cut the bread for it, just how the toaster should be placed, and how to tell when the bread is brown enough. When you can make the best toast father ever ate, you are

ready to learn to do the next thing. Maybe that will be boiling eggs or baking potatoes.

Preparing Food. — Many kinds of food need to be carefully prepared before they are fit to be served or to be used by the cook.

Raw fruits and *vegetables* need to be scrubbed and freed from all dirt before they are fit for the family to eat. There is a cheerful saying about our all "eating a peck of dirt before we die"; and that is often quoted to excuse serving lettuce or celery from which the dirt has not been removed; or apples and currants just as they come from trees and bushes. We will agree to eat the dirt if some one can assure us that it is "good clean dirt" and contains none of those bacteria that cause disease, which are flying all about in the air and falling on to everything. That is where the difficulty comes; for the boy who picked the apples cannot tell us how many unseen disease germs there may be on their skins, even when they come right off the trees. So the rule is that things we eat raw must be carefully washed. Apples and currants and many other things can be washed under running water without injuring their flavor. Some berries, like strawberries, need to be washed as quickly as possible; this is best done by putting them into a collander and dipping them quickly into a bowl of water two or three times.

The skins sometimes have to be removed before vegetables and fruits are cooked; that is not easy to do until one has learned how. They should be *pared thin;* for there are minerals in the skins which we lose entirely when we take the skins off in thick slices.

Clean food should be the aim in all that we do. That means clean dishes in which to prepare it and clean hands to handle it. Everything that comes in from the garden or is brought from the market should be washed, and everything in the pantry should be kept in covered boxes or jars, away from dust and those little pests (mice and roaches) that seem to know where to find a careless household in which food is left around for them to eat.

EXERCISES

1. Have you ever tasted any uncooked beans? How do they taste, and would you care to eat them? What change takes place when you cook these same beans? How do they look, feel, and taste when cooked?
2. How could you make impure milk safe to drink?
3. When you were very small, why was it that you were never given fried foods to eat?
4. Why does everything taste better out of doors? How many reasons can you give for this?
5. Keep a list of the things that you can cook well. Watch the list grow throughout the year.

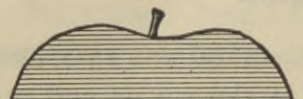
CHAPTER VII

WHAT TO DRINK

Why the Body Needs Water. — Did you ever lose your way when you were out in the woods and return home at night hungry and thirsty? You can remember how tired you were and how badly you wanted to sleep, but more than anything else you wanted something to drink. This shows us that men can go without food and sleep much longer than they can without water. Perhaps you can remember that your first desire, when you came in sight of your home, was to run as fast as you could to the well and pull up a pail of clear, cool water. You can remember how refreshing it tasted and how it satisfied your thirst. As soon as you had drunk as much as you wished, you were satisfied to wait until your mother had cooked supper without eating something before supper was ready. This is easily understood when we know that the body is about two-thirds water, and needs to be kept in that condition. Every day the body loses nearly two quarts of water,

in perspiration and in other ways. It must gain as much as it loses or part of its work cannot be done properly.

How We Get Water. — We get part of the water we need in the different foods we eat. Some foods, like rice, are cooked in water, and other foods, like potatoes, have much water in them. The juice of fruit is largely water, and a glass of milk is seven-eighths water. Can you tell why a little baby does not need to drink much water? The usual diet of a grown person does not provide as much water as the body needs, so we have to drink water. The desire for water we call **thirst.**



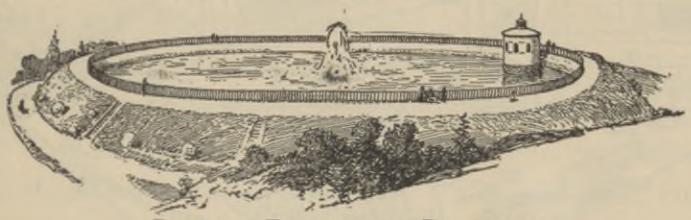
THE JUICE OF AN APPLE IS LARGELY WATER.

The Best Drink. — It is only water that can quench our thirst. If Henry says that he likes to drink cocoa and soda water and orangeade, because they all satisfy his thirst, we must agree with him. But all such drinks are largely made of water with something added to give it a flavor. If the water were all taken out of them, Henry would not want them on a hot day.

Pure water is the best drink in the world. It is

more refreshing than anything else, and more healthful. Cool water is better for us than very cold water. Those who drink ice water should take only a sip at a time, holding the water in the mouth a few seconds before swallowing it.

Safe Drinking Water. — The best water comes from reservoirs, mountain springs, and deep wells. Water from shallow wells is often made impure by

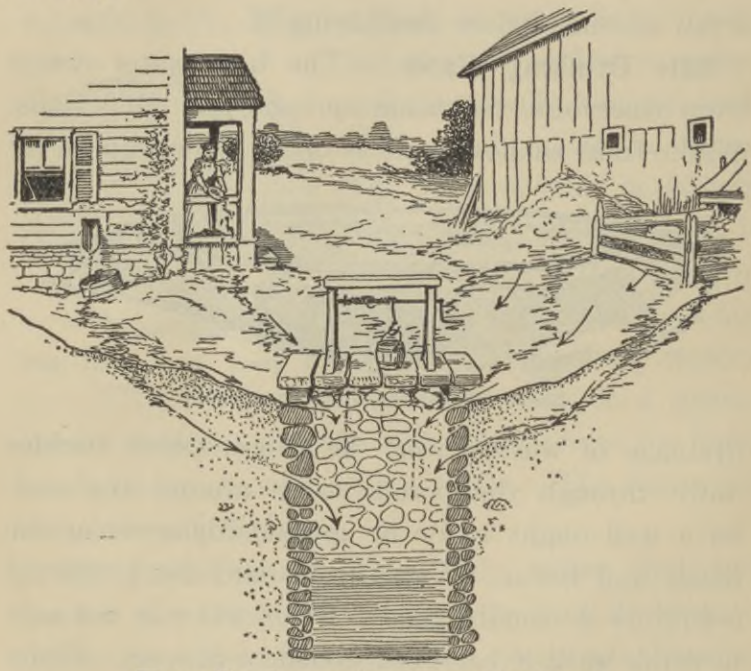


Reservoir Fenced in for Protection.

drainage of wastes from the house, which trickles down through the porous earth around the well. So a well ought to be on ground higher than the house and barns. Water from carefully protected reservoirs is usually good. River water is not safe to drink until it has been boiled or filtered. When such water is boiled the dangerous germs contained in it are killed, and when it is filtered the germs are removed entirely.

Many people drink too little water. Grown-up persons need about two quarts a day. Children who are running about and exercising constantly

require nearly as much. Part of this water they get, as we have seen, in their foods. Much more water is needed in summer than in winter. Can you tell why?



WOULD YOU CARE TO DRINK FROM THIS WELL?

Soda Water and Other Drinks. — Soda water is water plus a kind of gas that gives it a biting taste and a little sirup that gives it a flavor. It is not harmful if you do not take too much of it. Grown-up people often drink water with a little coffee or

tea in it, because they like the taste. Both coffee and tea are bad for young people, for one reason because they make them nervous. Cool water and milk are the only drinks that they need with their meals.

This is a good place to stop and say that we shall never understand about how to keep well, unless we pay attention to doing ordinary things in the right way. Many pains could be saved if every child would really do the simple things that will be suggested in this book. Much sickness is caused by tiny disease germs, so small that one can never see them without a microscope. The fact that you cannot see them, when you drink a glass of impure water, does not prevent their getting into your body and perhaps making you very sick. It is the small things we do or neglect to do that make the difference between being well and happy, or being sick and miserable. You must shake yourself out of the habit of thinking, "I don't believe that will do me any harm *this time.*" *Why not?*

Injurious Drinks. — All drinks that contain alcohol are injurious. The most common **alcoholic drinks** are beer and wine. They are made out of food grains and ripe grapes, but the trouble is that all this good material *is spoiled.* It is spoiled by

tiny plants, called **yeasts**. They pull the fruit juices to pieces, using the good food in them, and changing them into alcohol, which is helpful to the body when used externally, but harmful when used internally, in the form of intoxicating drinks.

Some alcoholic drinks are made from fruit juice, by simply leaving the juice exposed, so that the yeast plants which are floating in the air get into it. Sometimes a prepared yeast, very much like that which is used in making bread, is placed in the fruit juice. Beers are made in this way from grains.

Some drinks that contain alcohol are *beers*, *ales*, *wines*, *gin*, *rum*, *whisky*, and *brandy*. The beers contain the smallest amount; the wines, more; and rum, whisky, gin, and brandy, much more. The person who begins by taking a drink like beer, which contains only a little alcohol, is likely to want more. He may form a drink habit that will ruin his life. Nobody who starts to drink even the mildest of the alcoholic drinks is safe.

Pure alcohol looks like water. It is good for some purposes, such as rubbing on a sprained ankle or wrist. Very likely you have seen alcohol used in a lamp to heat milk; if so, you know that it will burn, while water will not. Alcohol never quenches thirst but rather increases it.

EXERCISES

1. Why can people live longer without food than without water?

2. How much water should you drink in one day? Notice how much you drink, and report.

3. Why does a baby need to drink water?

4. Where does your ice-man get his ice? Does he have an "ice-plant" and make it from pure water or does he cut it from a pond or river? What kind of ice is safe to put into your drinking water? Explain.

5. When taking a walk in the country why is it usually unsafe to drink from a brook? Have you ever seen a brook which was safe to drink from? Describe it and tell why it was safe.

6. Suppose you are camping where the water, you fear, may be unsafe, how can you make it safe to drink? Explain.

7. Before one drinks at a farmhouse, what should be noticed carefully?

8. What is the source of your drinking water? Is this water pure at its source? Is sufficient care taken to keep it pure from its source until you use it? Is it impure at its source? What means are used to make it pure before you use it?

CHAPTER VIII

DIGESTION IN THE MOUTH AND THE STOMACH

What Digestion Means. — When you put a lump of sugar into your cocoa, the cocoa does not become sweet until the solid lump of sugar is dissolved. Possibly you stir the lump around in your cup to make it dissolve faster. Something very much like this has to happen to the food we eat before it can be used to feed the body.

All parts of the body need food for building and food for fuel. This food is carried to them by the blood. Before the blood, however, can take it up from the digestive tract or the body can use it, it must be thoroughly mixed with the juices and dissolved, which means that it is broken up and made into a liquid. This process of dissolving and changing the food into simpler substances is called **digestion.**

How Food Is Prepared for Digestion. — In the mouth the food is given a certain kind of preparation before it goes to the stomach. As soon as you bite off a piece of bread the teeth proceed to chew it into fine bits. This helps the stomach to dissolve it, just as

breaking a solid lump of sugar would make it dissolve more quickly. Then the tongue helps by moving the food around so that all of it may be chewed.

If you look at your tongue in a mirror, you will see little bunches on it. Some of them contain tiny bodies, called *taste buds*, which are too small to be seen without a microscope. They tell us how our food tastes.

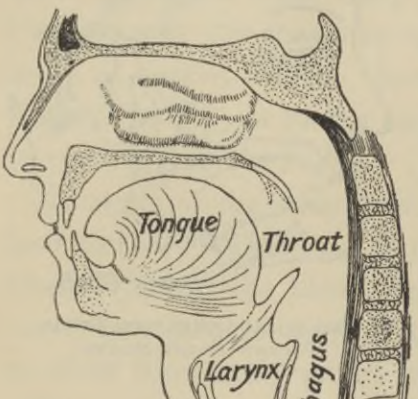
THE SALIVA COMES FROM LITTLE POCKETS IN THE MOUTH.

In the mouth there is a moisture which we call **saliva**. It comes from little pockets which are under the tongue and on the sides of the mouth; they are called **salivary glands**. One thing that the saliva does is to help us swallow our food. A liquid, such as soup, can be swallowed as soon as it is taken into the mouth; but if we try to swallow a piece of cracker without moistening it with saliva, we are likely to choke.

The saliva does another thing to certain kinds of food. Did you ever notice that if you chew a bit

of bread longer than usual, it becomes sweet? This is because the saliva turns part of the starch of the bread into sugar. The sugar then dissolves in the saliva, so that it is already partly digested before it is swallowed. This does not happen with meat, or with other foods that are like meat.

The Gullet. — After the food is chewed and moistened by the saliva, it is pushed into the back of the mouth and forced down the narrow tube which we call the **gullet** or **esophagus** (ē-sŏf′ă-gŭs), into the stomach.



WHERE THE FOOD BEGINS ITS JOURNEY.

The Stomach. — The stomach is like a bag with a small opening at each end. The opening in the upper end connects it with the gullet. At that opening there is a sort of gate, called a **valve**, that keeps the food from going back into the gullet. The opening at the lower end is closed by another little valve that keeps the food from leaving the stomach for an hour or more. The walls of the stomach

stretch to make room for the food. The stomach of a grown person will hold about three pints of food at a time. At the entrance of food the muscles in the walls of the stomach begin to move slowly, pushing the food about and mixing it with the liquids that help to digest it. From the picture on page 53, you will see that the stomach lies on the left side of the body.

The Gastric Juice Appears. — When we send food into the stomach, a sour liquid called **gastric juice** is poured on to it. This liquid is made by thousands of tiny glands in the walls of the stomach. These glands are like little factories; their only business is to make gastric juice, and as soon as a drop is made, each gland quickly sends it into the stomach through a separate little opening of its own.

The churning motion of the stomach moves the food about until every particle is mixed with the gastric juice. This sour liquid begins at once to dissolve and digest certain of the food substances.

Only a very little of the food is taken up by the blood from the stomach. But all of it is changed into a soft, pulpy mass. The stomach has then done its work, and the valve at its lower end opens and lets the soft mass of food pass out, a little at a time.

EXERCISES

1. Eat twenty-five oyster crackers without drinking. Why do you have to eat them so slowly? What has happened to them which makes swallowing possible?

2. Of what other use is the saliva?

3. Did you notice any other change in the taste of the crackers as you chewed them? How did you know about the taste? Sometimes we take something into the mouth which burns severely and then for a while we cannot taste very well. Why not?

4. Where do the crackers go after they leave your mouth?

5. Notice carefully just how you swallow. Do you know why the food leaves your mouth and what makes it go down your throat? If you do not, put your fingers on either side of your throat and swallow several times.

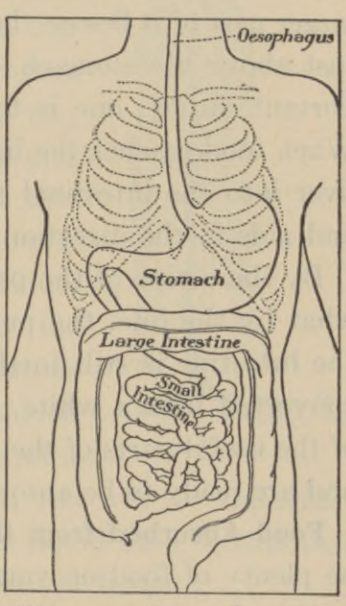
6. How do the crackers get into the stomach? What prevents them from going back to the mouth?

7. What more can you tell about the structure of the stomach and of its work?

CHAPTER IX

DIGESTION IN THE INTESTINE

The Small Intestine. — The food passes from the stomach into the upper end of the **small intestine**. This is a tube about twenty-five feet long and from one to two inches across. It is coiled up inside the body. If you measure twenty-five feet on the wall of your schoolroom, you will see how much this tube must be coiled to fit into its place in the body. In the intestine, as in the mouth and the stomach, there are special juices which soften and digest the food. The juices in the intestine come from two large glands, the **liver** and the **pancreas**, and from small glands located in the walls of the intestinal tract itself.



WHERE THE FOOD IS DIGESTED.

The pancreas is a long, thin gland situated just below the stomach. It makes the **pancreatic juice**, which is the most remarkable of all the digestive juices. It is able to work on all kinds of food and has a very powerful effect on them.

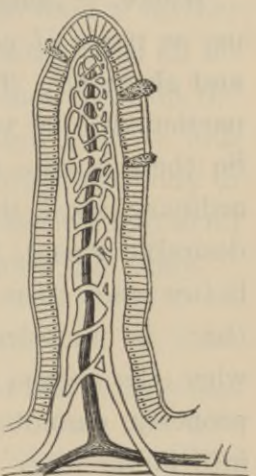
The liver is the largest organ in the body; in a grown person it weighs about four pounds. The larger part of it lies on the right side of the body and just above the stomach. The liver has several important duties; one is to make a juice called **bile**. When food reaches the intestine, bile flows from the liver into the intestinal tract, mixes with the food, and aids in the digestion of fats.

By the action of the pancreatic juice, aided somewhat by the bile, the pulpy mass of food sent into the intestine is still further softened. Finally it is converted into a white, milky-looking liquid. All of the useful parts of the food are now fully digested and are ready to be absorbed.

Food Absorbed from the Intestine. — There may be plenty of food on your plate, but it does you no good unless you put it into your mouth. Nor does it help you so long as it is in the mouth or in the stomach. Even the liquid food in the intestine does the body no good until it is taken into the blood; that is, until the food is **absorbed**. Very little food

is absorbed from the stomach; most of it enters the blood from the intestine.

The inner walls of the small intestine are lined with minute finger-like projections called **villi**. There are about four million of these tiny fingers extending out into the cavity of the intestine. Each one contains a large number of very small blood vessels. As the mass of liquid food passes over the villi, the tiny blood vessels, or capillaries, pick up those parts of the food that are fully digested. This liquid food is absorbed by these minute blood vessels, passes into the blood, and is carried to the various parts of the body. If you look at the cross-section drawing of a villus, many times enlarged, you will see the small blood vessels into which the liquid food is absorbed before it is sent out to nourish the body.



A Villus.

The Large Intestine. — It takes several hours for this mass of digested food to pass through the long tube of the small intestine. Such food particles as are not taken up by the blood finally pass into the **large intestine**. This is another tube, larger

around and not so long as the small intestine. While the food mass is passing through it, some useful material may be taken out; but what remains is of very little use to the body. The small and the large intestine together are called the **bowels.**

Waste. — Some food which we eat is of no use to us, as parts of nearly all foods cannot be digested and absorbed. There is considerable material in it, particularly in vegetables, that we cannot digest. So there is sure to be **waste** substance from every ordinary meal that we eat. This we might call desirable waste, for the organs of digestion work better when there is some waste of this kind. Then there is undesirable waste matter, which comes when the organs of digestion cannot do their work properly, cannot turn all the goodness of the food into liquid form. Then part of the good food has to pass out as waste. All waste matter, after going through the large intestine, finally passes out of the body. It is important that it should pass off regularly every day; if it remains in the body, it often is so changed that it produces poisons that make one ill.

The Process of Digestion. — Let us review the process of digestion. A piece of bread is chewed and is partly dissolved by being mixed with saliva. It

is then swallowed and passes through the gullet into the stomach. There it is changed, by the gastric juice, into a soft, pulpy mass. After an hour or two the lower end of the stomach opens and allows a bit of the food to pass through into the small intestine. In the intestine the food is further digested by the bile and the pancreatic juice, an intestinal secretion. The capillaries then take up the useful part of the digested food and pass it into the blood stream, which carries it through the body to the organs that need it. The waste matter moves on into the large intestine and then out of the body.

EXERCISES

1. Think about the food you like best of all. What is happening in your mouth? Can you tell just where each little stream of saliva is coming in? Could you count them? There are other digestive glands in your alimentary canal which are doing the same as the salivary glands.
2. Can you name all the digestive glands? Can you tell where they all are? Do you know what each does?
3. When is food fully digested?
4. How and where does the liquid food get into the blood?
5. Why should the waste pass out of the body every day?
6. Tell the story of a piece of bread and butter from the time it enters your mouth until it is taken into the blood.

CHAPTER X

FOOD AND DIGESTION

Our bodies carry on the wonderful work of digestion whenever we eat. As long as we are well we do not often think about this work, but surely we must see that the organs of digestion have a good deal to do. So their work ought not to be made harder by our taking the wrong kinds of food, or by our eating in the wrong way.

In order to know what kinds of food we ought to choose, we must have some idea as to which foods are easy to digest, and which are hard to digest.

Table of Common Foods

Easy to Digest	Less Easy to Digest	Hard to Digest
Bread (cold)	Boiled potatoes	All fried foods
Milk	Boiled or roasted mutton	Beans and peas
Rice	Roasted beef	Boiled cabbage
Tapioca	Roasted turkey	Boiled salmon
Soft-boiled eggs	Hard-boiled eggs	Cheese
Baked potatoes	Broiled pork	Roasted pork
Codfish (and most other fish)	Most vegetables	
Broiled or boiled beef and chicken		

The fact that some kinds of food are hard to digest does not mean that they should never be eaten under any circumstances. We can look at a strong light when there is some good reason for doing so, and yet we know that it would be foolish to keep looking at it when there was no need. A healthy stomach can take care of some food that is hard to digest, but it should not be given too much work of that kind to do.

Eating Too Fast is Sure to Cause Trouble Sooner or Later.

Some foods that are hard to digest, like dried beans and peas, contain a great deal of nourishment and may be good for us, if eaten properly. But we must not eat much of this kind of food at any one meal, and we must always take care to chew such food very fine. The above table will help you to understand which foods you may

eat freely and which you must eat in small quantities at a time.

People who live an active life out of doors seldom have any trouble with their digestion. Those who live indoors need less food and should be more careful in the choice of it. Some people have a trouble that is called **indigestion**; this occurs when any one of the digestive organs becomes unable to do its work properly. Indigestion often causes much pain, and it is a very common form of illness. In the beginning it is usually due to eating *too much food*, or eating *the wrong kind of food*, or eating *too fast*.

EXERCISES

1. What is the use of knowing what foods are hard to digest?
2. Have your brothers or sisters ever had hiccoughs or stomach ache or some other signs of indigestion? What caused the trouble?
3. When a horse comes to the stable, heated from a hard drive, he is never fed until he has rested and cooled off; otherwise he would get indigestion. Does this suggest a rule for hot, tired boys and girls?
4. How do you feel when you have hurried through your lunch, like the boy in the picture, so that you could have more time to play?
5. Why is it that mother does not wish you to eat very much candy at one time? Are such things good for father and mother? Why better than for you?
6. Select from the table given on page 58 a dinner suitable for children who are out of doors all day.

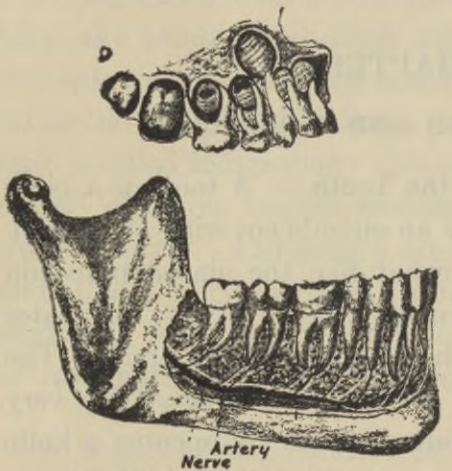
CHAPTER XI

THE TEETH AND THEIR CARE

The Formation of the Teeth. — A tooth is a piece of bone, protected by an outside covering of **enamel**. This enamel is somewhat like the glazed porcelain on the outside of a crockery dish. If very hot water is poured on the dish, the glazing may crack. The enamel of our teeth is sometimes cracked by very hot food, by biting nut shells, or by opening a knife blade with the teeth.

Beneath the layer of hard enamel is a bony substance called dentine. This substance is softer than the enamel and decays very rapidly when once its protective covering is injured. If it were not for the fact that each tooth has a messenger, a tiny nerve, to warn us when something is wrong, a tooth might waste away before we realized what had happened. When one of these little messengers warns us, we say we have a toothache. A tiny blood vessel brings food to each tooth, entering it through an opening in the root.

The Growth of the Teeth. — We have two sets of teeth. The first teeth begin to push through the gums when a baby is six or eight months old. They keep on coming, one after another, for nearly two years, until there are twenty in all.



BABY TEETH AND ADULT TEETH.

The upper figure shows the baby teeth and also the adult teeth which are to grow and push out the baby teeth. The lower figure is the lower jaw of an adult.

When a child is about seven years old, he begins to lose his baby teeth, and in place of each there comes a permanent tooth. The permanent teeth keep coming and the child's jaws keep growing larger until he is about twelve or thirteen years old. Then he has twenty-eight teeth. There are four more in the permanent set, called *wisdom teeth;* these do not usually appear until one is twenty years of age. Sometimes the teeth come through crowded one over another. This not only spoils the appearance of the face but also often prevents one from chewing

his food properly. A dentist can usually correct such irregularities in the teeth.

The front teeth, called *incisors*, are thin and sharp; they are fitted for biting food. The back teeth, called the *molars*, are larger and broader; they do the principal part of the chewing or grinding of the food.

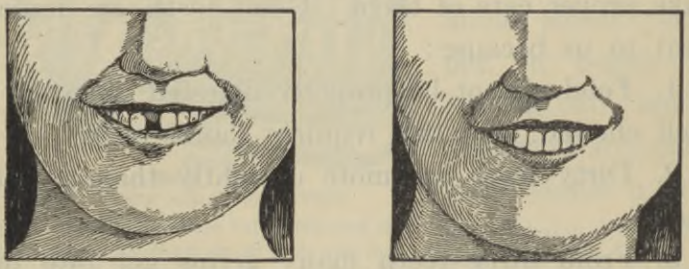
Importance of Good Teeth. — Most people might have good teeth all their lives, if they would only take proper care of them. Good teeth are important to us because:

1. Food cannot be properly digested unless it is well chewed, and this requires sound teeth.
2. Dirty teeth are more unsightly than a dirty face.
3. From dirty teeth many germs get into our food and are swallowed with it.
4. Unsound teeth cause toothache and much of the pain in the face that people call "neuralgia."

How Teeth Decay. — A healthy baby has good, sound teeth. If your baby teeth are always kept clean, and if you eat proper food, the permanent teeth will be sound when they come. Yet the large majority of school children have decayed teeth. The decay of a tooth is the work of the germs that get into the mouth from food, from

water, from our fingers, and from the various objects, like pencils and papers, that we constantly put into our mouths. These germs grow best in a warm, moist place. The mouth is an ideal lodging place for them, and they usually find bits of food between the teeth on which to feed.

As soon as the enamel protecting a tooth is cracked, the germs find their way through it into the softer parts, which they then cause to decay. If this



DO YOUR TEETH LOOK LIKE THE FIRST PICTURE OR THE SECOND?

process is not stopped, the decaying tooth finally breaks down and begins to crumble away. It is no longer any use for chewing, since food hurts it and makes it ache. The dentist saves a tooth that is beginning to decay by removing the decayed part and putting in something that will completely fill the cavity, so that more germs cannot get into the tooth. If we give him a chance to take care of the tooth when the decay first starts, it costs us less

and he can make the tooth stronger than he can if we wait until it is breaking away.

How to Prevent Decay. — Except in cases of illness, there is one simple cause for all this trouble with the teeth — they are not kept clean. **A clean tooth never decays.**

What we have to do is to remove the bits of food around the gums and between the teeth, on which the germs feed. A stiff toothbrush, used every night and every morning, will keep the outer surfaces of the teeth clean. They should be brushed up and down, as well as from side to side. The up-and-down motion carries the brush into the spaces between the teeth. At first the gums may bleed, but that does not matter; they will soon get used to being well brushed. A toothbrush that is used faithfully twice a day needs to be replaced frequently.

Besides the brushing, it is necessary to remove the bits of food that are crowded in between the teeth. This should of course be done in one's own room, and with either a soft wooden toothpick or a piece of strong silk thread that will slide easily between the teeth. Keep on using the silk until it no longer brings away any bits. Whenever we find the least decayed spot in a tooth, or if we have toothache, our teeth ought to be examined by a dentist.

In caring for the teeth one important point is to use them for chewing proper food. Crusts and other hard foods are better for them than soft food. While our teeth are growing, we need to eat food that contains plenty of lime out of which the tooth is made. We get this from cereals, meats, and bread, but not from cakes and candies. With good care the teeth will last for life.

EXERCISES

1. Of what use are your teeth?

2. Do you ever use your teeth for any other purpose than the one for which they were intended? If you do, what is likely to happen to them? Why do teeth, ill-treated in this manner, soon begin to ache?

3. What are the milk teeth? Look at the teeth of some young child and describe them.

4. Look at your teeth in a hand mirror. Feel of them carefully. How many incisors have you and how many molars? Have you any more to come?

5. When you were looking at your teeth, did you find them clean or dirty? Did you feel proud or ashamed of them?

6. If the first set of teeth are to be lost, why do you take care of them?

7. How often do you go to the dentist? It is always best to go twice a year, even if you know of no trouble. Why?

8. How do you care for your teeth? Is that the best way? Explain why.

9. When should the teeth be brushed? Why is the after-supper brushing of the very greatest importance?

10. Why is it important to brush them after the other meals of the day?

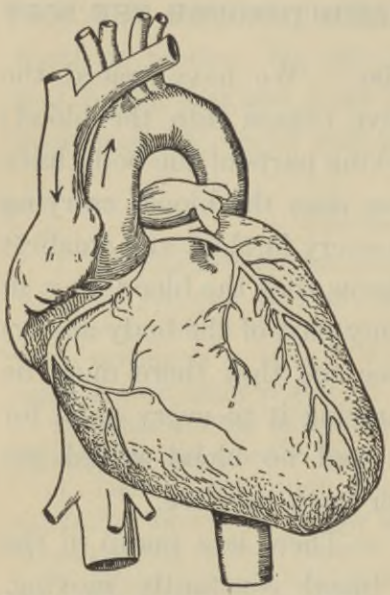
CHAPTER XII

HOW THE FOOD IS CARRIED THROUGH THE BODY

Blood the Food Carrier. — We have traced the food through the digestive organs into the blood; but as yet the living, working parts of the body have received none of it. How does the blood, carrying its food treasure, get into every farthest and smallest part of the body? We know that the blood does go everywhere, for a cut in any part of the body always draws blood. We can see too that there must be some regular plan for carrying it to every part, for otherwise the part that had no blood would get no food and could neither work nor live.

The Heart the Pump. — There is a pump in the body which keeps the blood constantly moving. That pump is the **heart.** It is very like a strawberry in shape and is about the size of its owner's closed fist. Your father's fist is probably nearly three times as large as yours and his heart is larger than yours in about the same proportion, for he has a big body to be supplied with blood. How big a heart has a baby?

Most of us know that the heart is nearly in the middle of the chest with its pointed end turned toward the left side. After we have been running hard or sometimes when we are frightened, we can hardly help knowing where it is, so plainly can we feel its beating.



THE HEART AND LARGE BLOOD VESSELS CONNECTED WITH IT.

We may think of the heart as a large muscle with a hollow space inside of it. This space is divided into two compartments by a thick wall running lengthwise, through which there is no opening. Each half, then, does its work absolutely independently of the other; yet each pumps at exactly the same instant as the other, just as two oarsmen dip their oars at the same time. Each of these two halves is divided crosswise into upper and lower rooms, which connect by means of tiny trapdoors or **valves**. From the two lower rooms or reservoirs the blood is constantly being

sent forth on its journey. Into the two upper reservoirs it is as constantly pouring as it returns.

All the time, day and night, your heart is working. If it should stop for even one minute, you would die. Each time you feel it beat, it is contracting; that is, making itself smaller, and thus forcing out blood into the blood vessels. When the heart beats faintly or irregularly, the blood moves sluggishly and so its work is not well done.

Helping and Hindering the Heart. — Like all other muscles, the heart was made to work, and it can work better when it is given the right amount to do. Those who sit still in the house all day do not give their hearts enough exercise. When we run about or do some work in the open air for several hours every day, the heart beats much faster during that time. If we do not play or work too hard, which means asking the heart to do too much, then it is better fitted by that exercise to do its regular work all the rest of the day. So the best help we can give it is exercise in the open air.

The work of the heart is made harder whenever we do not take proper care of the rest of the body. It is directly hindered when one uses tobacco or takes any alcoholic drinks. By listening to the heartbeat a doctor could select from a row of boys

those who were cigarette smokers. It is said that the runner runs with his heart more than with his legs. That is why those who are training for running contests are never allowed to use cigarettes or any other form of tobacco. They need to have their hearts fit for hard work. That is also the reason why all forms of alcoholic drink are forbidden when one is "in training"; they too make the heart unfit for its best work. Men have been unwilling to believe this, and so countless experiments have been made. Different forms of work have been tried, with men and boys of all ages, and careful records have been kept of the amount and quality of the work done. Always the report was the same — less work, poorer work, on the days when even a little alcohol was taken.

Heartbeat and Pulse Beat. — Keeping time with the heartbeat, which can be felt in the chest, there is what we call the pulse. This we feel most plainly at the wrist, on the thumb side. What we feel there is not really the beat of the heart, but the movement of the blood as it goes through the blood vessels. The heart of a grown person beats about seventy-two times a minute. A child's heart beats faster, and a baby's faster still. In a child of ten the heart would beat about eighty-five to ninety

times a minute. We test the rate of the heartbeat by feeling the pulse.

If, after sitting quietly for some time, you count your pulse for exactly a minute, you will find what your natural heartbeat is. Then run upstairs and count the pulse when you get to the top. You will find that the exercise has quickened it, which means that your heart has been made to beat many more times in a minute.

The Chief Arteries and Veins of the Arm and Hand.

The Blood Vessels. — When the heart contracts, the blood is forced out of it into tubes, called **blood vessels**. They carry the blood to the various parts of the body somewhat as the water pipes in our houses carry the water all over the house. They are of three kinds:

1. *Arteries* are blood vessels that carry blood *away from the heart.*

2. *Veins* are blood vessels that carry blood *toward the heart.*

3. *Capillaries* are the tiny blood vessels that connect the arteries and the veins.

As the arteries lead away from the heart, they

divide into thousands of tiny branches. These become smaller and smaller until they lead into tiny clusters of very small tubes, too small to be seen without a microscope. These are the capillaries.

After the blood passes through the capillaries it flows into tiny veins and begins its journey back to the heart. These veins keep uniting with others to form larger veins as they get nearer the heart. Finally the blood passes into the heart through two large veins.

Arteries, veins, and capillaries are found in all parts of the body. The large arteries, however, usually lie so deep within it that we do not see them. The veins come nearer to the surface. Can you see some blue lines running down the back of your hand? Let your hand hang down for several minutes and they will show more plainly. Those lines are the veins. Why are they more noticeable after the hand has been hanging down?

The Flow of the Blood. — Pumped out of the heart with decided force, the blood flows in spurts as it goes into the arteries. As it travels farther and farther away from the heart the spurting becomes less, so that by the time it reaches the capillaries it is flowing in a slow, steady stream. So it goes into the veins slowly and flows through them

steadily, until they carry it back to the heart from which it is again pumped out.

The Blood. — What is this blood which the heart works so hard to send all over the body several times every minute? You do not need to be told its color. The red in the blood makes our cheeks and lips red. To have bright red blood is a sign of health and strength. That is why we like to see children with bright red cheeks. The blood is made of three parts.

1. A *liquid*, which is largely water, and like water is nearly colorless. It may surprise you to be told that the liquid part of the blood is not red. But you know that water has no color, and yet if you look into a muddy puddle, the water looks brown. This is because there are thousands of bits of brown dirt in it, which are so near together that they make the water itself appear brown. In the same way, many tiny red bodies in the blood make its colorless liquid look red.

2. *Red corpuscles.* The tiny red bodies are called red corpuscles. They are round, and usually thinner in the center than at the outer edges. Sometimes they look like tiny little saucers. They are so tiny that it would take three thousand of them, placed side by side, to make a row an inch long.

In a drop of blood no bigger than the head of a pin there are about five million of them. All these millions and millions of red corpuscles are alive and active. We might think of them as little boats going around the body in the blood. It is their business to take out of the air a gas called *oxygen* and to carry it to all parts of the body. They do this without leaving the blood vessels, for there is no part of the body to which the blood vessels do not go.

3. *White corpuscles.* In the blood there are also colorless bodies, called white corpuscles. They are a bit larger than the red ones, and there are not so many of them. We might think of them as the street cleaners of the body. They can move of themselves and they go about hunting for any poisonous germs or any particles that might make trouble. Whenever it is necessary they pass out of the blood vessels as does also the liquid of the blood.

The liquid part of the blood consists of water and the liquid food that has been prepared by the digestive organs. Thus in the blood food and oxygen are carried all over the body.

The Circulation. — Let us go with a red corpuscle on its trip around the body and see if the journey is not interesting.

We will start at the heart. It goes " tick, tock " and our little blood corpuscle, together with millions of others just like itself, is pushed out of the right side of the heart into the lungs. From the air in the lungs, it picks up its load of oxygen and is sent back to the heart. This time it goes to the left side. Presently it is pumped out from the left side and starts on its journey over the body. It first passes into the main artery. The arteries, you remember, are the tubes that take the blood *away* from the heart. This artery soon divides into several branches which carry blood to the head, the arms, the legs, and all the other parts of the body. Let us say that our corpuscle is to go to the fingers. It leaves the main artery and, entering the large artery of the arm, it floats down the arm. This artery in the arm again divides into still smaller branches. We can feel the throbbing of the artery at the wrist, as the blood containing the little red corpuscle passes into the hand.

Again and again the arteries divide and grow smaller, just as the large branches of a tree divide into smaller and still smaller branches. Finally, in the finger tip itself, the corpuscle passes from a tiny artery into a still tinier capillary.

Its trip through the capillary is the really inter-

esting part of its long journey. There it gives up the oxygen that it has been holding all the time for this very purpose. There also the liquid part of the blood gives up some of the food which it has been carrying. Besides losing food and oxygen in the capillaries, the blood also takes up some of the waste substances from the tissues of the body. So when the blood flows from the capillaries into a small vein, it is no longer the rich, red blood that started from the heart. Even its color has changed to a purplish red shade.

From a small vein, the corpuscle goes on into larger ones, until finally it enters one of the two large veins that take the blood back to the heart. It is carried by this vein to the right side of the heart, and from there is sent to the lungs, where it again takes up oxygen and is made fit for another journey.

Another red corpuscle, should we watch it, might complete this circuit in a much shorter time. It might only have to go a little way from the heart; still it would travel in the same conveyances — arteries, capillaries, veins. So we see that one main artery and its many branches carry the blood from the heart about the body. Two large veins carry the blood back to the heart.

At their outer ends the arteries and veins are connected by capillaries. The blood is thus going round and round the body all day and all night; its movement is called the *circulation of the blood.*

EXERCISES

1. How do you know that there is blood in every part of the body which is working or growing?

2. Feel and see if you can determine just where your heart is. Why is it easier, by feeling, to find your heart than your liver?

3. Perhaps your teacher will get an ox-heart and let you look at it. If you cut through the walls very carefully you will be able to find all the chambers, the openings, and the tiny valves, or trapdoors.

4. How many chambers did you find? Which were bigger, the upper or the lower? The lower chambers have the thicker walls. Why?

5. Can you find your pulse? Count the beats and then compare the number with those of your friend. Is your pulse faster or slower than your friend's?

6. When you blister your hand, water is formed in the blister. What part of the blood is this water?

7. When you cut your finger, minute blood cells flow from the cut and endeavor to kill the bacteria near the wound. What part of the blood are these blood cells?

8. Describe the journey of a red corpuscle from the heart to the lungs and back. What has happened?

CHAPTER XIII

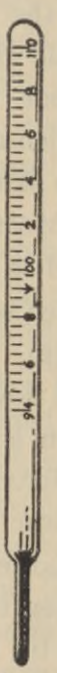
WHAT THE CIRCULATION ACCOMPLISHES

WHETHER we are awake or asleep, the blood is constantly flowing through the blood vessels. We have learned of three important things that are accomplished as the blood circulates:

1. The blood carries food to all parts of the body.
2. The blood carries oxygen to all parts of the body.
3. The blood takes up waste materials, which would interfere with the body's work. These it carries to certain organs that remove them from the body.

But that is not the whole story. The blood serves a fourth purpose — it helps to keep the body warm. We could not continue to live if our bodies were not kept at a certain temperature. There are several ways in which the heat of the body is kept up without our knowing anything about it. The circulation of the blood is one of them; let us see what it has to do with heat.

The Temperature of the Body. — There are little thermometers that are made for doctors to use in testing the temperature of the blood. By putting one of these under your tongue you will discover how warm your body is. It makes no difference whether you make the test in cold winter weather or in the heat of summer, the thermometer will give the same report; it will stand at a little over 98°. When a person's temperature is higher or lower than that, it means that he is ill; a little change shows the doctor that his patient is slightly ill, much change that he is very ill. On a hot day we certainly feel warmer than we do on a cold winter day. So we can see that the thermometer does not tell how we *feel*, but it does tell us how warm the body really is.



A Doctor's Thermometer.

How the Body Is Warmed. — The body is not warmed by the temperature of the air around it, no matter how hot that may be. Nor is it warmed by the clothing we wear. It is warmed by the burning of the food we eat. Of course the food does not burn in our bodies with a flame; it is united with oxygen and is burned in a slow and

flameless manner which produces all the heat that the body needs. The organs by which we feel heat are in the skin, while this burning takes place not in the skin but inside the body. We know very little about the amount of heat that is being made inside the body. Since almost all the organs by which we feel heat are in the skin, we feel warm when the skin is warm and cold when the skin is cold.

Most of the blood is in the inner parts of the body, and so it is warmed by the heat that is made there. Then when it flows through the outer parts, it warms them. There is a wonderful arrangement by which the flow of the blood in the vessels just beneath the skin is controlled. The blood vessels are tubes of different sizes, and even the smallest ones have the power to change their size somewhat. When they enlarge, more warm blood flows through them; when they contract, less blood flows through them. So by the change in their size, a larger or a smaller amount of blood is sent to the surface of the body.

How the Body Is Cooled. — When much of the blood that has been warmed inside the body is flowing through blood vessels near the surface of the skin, we feel warm. So on a very hot summer day we might think that it would be much more comfortable if the hot blood would not keep flowing

so fast and so near the surface. We should like to get cool. The fact is that we are being granted our wish without knowing it; we are really cooling off, since the warm blood is being cooled by the air. If the body is likely to become too warm, it sends the warm blood to the skin to be cooled off. Thus you see that when you feel very warm, you are really cooling off, and when you feel cooler, the warmth is being kept inside your body.

If you played ball on a very hot day, so much heat would be made in your body that you would be sick if all that heat were kept inside; but the blood carries heat to the skin and the air cools it. The body usually makes more heat than is needed to warm it, but there are times when it has to work very hard to make enough heat. You can imagine that if a man lost his way in the cold on a mountain road and had to walk for several days with almost no food to eat and no heavy clothes to keep him warm, it might become very difficult for the body to make the heat needed. Very little blood would be sent to the skin, but even so there might not be sufficient heat produced to make the body warm enough so that the man could be kept alive.

Getting Warm. — When the blood circulates well, the body is warm all over. If the circulation is too

slow, the hands, the feet, and the ears are the first parts to grow cold. The best way to warm them is to start the blood flowing into them more rapidly.

The next time your fingers feel cold, instead of trying to warm them at a stove or over a register, rub them hard. You will find that they become warm quickly and stay warm for a long time. The rubbing starts the blood to circulating through them freely. Brisk walking or running is far better for warming the body than wrapping it up in heavy clothing or sitting over a hot stove or register.

Hindering the Circulation. — The arteries are so deep in the body that pressure on the skin would not be likely to affect them. The veins, however, lie so near the surface that pressure often checks the flow of the blood that they are carrying to the heart. Many articles of clothing may be worn tight enough to hinder the circulation in this way. Cold feet are often due to tight garters which check the circulation below the knee. Tight collars help to cause dizziness and headache; and tight clothing of any kind is always less warm and less comfortable than loose garments.

With good blood and a good circulation, it is evident that all parts of the body will be well fed, while if blood and circulation are poor, it will be more

PLENTY OF OUT-OF-DOOR EXERCISE MEANS PURE BLOOD AND GOOD CIRCULATION.

and more difficult for the body to do its work. Plenty of sleep, the right food, pure air, and exercise are the simple means by which the blood and the circulation may be kept in the best condition.

EXERCISES

1. Why does mother or the doctor always put the thermometer into your mouth when you feel ill? What may they conclude if the thermometer says 100°? If the thermometer says 103°?

2. Have you ever seen a teamster swinging his arms violently against his chest when the weather was very cold? Why was he doing this?

3. Wind an elastic tightly around your finger. How does your finger feel? Is it cold or hot? Explain.

CHAPTER XIV

CUTS AND WOUNDS

Bleeding. — If there is a leak in a water pipe, the water flows out. If the leak is large, the water flows quickly. From a small opening it comes more slowly. If you cut your finger, you are almost certain to cut into a blood vessel, and then the finger bleeds. If it does not bleed, it means that you have so slight a scratch that you have hardly cut through the skin.

If an artery is cut, the blood that flows out is bright red, and it comes in *spurts.* Do you remember why the blood in the arteries flows in spurts?

If a vein is cut, the blood flows gently and evenly, never in spurts. The blood in the veins is darker red because it lacks oxygen.

We should always try to stop bleeding promptly, so as not to lose any more of the blood than necessary. From a slight wound, such as a cut in the finger, the bleeding usually stops after a short time. Have you ever noticed, when you have had a cut or

a scratch, how the blood thickens in the opening, or on the finger outside of the cut? We call the thickened blood a **clot**. This clot closes up the opening made by the wound so that no more blood can flow out.

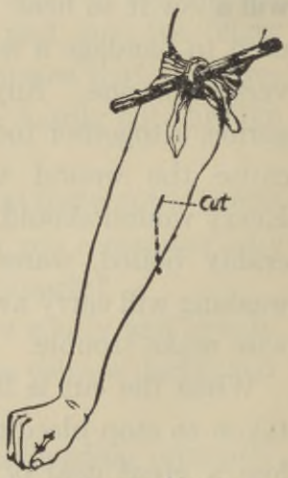
How to Stop Bleeding. — A small cut will soon stop bleeding, especially if we press the edges together and bind the cut tightly with a *clean* cloth. A strip of surgeon's plaster is better than the cloth, for it will keep the cut from bursting open again and will allow it to heal. A *soiled* cloth should *never* be used to bandage a wound, even though the cut be a very slight one. Any soiled cloth may hold harmful germs, altogether too small to be seen, which might cause the wound to become inflamed and sore. Every wound should be washed in clean, and preferably boiled, water before it is bound up. The washing will carry away any germs that might otherwise make trouble.

When the cut is large or deep, measures must be taken to stop bleeding at once, otherwise one might lose a great deal of blood or even bleed to death. When a wound of any kind is followed by a *spurting* of bright red blood, we know that an artery has been cut and that the blood will flow too fast for clotting. The only way to stop the bleeding is to

press the artery together *above the cut*, that is, between the cut and the heart, so that blood cannot run through the artery.

SHOWING THE METHOD OF GRASPING THE ARM TO STOP BLEEDING FROM AN ARTERY.

The illustration shows how we may grasp an arm so as to check bleeding anywhere below the elbow. The next thing is to stop the bleeding by putting a bandage tightly around the arm. We will suppose that the arm was cut below the elbow. Wind tightly around the upper part of the arm a good-sized handkerchief, and tie it as shown in the illustration. Now run a stick through the knot. Give the stick a turn or two, twisting the bandage tightly until the bleeding stops. With a wound in the leg, the flow of blood is stopped in a similar way. A physician should be summoned at once, and the bandage must be kept in position until he comes and ties the cut artery.



SHOWING THE METHOD OF APPLYING A LIGATURE TO THE ARM.

If the cut blood vessel is a vein, bandage in the same manner, only place the bandage *below* the cut instead of above it, since the blood is flowing toward the heart instead of away from it.

The life of many a person has been saved in this way by boys and girls who had learned the method in school. In order to learn how to arrange the bandage, one needs a little practice; so get some friend to let you try doing it.

EXERCISES

1. Why must bleeding be stopped as quickly as possible?
2. What good does the clotting of blood do?
3. How can you tell whether an artery or vein is cut?
4. How is blood stopped in ordinary cuts and bruises? If there is need of bandage or plaster, what care must be taken? Sometimes children moisten court-plaster with the tongue and stick it on a cut. Why is this almost sure to cause a sore? Why is your handkerchief usually unsafe to use as a bandage?
5. How would you treat a wound in case a vein had been cut? Treat one of your schoolmates as if he had such a wound.
6. When you go to bed to-night, find the place on the inside of your thigh where you can shut off the blood going to your legs. Explain why you can shut the blood off in this manner.

CHAPTER XV

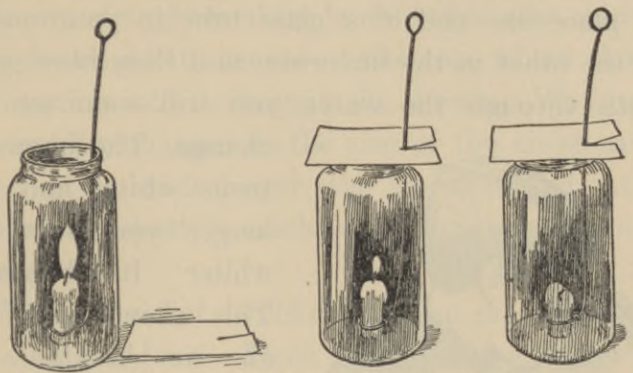
HOW AND WHY WE BREATHE

Why the Body Needs Air. — We breathe some twenty times every minute. Usually we do not think about it, but if we wish, we can breathe either slower or faster than that rate for a little time. James decided to hold his breath for five minutes; he was determined that he would not breathe until that time was up. When he had been holding his breath for nearly a minute, something happened, and before he could stop it, he was breathing. The body needs air and will not let us keep the air away from it for more than a minute. Let us see why.

A fire in a stove will not burn unless it has air. To make the fire burn more rapidly we open the draft and let in more air. The larger the draft, the faster the fire burns and the hotter the fire is. Besides a draft, the stove must have a chimney to carry off the smoke and the gases made by the burning fire.

We have learned that food is constantly being

burned or oxidized in our bodies. This flameless burning requires oxygen, just as much as the fire in the stove does. It is necessary also that waste



NOTHING CAN BURN WITHOUT OXYGEN.

The candle burns if the top of the jar is left open, so that the air can have entrance. If the jar is covered with a paper, the candle burns lower and is finally extinguished from lack of air.

gases be carried off from the body, just as they must be carried off from the stove.

Respiration. — By means of **respiration**, the body is given its proper supply of air and the waste gases are carried off. Every time we breathe in (**inhale**) we take air into our bodies, thus providing the blood with the oxygen it needs. Every time we breathe out (**exhale**) we send from the body waste gases and moisture.

It is easy to prove that the air we inhale is changed before it is exhaled. Get some limewater from a

drug store and pour a little into a tumbler. If you send *pure* air through the limewater, blowing it in with a syringe, the limewater is not changed. If you place one end of a glass tube in your mouth and the other in the limewater and then blow your breath through the water, you will soon see the change. The limewater turns white, and the longer you blow the whiter it becomes. This shows that the air we breathe out must contain something that is not in the pure air which we inhale. A gas called **carbon dioxid** is found in the air exhaled; this is a waste gas and is produced by the burning that is going on in the body. It passes off in the breath, much as gases from a stove pass up the chimney.

TINY DROPS OF WATER FROM THE BREATH GATHER UPON THE GLASS.

This breath we exhale also contains *water*. This we can prove by breathing upon a cold mirror or a cold window pane. We shall find that the glass

becomes cloudy when the tiny drops of water from the breath gather upon it.

How We Breathe. — The **chest** is a box; its sides are strengthened by bones called **ribs**, and it is closed completely except at the top, where there is an opening into it through the throat. We breathe by making changes in the size of the chest cavity. When it is made larger, the air is sucked into it. When the chest is made smaller again, the air is pushed out.

With the aid of a rubber ball you can see how the breathing is done. Place under water a hollow rubber ball with a hole in it. Squeeze the ball and notice how the air is forced out. Still holding the ball under water, let it expand, and it will fill with water. Every time you squeeze it, air or water rushes out. Every time you let it expand, air or water rushes in.

The chest box with its curved top, curved sides, and curved bottom can easily be made smaller or larger, thus allowing the air to rush in or out. In fact we are changing it many times every minute, and this is done just as well when we are asleep as when we are awake.

How the Chest Is Enlarged. — We enlarge the chest in two ways. We lift up the curved ribs which form the sides of the box, and we also draw

down the curved bottom of the box, which is a soft layer of muscle, called the **diaphragm** (dī′*ȧ*-frăm). Place your hands on the sides of your chest and take a long breath. You will feel the ribs rise as you breathe in. Place your hand below the diaphragm and take another long breath. You will notice that the stomach and bowels seem to push out as you inhale. This is because the diaphragm, when it is drawn downward, pushes against these organs, and so forces them outward a little. When the diaphragm is at rest, it curves upward in a half circle. When the lungs are full of air, the diaphragm is at work and it is more nearly flat.

The Air Passages. — When we breathe, the air first enters the moist, curved passages in the nose. Here it is warmed as it passes through, and dust particles are filtered out of it by the moisture and by the little hairs that line the nostrils.

Then the air goes down the upper part of the throat, past the tonsils, which often give us trouble by becoming inflamed and enlarged, and into a tube called the **windpipe**, which lies in the front of the throat. If you place your fingers under the chin and swallow, you will feel a little bunch moving up and down. This is the **larynx**, or Adam's apple, and in it we make sounds when we talk or laugh or shout.

It is just at the top of the windpipe; so if you carry your fingers below it, you can feel the windpipe.

The windpipe is just in front of the esophagus, down which, as we know, the food passes to the stomach. Air never goes down the esophagus, but it sometimes happens that a bit of food gets into the windpipe, for all the food has to pass over the little trapdoor that leads into it. This door opens when we breathe and closes quickly to let the food pass. When it is closed, we cannot breathe, and there are times when we ask it to be closed and open at the very same instant. One of them is when we laugh and draw in the breath, at the same time that we are swallowing. Then a bit of food is likely to get into the windpipe and we cough until it is thrown out. The windpipe will take nothing except air; as soon as a bit of food, or worse still a fishbone, gets into it we cough and choke until the intruder is expelled. Thumping a person between the shoulders, under those circumstances, often helps him to get some air into his lungs. How does it help?

The windpipe passes down into the chest and divides into two **bronchi**, one going to each lung.

Mouth Breathing. — When we want to run fast, we sometimes try breathing through the mouth. We can get air faster in that way, but we soon find

that we get out of breath and have to stop running. Many young people get into the habit of sitting with their mouths partly open, and so they breathe through the mouth. That is a foolish habit because nobody looks alert and bright when the mouth is partly open. Besides, those who do that in the daytime are likely to breathe through the mouth when they are asleep. We were not made to breathe in that way, and the bad results of it often show in changes made in the face; the upper teeth point out, and the lips thicken, thus spoiling the attractiveness of the face.

All mouth breathing is not due to carelessness. It has been found that in some schools one-fifth of the children are breathing through the mouth because they cannot easily get air enough through the nose. The cause is usually some spongy little growths, called **adenoids**, that come in the upper part of the throat and partly block the passage of the air down from the nose. These little adenoids can be easily removed by a physician; they should not be left, for they produce trouble.

Chest Development. — Breathe out, expelling from your chest as much air as possible. With a tape measure find out how many inches your chest measures when the air is breathed out. Breathe in

all the air you can, and measure again. How much larger is your chest when it is full of air?

Place your hands about your waist, pressing them as tightly as you can. Is each breath shortened or lengthened by the pressure? When the diaphragm presses down upon the stomach and bowels (inhalation), what happens if the waist is compressed by a tight belt? Evidently these organs are squeezed, and since the diaphragm cannot move as much as it should, the lungs cannot expand as they should. After you have taken in a full breath, you ought to be able to slip two fingers between your belt and your body without making the belt feel tight.

Well-developed Chest, Due to Exercise and Deep Breathing.

Hollow Chest, Caused by Incorrect Position and Wrong Breathing.

It is a good thing to have a large chest. In the first place, we always admire a boy or girl who stands erect and has a large chest. We do not like the appearance of one who has a small chest and is stoop-shouldered. Such a

boy cannot be strong, or run fast, or excel in any outdoor games. We do not admire the looks of such a girl and we know that she cannot be strong. We should all be proud of chests that are full and that expand several inches when we breathe. Chests may be developed by exercise, for it is a rule that *the part of the body that is exercised gets the blood.* We know that the way to build any part of the body is to send it building food in the blood. If you take a dozen long breaths several times a day, this will develop your chest. Running and active games do the same thing and the gymnastics given in many schools are a great aid.

EXERCISES

1. Sometimes on a cold winter day the room feels "close" and we feel cold even though the thermometer registers 70°. Why? If we open the windows for five minutes and take long, deep breaths we are soon warm again. Why?

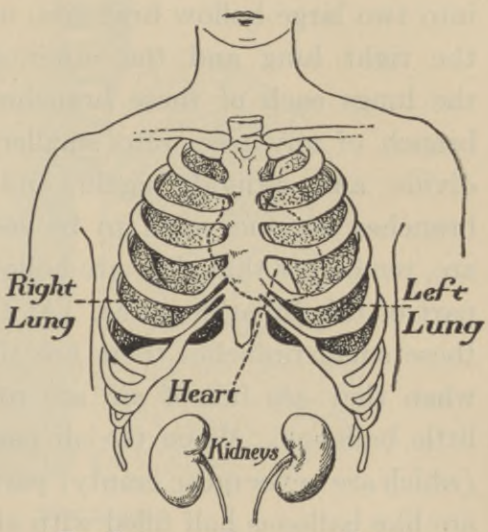
2. Trace a breath of air to your lungs and back again. Do this again and tell just what organs it passes through and what changes take place in it.

3. Is a hollow-chested person apt to become ill sooner than one with a full chest? Explain.

CHAPTER XVI

WHAT BREATHING DOES FOR THE BLOOD

When the chest is expanded, air is drawn into the lungs through the nostrils. From the nose it passes into the throat, and from the throat through the windpipe into the lungs. Just before reaching the lungs, the windpipe divides into two branches, one going to each lung.



The Chest and Lungs and Kidneys.
The figure shows the position of the lungs in the chest, the heart being represented in dotted lines, because it is partly covered up by the lungs.

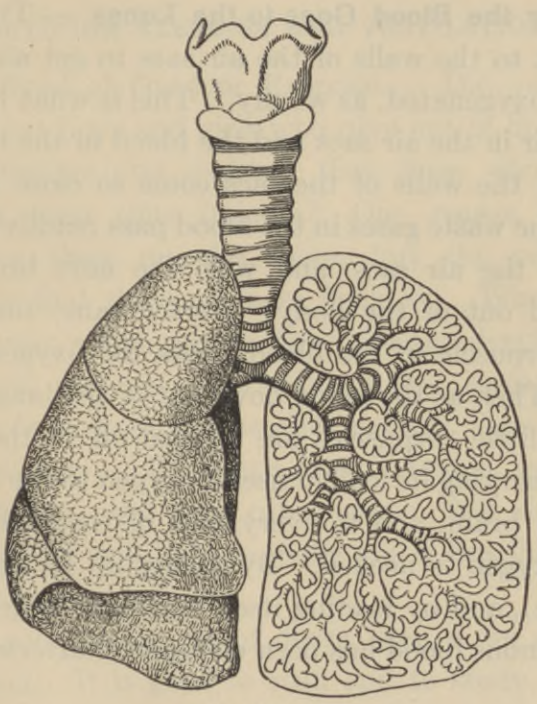
The Lungs. — The lungs lie in the chest box, one on the right side, the other on the left, as shown in the figure above. If you wish to see how they look, ask a

butcher to show you the lungs of an ox. You will find that they are pinkish gray in color, and that they look somewhat like a sponge.

The Breathing Tree. — To understand better just how the air passes in and out of the lungs, let us imagine them to be the branches of a hollow tree turned upside down. Imagine the windpipe to be the hollow trunk of the tree. This trunk divides into two large hollow branches, one of which enters the right lung and the other, the left lung. In the lungs each of these branches divides, like the branch of any tree, into smaller branches. These divide and redivide again and again until the branches are too small to be seen. Tiny as they are, remember that they are hollow, like every other part of this breathing tree. At the ends of each of these small branches there are tiny air sacs, which, when they are full of air, are round and firm like little balloons. When the air passes out, these sacs (which are never quite empty) partially collapse, and are like balloons half filled with air.

What Happens in the Lungs. — Now take a long breath, and let us find out more about how the air goes in and out of the lungs, which we have likened to a breathing tree. As the chest rises slowly and the chest cavity grows larger and larger, the air

rushes in through the nose, down the windpipe, through the two windpipe branches into the lungs, and then through the countless smaller branches



THE LUNGS.

until it reaches the air sacs. When the chest has expanded as much as it can, the sacs and little tubes are full of air. By letting the chest fall, the air is forced out again, leaving the air sacs and tubes partially collapsed.

All around these air sacs there are millions of tiny blood vessels through which all of the blood of the body is being pumped by the heart every few minutes.

Why the Blood Goes to the Lungs. — The blood is sent to the walls of the air sacs to get air, to become oxygenated, as we say. This is what happens. The air in the air sacs and the blood in the tiny vessels in the walls of the sacs come so close together that the waste gases in the blood pass readily into the air of the air sacs, and with the next breath are carried out of the body. At the same time, each red corpuscle in the blood seizes the oxygen in the air. Then as the blood flows out of the lungs again, these little corpuscles are hurried off in the blood, each carrying its load of useful oxygen to the muscles, to the brain, and to every part of the body where the oxygen is needed. By giving up its impurities (waste), and by loading itself with the oxygen of the air, venous blood has been changed to arterial blood.

EXERCISES

1. You have just been told that the blood is purified in the lungs, but do you suppose that it loses there all the waste matter contained in it? Explain.

2. Can you tell why the lungs of people working in close, dusty places readily become diseased?

CHAPTER XVII

OUTDOOR EXERCISE AND VENTILATION

The Need of Outdoor Exercise. — Did you ever notice that boys and girls who play out of doors are much stronger and healthier than those who spend most of their time indoors? One reason is that they use their muscles more, but the principal reason is that they get more fresh air. When they are playing active games, they breathe deeply, and take much pure air into the lungs, and, since out-of-door air is more pure than that indoors, they get far more oxygen. "Prisoner's base," tennis, baseball, golf, hockey, and any other game that develops your muscles will help to make you a healthier and happier boy or girl.

It is good to be out of doors, even if we are not exercising. It is good to read and to study, to eat and to sleep in the open air — in fact, to live there as much as possible. The Boy Scouts, the Camp-Fire Girls, those who go to camps and those who are so fortunate as to be able to live out of doors a great deal, realize this. We must not make the mistake, however, of thinking that living out of

doors will do everything for us. Although we are less likely to become ill, we must not think we need to take no precautions to keep well.

If you wet your feet at the beginning of a hike and kept on tramping all day in the rain, you would not be likely to feel any ill effects. If you went to bed, however, wet and chilled, you might wake up the following morning with a very severe cold. It is never safe to sit still very long or go to sleep in wet clothing.

Bicycling is fine exercise if the rider sits straight, rides moderately, and stops before he is too tired. Skating and rowing are also good exercises. Every boy and girl who lives near the water should learn to swim. Although walking is a good exercise too, children need exercise that is more vigorous, like running and jumping. Taking exercise in the open air is like giving the blood a bath; we make it easy for the blood to give up its impurities and to get all the oxygen it needs.

The Need of Sunshine. — Besides the pure air which we breathe in outdoor exercise, the influence of sunshine must not be forgotten. We like best to play out of doors on sunny days; we work best when the world is bright; when we are ill, the sun always makes us feel better. The more we live in sunshine, the healthier and happier we shall be.

Every home should be built so that plenty of sunlight can get into every room and closet, and into the cellar as well. The curtains should be raised and the sunlight allowed to enter our rooms freely, especially in the fall, winter, and spring. On hot days in summer this is not so necessary, and we may draw the curtains to keep our rooms cooler by excluding the sunlight.

Pillows and bedding should be aired in the sunlight frequently and clothing kept in closets should likewise be given a sun-bath occasionally.

The Need of Ventilation. — It is impossible to be always out of doors, no matter where we live. We have to be in school, and usually have to sleep in the house. Since so much of our time cannot be spent out of doors, the next best thing is to bring into the house as much fresh air as possible. Much air needs to be coming in because it becomes impure so fast. Every minute you breathe you spoil ten barrelfuls of air. Just do a little figuring for yourself, and see how much air needs to be taken into a lecture hall in an hour if one hundred people are assembled there. Under such conditions, it is necessary in some way to provide enough fresh air to replace the air that has been made impure by breathing. Removing the impure

air and supplying fresh air to take its place is called **ventilation.**

Have you ever noticed a close, unpleasant smell in your schoolroom as you stepped into it from out of doors? If so, it was because the air had become impure from being breathed over and over again.

An Outdoor School.

Where did the impurities come from? Such air is unwholesome, and it is quite likely to make us dull and drowsy or to give us headaches. Or else it may put us in just the condition to catch cold easily. We often take cold because we are not getting fresh enough air. In "out-of-door schools," pupils study when the wind is blowing hard, and yet they do not take cold. Of course they must wear warm cloth-

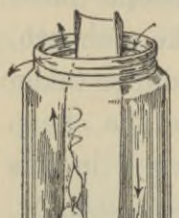
ing in winter. Pupils not only become stronger in the open-air school, but they can do better work in their studies, and they are happier.

It is clear that when a number of people must stay for some time in the same room, like a church, a school, or a public hall, special care should be taken to keep the air pure. The halls where the cheap "movies" are shown are usually the worst in this respect. They have to be kept dark and so, usually, have no window openings. Some other means of ventilation should be provided in all such rooms.

If there is no special means of ventilating a room, we may provide fresh air by opening the doors and windows. It is better to open the windows at the top. Then the overheated and impure air will pass out, while fresh air to take its place will be forced in through the crevices in doors and windows.

Test this by placing a lighted candle in a two-quart fruit jar, covered as shown in the illustration on page 89. Notice that as the candle flame burns up the oxygen of the air, it dies out. Now fit into the jar a piece of pasteboard, notched at the bottom as shown in the figure on page 106, dividing the jar into two chambers. Place the lighted candle in one of these chambers and notice that although you have not put any fresh air or oxygen in

the jar, the candle will continue to burn. That is because the air that has been heated by the candle, and from which it has taken the oxygen, rises and passes out of the jar, and because the fresher, cooler air on the other side of the jar is forced in to take the place of the heated, impure air that has passed out. This illustrates what takes place when we ventilate a room, and the experiment shows clearly the need of a constant supply of fresh air in the rooms in which we live.

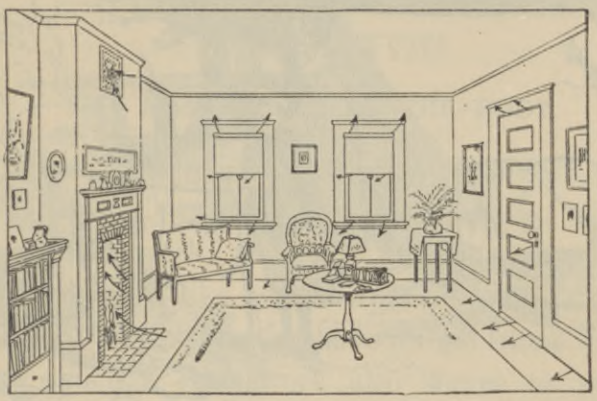


PURE AIR TAKES THE PLACE OF THE IMPURE AIR FROM WHICH OXYGEN HAS BEEN TAKEN.

When we pull a window down from the top, the impure air passes out of the opening and pure air finds its way in through the cracks in the doors or windows. Stoves help to ventilate a room by sucking in air at their drafts and sending it up the chimney, this being replaced by the outside air that works in through doors and windows. An open grate is an excellent ventilator. Explain why.

Fresh air is necessary to good health. A house should be thoroughly aired every morning, even in winter, by throwing open the windows if only for a few minutes. We should be far more afraid of impure air than of drafts. To stay in a room con-

taining impure air is much more likely to give us colds than to have a draft blow upon us.



AIR CURRENTS IN A ROOM.

The direction of the air currents in an ordinary room are shown by the arrowheads.

One very good time to get plenty of fresh air is when we are asleep. At least one window of the sleeping room should always be open at night, even in the coldest weather. Out-of-door night air is not injurious. Breathing cold, pure air during the night will make us feel fresh and vigorous in the morning. Sleeping out of doors, as when camping out, or on sleeping porches, will help to make us strong. Two good rules to remember are:

1. Live out of doors just as much as you can, day and night.

LIVE OUT OF DOORS JUST AS MUCH AS YOU CAN

2. When you have to stay indoors, get as much of the outdoor air into the house as possible.

EXERCISES

1. How many windows have you in your sleeping room? If there is but one, why is it better for you to open it at both top and bottom?

2. Can you tell why a sleeping room with windows on two sides is better than a room with two windows on one side?

3. How do you ventilate your sleeping room at night? Explain how you vary this with the seasons and with the changes in the weather of the seasons.

4. Do you know why mother is so particular to have you wear rubbers in wet weather? Why?

5. Are you forming correct habits in breathing?

CHAPTER XVIII

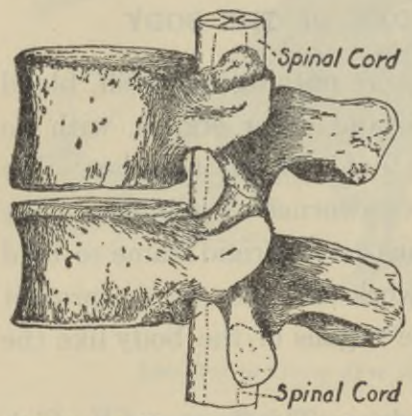
THE FRAMEWORK OF THE BODY

Suppose our bodies were nothing but flesh, blood vessels, heart, stomach, and other organs, with no strong framework to hold them together. We should be much like earthworms or jellyfish. The flesh is so soft that it must have a rigid frame to hold it up. Such a framework also serves to protect from injury the delicate organs of the body like the heart and lungs.

The Bones of the Body. — This framework which holds the soft parts of the body in place is made of bones and is called the **skeleton**. The bones of grown people are hard and not readily broken and so strong that they cannot easily be bent. There are in the human skeleton about two hundred bones of different shapes and sizes held together by ligaments. The *backbone*, which is really the main support of the whole framework, consists of twenty-six small bones fastened together. If this backbone were one solid bone, it would be quite rigid and more likely to break, but because made up of so many small bones,

it may be slightly bent in all directions without breaking.

By moving your fingers along the backbone above the waist, you can feel these separate little bones. Passing through the center of the backbone is a very important part of the body, called the **spinal cord** (see figure).



TWO OF THE TWENTY-SIX SMALL BONES THAT MAKE UP THE BACKBONE.
Showing a piece of the spinal cord passing through them.

The **skull** is a bony box at the upper end of the backbone. It covers and protects the brain and holds the eyes, ears, nose, and mouth.

The Framework of the Chest. — Forming the large cavity which we have called the chest box, in which the heart and lungs are placed, there are twenty-four ribs, twelve on each side of the **breastbone.** The upper ribs on each side are fastened to the breastbone in front and at the back to the backbone. The two lowest ribs on each side are fastened to the backbone only. They are called floating ribs because in front they are not fastened to the breastbone or to

the other ribs (see figure on page 97). Find the position of your ribs by feeling with the fingers. Locate the floating ribs.

The Arm and Hand. — A single bone from the shoulder to the elbow forms the *upper arm*, while two smaller bones reaching from the elbow to the wrist make up the *forearm*. In the wrist there are several small bones firmly bound together. In the palm of the hand there are five bones, and in each finger, except the thumb, there are three; the thumb has two.

The Joints. — Wherever the ends of two bones come together they form a **joint**. If it were not for these joints, we could not move. We can bend the arm because the bones of the arm and forearm come together at the elbow joint. There are several different kinds of joints. Some, like those at the elbow, knee, and in the fingers and toes, allow motion in but one direction. At these joints the bones swing like the hinges of a box cover. For this reason, they are called *hinge joints*. Other joints, as in the shoulder and hip, are called *ball-and-socket joints*. In these motion is possible in any direction.

At the joints the bones are bound together by strong white bands or cords called **ligaments**. These are made of shiny, inelastic connective tissue which

binds or straps the ends of the bones together, so that while the bones are held in position firmly, they can be moved.

Growth of the Bones.— Although bones are hard and tough, they are alive and they grow. They are fed by tiny blood vessels that pass through tiny canals into the solid bone. Bones are also supplied with nerves. We can readily see that the bones of a child grow larger from year to year. The bones of grown people do not grow larger, but, as you have already learned, they wear out and need constant repairing. So, too, the bones of a child need constant repairing.

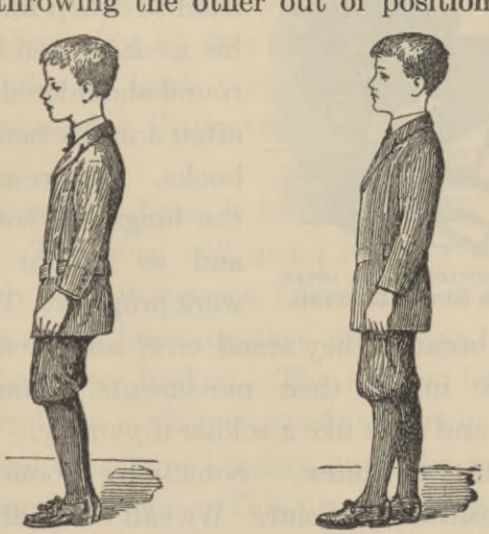
A Deformed Foot Caused by Wearing Ill-fitting Shoes.

If our bones grow naturally, they will grow into the proper shape. We can help them to grow as they should by giving them the proper building food, and by preventing them from being deformed by wearing tight clothing. We prevent their growing into a proper shape by wearing tight shoes, by sitting in a slouching position at our tables or desks, or by

A Properly Shaped Shoe.

leaning against a support instead of standing erect; or when we form any habit that puts the body into an awkward and unnatural position.

The bones of children are not hard, so children need to be much more careful than grown people about how they sit and walk, and about what they carry. If you have to do some work that puts your body into an unnatural position, change the position frequently. Carry your books to school on one arm and back home on the other arm. Never stand letting one side of the body sag; that really does not rest you. Learn to rest by standing on one leg without throwing the other out of position.



A Bad and a Good Standing Position.
Which do you prefer? You can have either.

A Graceful Body. — Every boy and girl wishes to be strong and vigorous as well as graceful in appearance. A well-built, graceful body depends very largely upon the position and shape of the bones.

We can all lay the foundation for a strong body, if we form right habits of standing, sitting, and sleeping. Stand with *head up, chin in,* and *chest high.* This is the easiest position when one gets used to it. A person who allows his head to droop forward and his neck to bend becomes round-shouldered. This is often done by bending over books. The result is that the lungs are compressed, and so cannot do their work properly. We admire soldiers because they stand erect and seem so alert and sure in all their movements. You can be straight and alert like a soldier if you try.

Round Shoulders Are often Caused by Sitting Like This.

Accidents to Bones. — Sometimes a bone is pulled out of position at a joint. We call this a **dislocation.** It must be put back into its proper place before we

can move it in the usual way. This should be done by a physician.

When a joint is injured so that the bands or ligaments connecting the bones are strained or torn, we call this a **sprain**. If the sprain is at all serious, a doctor is needed. Strips of cloth kept wet with cold water or alcohol and wound tightly about the joint will help to relieve the pain until the doctor arrives. For a slight sprain, if a doctor is not needed, bathe the joint first with very hot water and then with cold. After the pain is relieved, bind up the joint tightly with bandages soaked in alcohol, witch-hazel, or any good liniment. For the first day or two after the accident the joint should be kept very quiet. After that it should be used a little every day to prevent stiffness.

Occasionally a bone is broken; this is called a **fracture**. The bone will mend itself in time, if it is properly *set*. A surgeon knows how to bring the two parts of the bone together, exactly as they were before they were broken. The arm or leg is then bound firmly to a piece of wood, or put in a plaster cast, to hold the bone in place until the parts have grown together again. This usually takes from six weeks to two months.

EXERCISES

1. What organs in our bodies are best protected by bone? Of what advantage is this?

2. Describe the way in which these bones are arranged around these organs.

3. Ask mother to let you examine the joint next time you have a leg of lamb. Can you find the ligaments and are you able to count them? These ligaments must be cut before mother can disjoint the leg.

4. Mention some habits that are likely to make the bones grow out of shape. Have you any of these habits?

5. What should you do if your sister were to sprain her ankle when you were alone with her?

6. How should you sit in your chair or at your desk in school? Are you forming the habit of sitting, standing, and walking correctly?

CHAPTER XIX

HOW WE MOVE

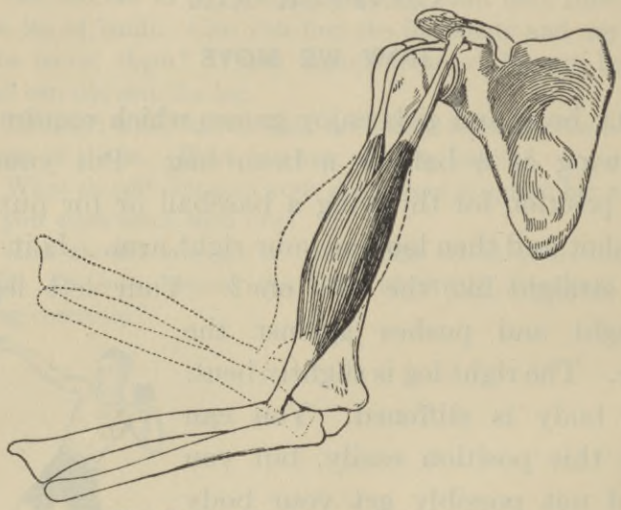
ALL boys and girls enjoy games which require the throwing of a ball or a bean bag. Put yourself into position for throwing a baseball or for putting the shot and then look at your right arm. Is it stiff and straight like the left one? Your left leg is straight and pushes against the floor. The right leg is slightly bent. The body is stiffened. You can take this position easily, but you could not possibly get your body so placed if you had no muscles.

PUTTING THE SHOT.

The Muscles. — The muscles of an ox or a sheep are made of what we call lean meat or flesh. The muscles of our bodies are also formed of lean meat. They look red like beefsteak. When you grasp your upper arm tightly, you can feel the muscles that cover the bone which lies under them. There are about five hundred of them. They are found in

nearly all parts of the body. More than one half of the body consists of muscles. They use the largest part of the food we eat.

How Muscles Work. — Muscles have the power of shortening and of being stretched out again.



THE BICEPS MUSCLE AND ATTACHMENTS.
Showing how the arm is moved.

They are attached to the bones of the body, and when they shorten (contract), they move the bones. When you bend your arm, you contract the muscles above the elbow. When you lift your leg to take a step, you contract the muscles of the leg and thus lift the bones. It is always the contraction of muscles that gives us motion.

The Tendons. — A muscle is usually larger in the middle than at the ends. Most muscles are attached at their ends to two bones. Usually this attachment is made, not with the end of the muscle, but by cords called **tendons.** If you grasp your left wrist, and then open and close the fingers of the left hand several times, you can feel the pull on the tendons at the wrist. The tendons do not contract; they are pulled, like strings, by the muscles in the arm that move the fingers. You can feel these muscles by grasping the arm below the elbow and then opening and shutting the fingers.

The strongest tendon in the body is at the heel; it is called the *tendon of Achilles.* It connects the large muscle of the back of the leg with the bones of the feet. Do you know the interesting old Greek story about the way this tendon was named? Get somebody to tell you about it if you do not.

The Voluntary and Involuntary Muscles. — Some muscles we can move at will; they are called *voluntary* muscles. One always uses such muscles when he desires to move his head, arms, legs, fingers, and toes. Then we have other muscles which move without our control; they are called *involuntary* muscles. They work like the muscles of the stomach, which push the food around with-

out our being even conscious of the fact that they are moving.

There are also certain muscles that are partly voluntary and partly involuntary; that is, we can move them at will, but they can be moved without attention on our part. Winking is one of the motions that takes place in both ways. We can close our eyes by shutting the lids whenever we please, but the lids are also shutting every few seconds without our noticing the fact.

EXERCISES

1. Ask for the feet of a chicken at the market. Notice the small white cords sticking out from the cut end. By pulling these you can find which ones make the different toes move. These are the tendons which are attached to the muscles.

2. Next time you get a "drumstick" at dinner, look for the tough tendons at the small end. Can you tell how the muscles are attached to the leg bone you are eating?

3. Where are the muscles that move your fingers when you open and close your hand?

4. Mention some voluntary motions; some involuntary motions.

CHAPTER XX

HOW TO STRENGTHEN THE MUSCLES

EVERY one wishes to be strong. We all like to have the muscle of the upper arm large and hard; we like to be able to run fast and to throw a ball straight and for a long distance. Strong muscles help people to work and play well and thus to keep always in good condition.

Good building foods help to make strong muscles. Some people try to make their muscles stronger by taking what they call a stimulant, that is, some kind of alcoholic drink. That is a great mistake, for alcohol tends to weaken the muscles rather than to strengthen them. The boy who takes alcohol can never become a fine athlete. Good athletes take only nourishing food and plenty of exercise.

Using the Muscles. — Simply eating good food will not make you strong. You must use your muscles if you wish them to grow strong. The more you use them, the stronger they grow. Most men find it difficult to lift anything heavier than their

own weight, yet the trained athlete may develop his muscles until he can lift several times that amount.

If we do not keep our muscles at work, they grow weaker. Little babies move the muscles of their toes as easily as those of their fingers. After their feet have been confined in shoes for a few years, the toe muscles lose their strength, until they are of very little use.

STRENGTHENING THE MUSCLES BY THE USE OF INDIAN CLUBS.

Young children are so active that they keep nearly all their muscles in use, but when they get older they often stop running and jumping. The result is that the muscles lose much of their grace and quickness of movement.

If we wish to be strong, we must *use our muscles.* If we wish to be graceful, we must *use them all.* We should be careful not to use the same muscles too long at a time. Muscles grow better with a moderate amount of work than when they are worked too hard. Above all learn to stand erect, even when working.

Exercise. — The best kind of exercise is something that keeps you moving very actively and something that you enjoy doing; then both your muscles and your mind are busy. This is the reason why games are so good for children, and why hard and exciting games, if not kept up too long, are better than easy and quiet ones. Many kinds of work also give good exercise; the fact that doing them helps father or mother will make them all the more enjoyable. Outdoor exercise makes children stronger and more healthy in body, and also makes them brighter scholars. This is true of both girls and boys.

A Good Way to Learn How to Stand Straight.

Rules that apply to all work and exercise:

1. Keep your body in a good position; that makes work easy.

2. Do not bend your back too much; that cramps the organs of the body.

3. Play or work briskly; you will then get joy out of it.

4. Stop, if you can, when you are tired. After a little rest you will be ready to begin again.

5. Do not try to lift heavy weights, or to tax your muscles. The time for such exercises will come when you are grown up.

A Good Exercise to Strengthen the Muscles of the Back and Shoulders.
Note correct position of girl at right.

EXERCISES

1. Can you pick out the strongest girl and boy in your school? Get them to tell you what kinds of food they eat. How does their activity affect their strength? Do you take sufficient exercise to give you good health?

2. What muscles do you strengthen when you sweep, run, climb trees, pick up wood from the ground, and swim?

3. Mention some other exercises and the muscles that they call into action. If any of your muscles are weak, find out what exercises will strengthen them and perform these every day.

CHAPTER XXI

THE COVERING OF THE BODY

The Outer and Inner Skin. — The body is covered with **skin.** It consists of two parts, an *outer* and an *inner* skin. The outer skin is constantly wearing away and peeling off in little scales. If you stick a pin into this outer skin, it will cause no pain and bring no blood, because it has neither blood vessels nor nerves.

The inner skin is much thicker and is very sensitive. It is full of blood vessels and will bleed if it is cut.

In some places the skin is stretched tightly over the bones or flesh, as on the top of the head, the palm of the hand, and the knee. In others it is so loose that it can easily be pinched up with the fingers, as on the back of the hand, the upper arm, and the ankle.

The Skin as a Protection. — The skin gives great protection to the flesh and to the other delicate parts beneath it which need to be kept from injury. Have you noticed that when you have played base-

ball for a few weeks you have hard places on the inside of your hands? If you have ever been barefoot in the summer, you have noticed that at first your feet were very tender. After a few days, however, the feet became toughened, because the skin had grown thicker. This toughening and hardening of the outer skin is nature's way of protecting the flesh beneath.

The skin also protects the body in another way: it bars out the minute disease germs that are in the air. These might harm us if they should get into the body, but they cannot get through the uninjured skin. Sometimes, when this protecting skin is cut or bruised, these germs do get into the body. Then the wound becomes inflamed and a very painful as well as serious illness may result. To avoid this danger we should always follow the directions given for washing cuts and bruises with *clean* water, and for bandaging them with *clean* cloth. This is always important, for dangerous germs are almost sure to be found on the skin. They do us no harm while on the skin, but if they get into the body through the skin, they cause trouble.

The Pores of the Skin. — Hold your fingers close to a piece of cold glass. Notice the moisture that collects on the glass. The water comes from the

skin, and the experiment shows that a large amount is given out constantly through the skin. Look closely at the skin of the fingers, and you will see a great many ridges. Along the top of each ridge there is a row of tiny holes called **pores**, too small to be seen without a magnifying glass. They open into little tubes which lead into sweat glands.

The Sweat Glands. — There are more than two million **sweat glands** in the skin. They are constantly taking water from the blood and pouring it out on the surface of the skin, where it generally dries quickly and disappears. When we work or play hard or when the weather is warm, moisture comes through the skin so fast that it collects in drops. We then say that we are **sweating** or **perspiring**. The fact is that we really perspire all the time, but we do not notice it until there is so much perspiration that it will not dry quickly. If for any reason moisture fails to come through the skin, we become ill. When a person has *fever*, his skin is dry and hot; that is, he is not perspiring properly.

Regulation of Body Heat. — Some furnaces are so arranged that when they reach a certain degree of heat the draft shuts of itself. When the fire has cooled to a certain degree, the draft opens again. The skin does a somewhat similar service for our

bodies, when it acts as a heat regulator. We have already learned that the blood carries heat to different parts of the body, and that when there is too much heat the blood is cooled by being sent to the skin, where it is cooled by the air, which usually has a lower temperature than the blood.

The skin has another way of cooling the body. When we get very hot, we begin to perspire very freely. The perspiring actually cools us off, because evaporation of the moisture, or the drying of the skin, requires heat which is taken from the blood, thus cooling it. So if the body gets too hot, the hot blood goes to the skin, and the sweat pours out, thus cooling us off, just as an over-heated room may be cooled when the window is opened. If the body is cool, the sweating partly stops, and less blood goes to the skin. So the body heat is kept in, much as a room may be kept warm by closing the windows. In this way the heat of the body is kept at the same point in winter and in summer, no matter how warm or how cold the air may be.

The Hair. — Hair grows on all parts of the body except the palms of the hands and the soles of the feet. It is so short in most places that we do not notice it, unless we look carefully for it. Hair on the body is of great use to animals like cats and dogs,

keeping them warm and protecting the skin. It is of little use to us because we wear so much clothing. The hair on the head serves as an ornament, especially if it is well cared for. Each hair has at its root a tiny oil gland, which secretes oil enough to keep the hair soft. Brushing the hair helps to distribute this natural oil, and is better than the use of hair oil. Rubbing the roots of the hair with the fingers helps to keep the blood flowing vigorously through the scalp, and so stimulates the growth of the hair.

A Head of Hair That Is an Ornament

A Head of Hair That Is Anything but an Ornament

The Nails. — The finger and toe-nails, like the hair, are really parts of the outer skin. They protect the ends of the fingers and toes from injury. If a nail is injured, a new one grows in its place.

The Kidneys. — The body gets rid of some of its waste through the sweat that forms on the skin. There are other impurities which

are taken from the body by two important organs called the **kidneys**. Each of the kidneys is about the size of the palm of the hand. They are located just behind the stomach, one on each side of the backbone (see cut, page 97). They remove poisonous waste materials that are made as the body works, and with them a large amount of water. The kidneys, aided by the skin and the lungs, remove the greater part of the waste materials from the body. Carbon dioxid gas and water are thrown off through the lungs; water and some other materials from the skin; and much water, together with a substance called **urea**, from the kidneys.

EXERCISES

1. On what parts of your body is the skin the thickest? Is it the outer or the inner skin that becomes so thick? How can you tell?

2. Pinch the skin on the back of the hand. How thick do you think it is?

3. Sometimes you get a blister from rowing or digging vegetables in the garden, and the outer skin breaks. This makes the place very sore. Why?

4. What and where are the pores? Explain why perspiring cools the body.

5. Why is it necessary for every one to bathe his body frequently?

CHAPTER XXII

HOW TO CARE FOR THE SKIN

Since the skin has so many different and important duties to perform it should be well cared for. If injured, it becomes inflamed and sore and gives us pain. If we allow it to get sluggish, perhaps by wearing too much clothing or living too much in warm rooms, we not only suffer in cold weather, but we also "catch cold" easily. If we rub the skin too hard, when it is not toughened by use, it becomes blistered. If it is not kept clean, it becomes rough and unsightly.

Toughening the Skin. — Most of us probably enjoy washing our faces in cold water. Boys and girls who are so *fortunate as to sleep in unheated rooms*, with windows opened, sometimes find ice in their water pitchers when they dress in the morning. Washing the face in ice-cold water makes the skin tingle, and is very invigorating. But to plunge the whole body into iced water or into a snow bank would surely tax our courage. The reason is

largely because our faces have become accustomed to cold air and cold water and the skin has become toughened, while our bodies have been so carefully protected from the cold that the skin is tender and sensitive. By practice, however, we could make the skin of the whole body as tough as that of the face and hands.

The more we can toughen the skin, the less likely we are to take cold. Yet, living in very warm rooms as we do most of the time in a cold climate, it is not safe to risk the exposure that would be perfectly safe for people who live out of doors in all kinds of weather, as the American Indians did.

Bathing the Skin. — We may do much toward making the skin active, strong, and able to endure cold, by proper bathing. An active skin is one through which the blood flows briskly, and in which the pores or sweat glands are free and vigorous. If we do not bathe frequently, the body acquires an unpleasant odor. The dirt and the waste matter of the body thrown off by the pores collect on the skin like a thin, invisible film. If this waste is not removed, it not only produces a disagreeable odor, but it may help to cause serious skin diseases.

Young people occasionally say that the daily bath is "too much bother." If they will run over in

their minds the people whom they like and admire most, they will probably find that those who are doing things that are worth while are not afraid of "too much bother." The really big people find time to do small things well.

The bath is also of great importance as a means of stimulating the skin. For this purpose, the water we use must be cold. One kind of *cold bath* may be taken by washing the skin with a sponge dipped in cold water. Then there is the cold plunge bath, in which the whole body is covered with cold water, as when we go in swimming. There is also the shower bath in which cold water is poured or showered over the body.

A cold bath should always be followed by a vigorous rubbing of the entire body with a bath towel. This has the same effect on the skin that exercise has upon the muscles. It makes the skin active and strong. Before breakfast is the best time for a cold bath.

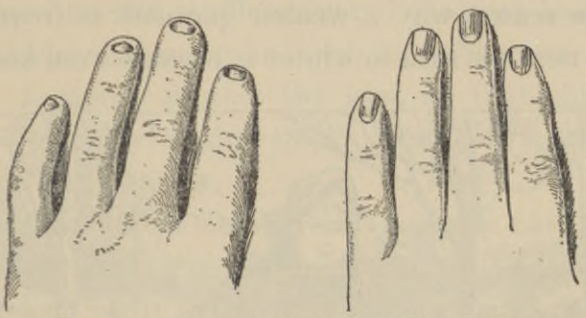
A child who acquires the cold-bath habit will be saved from many colds and other illnesses. At first it takes considerable courage to put cold water upon the skin in winter. Start by wetting say an arm or a shoulder, then gradually the whole body. Then rub until the flesh is pink in color. It is a good

plan first to dry the body with a linen towel, and then to rub it with a bath towel. When your body has been bathed and rubbed in this way, the blood will be hurrying through your blood vessels, the skin will be in a glow, and you will be in splendid condition to begin the day.

A *warm bath* cleans the skin but does not stimulate it. Cold baths are strengthening; hot baths may be weakening. Hot baths are helpful when one is very tired, as from a long tramp. If you take a warm bath for the purpose of cleanliness, the best time for it is just before going to bed. Neither a warm bath nor a cold bath should be taken immediately after eating. The stomach then needs more blood than usual and the bath would call too much of this blood away from the stomach to the skin.

The Care of the Nails. — The finger nails should be kept short enough so that there is no danger of their breaking. They should either be filed or carefully cut with scissors; but never cut or filed down to the *quick*, that is, to the tender skin under the nail. The nails should never be bitten, for this habit is not only vulgar, but it spoils the looks of the finger tips. The nails should be kept clean by removing the dirt that gathers under them every time the hands are washed. Do not try to clean

the nails when the hands are dry. If dirt is allowed to collect under the nails, the beauty of the hands



NOTICE THE DIFFERENCE IN THESE TWO HANDS.
The nails at the left have been bitten, those at the right have been well cared for.

is spoiled. Clean finger nails, daintily cared for, add greatly to the attractive appearance of boy or girl.

Clothing. The Best Kind to Wear. — We wear clothing both for comfort and for adornment. Clothes do not make us warm, but they keep the heat of our bodies from passing out into the air. The body should be well covered with clothing in cold weather. But as the clothing does not warm the body, but simply holds in the body heat, keeping it from passing off through the skin, clothing that conducts heat slowly will keep the body warmest. Linen and cotton carry the heat away rapidly, while woolen, which is a poor conductor, holds the heat. We should, therefore, wear linen and cotton gar-

ments in summer and, as a rule, woolen clothing in winter.

The reason why a woolen garment is frequently worn next the skin in winter is because wool keeps in

READY FOR WINTER SPORTS.

the body heat much better than cotton and so protects us from the cold. The clothing worn next the body should be changed often. It should all be

changed at night, so that it may be dried and well aired while we are asleep. Except in the coldest weather furs and mufflers around the neck keep the skin tender and make us much more likely to catch cold. Leggings protect the legs, so that children can safely play in dry snow. Rubbers should be worn in wet weather.

The Color of the Skin. — Did you ever notice that children who stay in the house much of the time are apt to look white and pale, while boys and girls who play out of doors in all kinds of weather have rosy cheeks? When we are in the warm sunshine, the skin becomes *tanned;* that is, the sun turns it brown. Which would you prefer to have, pale cheeks or rosy cheeks? A tanned skin or a white skin? Remember that light, heat, cold, and exercise in the open air all tend to make rosy cheeks.

EXERCISES

1. What habits help to keep us from taking cold? Do you practice these habits?
2. What is the value of taking a cold bath? Of a warm bath? Of a hot bath?
3. Why does clothing keep your body warm?
4. Is it desirable to wear woolen clothing in summer? Why?
5. What is the use of the finger nails? Do you see why this makes it important to take good care of them?

CHAPTER XXIII

INJURIES TO THE SKIN

From the Cold. — Once in a while, on a very cold morning, a finger or toe gets **frostbitten**, without one's knowing it. If some day when you reach school you are told that your nose or ear is frozen, you should go out of doors at once. Have some one rub the frozen place with snow, ice, or ice water until it begins to tingle. Thaw the frozen part gradually, so the blood will begin to flow again slowly, and the frozen part will soon be restored to its normal condition. If thawed quickly before a fire, it is liable to become inflamed and to cause trouble.

Chilblains, from which children so often suffer in cold weather, are caused by the continual heating and chilling of the feet. If you can keep the blood flowing vigorously through the feet, you will not be likely to have chilblains; but with the feet shut up in tight shoes the blood often flows sluggishly. The difficulty may usually be avoided by wearing warm

stockings and loose, thick shoes. Children who suffer from chilblains should bathe their feet with cold water every night, and should follow the bathing with a thorough rubbing to start the circulation of the blood. Cold water will relieve the itching for a time, and rubbing will tend to help cure the trouble.

From Fire. — Every one has had the painful experience of getting his fingers burned. The burned place becomes red and inflamed, and sometimes blistered. A slight burn will usually be relieved by dipping the burned part in cold water. A teaspoonful of cooking soda dissolved in a teacupful of water may be used for wetting cloths to place on the burn. If the pain continues, after the first burning sensation is relieved cover the burn with vaseline. For a severe burn, always call a doctor.

Wounds made with the toy pistols that once were used on the Fourth of July are very dangerous. Many children have lost their lives from such wounds. The pistols explode and carry into the skin dirt that is likely to contain dangerous germs. Far out of sight in the wound, these germs cause serious trouble.

Blisters. — When the skin is rubbed too hard, by work or by an ill-fitting shoe, a **blister** often forms. If the irritation continues, the blister breaks and this

gives a chance for dirt and bacteria to get in and cause a serious infection of the place. This is especially true of blisters on the heel where the colored stockings rub upon them. So it is well to let the water out of a blister by opening it at one side with a needle.

Corns. — If the shoes press too tightly upon the toes, the skin is apt to grow into a thick bunch, which may become painful and make it difficult to walk. We call such bunches **corns**. The way to avoid them is to wear properly fitting shoes, not so tight as to pinch the toes, and not so loose as to slip on the feet and rub them. It is easy for a child to avoid corns, but it is very difficult to get rid of them.

Warts. — Sometimes the skin grows into rough bunches called **warts**. If we let them alone they will usually disappear after a time. They are not caused, as some people believe, by handling toads.

EXERCISES

1. How would you treat a frostbite? A burn?
2. How can you avoid chilblains? How would you treat them?
3. Name the different kinds of skin injuries due to pressure or rubbing.
4. Why has the sale of toy pistols been forbidden in many cities?
5. Why should you prick a blister? Why at the side, rather than in the middle.
6. Do you get your shoes long enough and wide enough? Many people do not.

CHAPTER XXIV

HOW THE BODY IS GOVERNED

The Body's Constant Work. — If you sit still for five minutes, you may think you have been doing nothing in all this time. Yet your heart was beating, and the blood was circulating through the body; very likely your stomach was digesting food, and the blood in the villi was taking up some of it; you breathed a hundred times or more, taking in fresh air and sending out poisonous gas; you winked every two or three seconds, and probably moved your hands and feet a number of times, besides swallowing and rolling your tongue. With all these complicated actions going on at the same time, there were no mistakes made and no confusion.

While you were sitting still you were also doing something else: you were *thinking*. You may have been thinking of the baby at home, of the games you would play at recess, or of what you hoped to have for dinner. At least you were thinking of something, for when we are awake, we never stop thinking.

The Mind Controls the Body. — The thinking part of us we call the **mind**. If there is a rosy apple on the table, something in us sees it and decides that it would taste good. Then that something sends a message to the muscles of the arm and hand telling them to pick up the apple and carry it to the mouth. The something that really sees, feels, and tells our muscles to move is the mind. We know too that it directs all the motions of the body so that they work in harmony. We do not know just what the mind is, but we do know that it is in the brain and works through the brain.

Brain and Spinal Cord.

What the Brain Is. — The **brain** is, therefore, the part of the body through which we think. It may

be called the king of the body. If we think that we want to run across the school yard at recess, King Brain instantly orders our muscles to contract, and off we go. We think it is time to study. The brain makes our feet walk to the desk, makes our hands pick up the book and open it, and makes our minds begin to learn the lesson.

The brain is formed of a soft, delicate substance. The outside surface is not smooth like a ball, but is covered with small ridges and with deep furrows known as **convolutions**. The brain is inclosed in a tight box, a part of the skull, called the cranium.

The human brain is the most wonderful part of the body. It is because our brains are more highly developed than the brains of other animals that we can do so much more than they can. It is because man has a large and highly developed brain that he has learned to read and write, has found out how to make engines and build railroads, and how to do all the wonderful things which he can do.

What the Brain Does. — The brain, like the heart, is always at work; there is much of its work that we hardly ever notice at all. We know some of the things it does while we are awake; it also works when we are asleep, though its work then is not nearly so hard. The duties of the brain are of three kinds.

1. It receives reports from its messengers, which tell it what is going on outside of the cranium.

2. After receiving the reports, it decides what should be done.

3. After deciding what is to be done, the brain sends messages to the different parts of the body, telling them what to do.

The brain and its helpers are like a telegraph system. The brain itself is the operator, and it is constantly sending messages to this or that muscle, or even to hundreds of muscles all at once. A telegraphic message passes to its destination over wires strung on poles. A message from the brain passes to the muscles by means of tiny white cords, called **nerves**. The brain is connected with every part of the body by these nerves. If you prick your finger, you feel pain. The pin touched a nerve. The nerve instantly sent a message to the brain, and the pain was the result. It is through the messages the brain receives that we learn all we know of the outside world.

The Nerves. — You may wonder how the brain, shut up in the skull, can know what is going on in the world. Remember that it is constantly receiving innumerable messages through the little white **nerves**, which extend from all parts of the body to

the brain. One large bundle of these nerves runs down the back. It is called the **spinal cord**. Many smaller nerves branch off from the cord and run to every part of the body. Some of the nerves go to the muscles, others to the skin. These nerves are all connected with the brain or with the spinal cord, which takes and answers such messages as it can, to help the busy brain.

Kinds of Nerves. — There are two kinds of nerves.

1. Nerves that carry messages *to* the brain. Through these nerves the brain gets all its knowledge of the outer world. They are called **sensory nerves.**

2. Nerves that carry messages *from* the brain. These carry the brain's commands to the different organs. When the brain wishes to move a finger, it sends an order over one of these nerves to the muscles that move the fingers, and the muscles instantly obey. These nerves are called **motor nerves.** If a motor nerve should be cut so that it could not carry a message, we could not move the muscle which that nerve controls.

If you pinch your finger, a message instantly passes along a sensory nerve to tell the brain about it. You do not feel the pinch until the message reaches the brain. It is not the finger that feels, but the brain;

and if the message did not reach the brain, you would know nothing about it. So if the sensory nerves running from a finger to the brain were cut in two, we might crush the finger, but we should not feel any pain.

EXERCISES

1. Is the brain more carefully protected than any other part of the body? Why?

2. Mention various actions going on in your body when you are sitting perfectly still. What controls these actions?

3. Have you ever seen a brain? If not, secure a sheep's brain and carefully examine the various parts. Notice the place where the spinal cord is attached.

4. The more intelligent the animal, the more convolutions there are in its brain. Would the brain of a bird or that of a dog have the more? Explain.

5. When mother calls you to dinner, what makes the muscles of your legs carry you so quickly?

CHAPTER XXV

THE CARE OF BRAIN AND NERVES

Work. — We have learned that we must use our muscles if we wish them to grow strong. The brain, too, grows stronger by use. When you first went to school, you found it hard to recognize the simplest words. Now you can read without any difficulty. Children go to school in order that brain and nerves may be trained to work quickly and accurately. The brain that is well trained can do one thing at a time without thinking about anything else. It is not always easy to learn to do this, but if we train our brains to be good servants, we are more likely to become useful men and women. The first rule then is: *Keep the brain busy;* the harder it works, the stronger it becomes.

Recreation. — "All work and no play makes Jack a dull boy." In order to keep his brain and nerves healthy, "Jack" must certainly have some recreation, or play.

Games are the best form of recreation for children. When we play active games, we use the muscles,

and the fun we have rests our brains. Besides, we have to learn to think quickly if we are to win; and quick decisions mean a useful brain. When you play, play to win. It is by trying earnestly to win in the games we play that we enjoy them most. Always "play fair"; there is no satisfaction in winning by some trick or through the carelessness of a better player.

Sleep. — The second rule is: *Give the brain plenty of rest.* Some parts of the brain work all the time. Other parts need rest, after a day of play and work, just as much as the body needs rest. The brain is relieved of much of its work when we sleep. It has to keep the heart beating properly and to look after the muscles, for the muscles of breathing keep on working at all times; but when we are asleep, we are not thinking, talking, moving about, or exercising, and the brain is resting.

It is a mistake to study or work when you are sleepy. The lessons that you try to learn then you do not remember. It is better to leave them, go to bed, and rise a little earlier than usual the next morning, when you are rested and fresh and can think quickly.

People rarely take too much sleep. Children ten years old need nine or ten hours' sleep, and young

children much more. We sleep much better if we go to bed at the same hour every night; the body likes a regular bedtime just as much as it likes regular mealtimes. To sleep well, we need plenty of fresh air in the room. In cold weather the bed covering should be warm enough so that we never "sleep cold."

Soft, fluffy pillows make a bed look comfortable, but they help to make the sleeper round-shouldered by keeping the head too high. It is much better to use a thin pillow, or none at all. The body should be stretched out when we sleep, with the spinal column straight. It is foolish for well people to get into the habit of thinking that they can sleep in only one position.

Habits. — The third rule is: *Form good habits.* There may be other boys and girls who feel like the children who said that they had heard about "habits" until they were tired of the word and never wanted to form any kind of habits. The fact

FOUR GOOD HEALTH HABITS.

is that we are all forming habits whether we like to or not. Every time we do anything, we make it easier for the brain and the nerves to do the same thing in just the same way another time. So we are bound to make habits of some kind, good or bad, in everything that we do.

Bad habits are formed in the same way that good ones are formed — by doing things repeatedly. Doing them in the right way forms good habits that help us; doing them in the wrong way forms bad habits that hinder us. Did you ever watch a schoolmate trying to overcome the habit of holding his pen in the wrong position? It was hard to change that habit, although it would have been easy in the beginning to learn to hold the pen in the right position. So in all cases, the easiest time to form good habits is when we are learning to do things. If we take care then to do them in the right way, we can trust the brain and the nerves to keep on doing them in the right way.

We should get into the habit of sitting and standing straight. We should make it a habit to take regular exercise. We should always tell the truth. We should work hard when we work and play hard when we play. We should always be kind and speak pleasantly. If we form such good habits early, they will always stay with us, and will make

our lives happier and better. Every good habit is like a beautiful garment that will wear and be beautiful all our lives.

Going to bed at a regular time every night, having our meals at regular times every day, studying at regular hours, and performing cheerfully whatever duties about the house may fall to our share — all these are splendid habits.

Use of Narcotics. — The fourth rule is: *Keep the brain clear.* Some people have formed the bad habit of using certain drugs, called **narcotics**, that put the brain to sleep. This is an unnatural sleep and very harmful. Opium, paregoric, and soothing sirup are some of these drugs.

Alcohol is another kind of narcotic, which is used even more commonly than opium. *Drinks that contain alcohol, such as beer, wine, ale, and whisky, dull the mind.* The person who forms the habit of using them cannot think clearly. This is because alcohol makes such changes in the brain and nerves that they simply cannot do their work right. Men often believe that they can work better when they have taken a little alcohol, but the alcohol neither strengthens the muscles nor makes the brain clear. What it does is to make the man's judgment uncertain; he thinks he is doing much better than he really is.

Sometimes an ignorant person gives paregoric or soothing sirup to a crying baby to quiet it. This person forgets that the baby would not cry unless it was sick or uncomfortable and that what should be done is to find out the real cause of the trouble and remove it. A narcotic, or soothing drug, should never be given to or taken by a person except as ordered by a physician. The doctor knows when and how to use narcotics in such a way as to help the sick person.

It is always a safe principle to go on, therefore, that narcotics and drugs are harmful to the health, except when taken under a doctor's directions.

Use of Cigarettes. — Tobacco has also a bad effect on the brain. The boy who learns to smoke cigarettes loses his brightness and is almost sure to be a dull, poor scholar. If you want to become a bright scholar and a strong man, let cigarettes and all forms of tobacco alone. If you want to be successful in sports and games, you must have nothing to do with cigarettes.

The keen, strong, healthy man is the man who succeeds in life. To be strong and capable you must have a clear brain. Train your mind by faithful study, strengthen it by work, keep it bright by sleep and recreation.

EXERCISES

1. Which of your playmates have the most active brains; the ones who are always busy or the lazy ones? Why?

2. Why do you need to sleep? If you are sleepy when it is time to get up, would it be better to go to bed earlier or get up later? Explain.

3. When you lie on your back with your head on a large pillow, is your spine straight or curved?

4. Is it easier for you to skate now than it was when you first started? Why?

5. Do grown people form habits? Who forms them more easily, you or your father?

6. What is the difference between the sleep you have every night and the sleep caused by a narcotic? Can you tell what each does to your brain?

7. Why is smoking a bad habit for boys to form? What are the various harmful things that this habit does to the nervous system?

CHAPTER XXVI

THE STORIES TOLD TO THE BRAIN

The Brain's Sentinels. — The brain learns about things outside the body through the messages that it receives from its sentinels — the sense organs. We call these messages sensations. We sometimes say there are five kinds of sensations, *sight*, *hearing*, *taste*, *smell*, and *touch*. But really there are several more, like the feelings of *cold* and *warmth*, of *hunger* and *thirst*. We have many feelings, and if it were not for the way in which the brain learns to tell what they all mean, we should know very little about ourselves or the world in which we live. Let us see what the messages are from which the brain discovers so much.

The Sense of Touch. — Touch your skin in several places with the point of a pin. Can you find any spot that does not feel the point? Wherever you feel the pin, there must be a sense organ to receive the sensation and, leading from it, a nerve to take the message to the brain.

The sense of touch tells us whether objects are hard or soft, smooth or rough, and whether they are

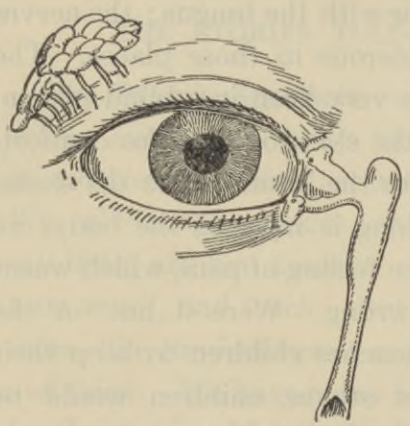
pressing the skin forcibly or gently. Some parts of the skin are more sensitive to touch than others. We know that by experience, for when we want to learn all we can about some object we touch it with the tips of the fingers, or with the tongue; the nerves of touch are most numerous in those places. The sense of touch becomes very keen in a blind person.

If an object presses the skin too hard for comfort, the message that goes to the brain causes the sensation of pain. If anything is injuring the body, we are almost sure to have a feeling of pain, which warns us that something is wrong. Were it not for the feeling of pain which teaches children to keep their fingers away from hot stoves, children would be constantly burning themselves.

The Sense of Sight. — *The Eyes.* — The sense of **sight** makes it possible for the brain to know what is going on outside of the body, even a long distance away.

The eye is a wonderful and very delicate organ. The round part of the eye is the **eyeball**; the circle of color is the **iris**, and the black spot in the center of the iris is the **pupil**. This is really not a black spot, but a hole in the eye through which light is let in. When we look toward a bright light, the pupil grows smaller. When we are in a place that is partly dark, the pupil grows larger to let in more light.

The eyes are very carefully protected from injury by little curtains of skin, called the **eyelids**, and by fringes of curved hairs on the edge of each eyelid, called the **lashes**. Both the eyelids and the lashes help to keep dust out of the eyes.



THE EYE, SHOWING TEAR GLANDS AND TEAR DUCTS.

Have you ever noticed how smooth and moist the surface of the eye is? This is because it is being constantly bathed by a liquid we call tears, which washes away the dust and keeps the surfaces moist. The **tear gland** is just above the eyeball, on the side away from the nose. These tears are flowing over the eyes all the time to keep them moist and clean. They pass out of the eyes into the nose through little tubes. When cinders or dirt particles get into the eyes, or when we cry, the tears flow faster than they can pass off through the tubes, and run down over the cheeks.

A special nerve, called the **optic nerve**, carries messages from the eye to the brain. It is the brain that really sees what is outside the body; but it

could not see without the messages from the optic nerve.

The Sense of Hearing. — *The Ears.* — Messages carried to the brain from the ears also tell us what is going on outside of our bodies. The real ear, in which the organ of hearing is located, is inside of the head, protected by the skull. What we commonly call the ear is only a broad piece of thin cartilage that serves as a kind of trumpet to make the sound louder. The opening in this trumpet passes to the real ear. A little inside of the opening, a thin skin, or membrane, is stretched tightly across the tube. This skin, or **eardrum**, is very delicate and if injured, deafness often results.

The Sense of Smell. — *The Nose.* — The sense of smell is located in the nose. We smell by sniffing air into the nose, and we really get the sense of odor only from gases. This is hard to realize when we are so seldom conscious of smelling any kind of gas, and are getting odors all the time from food and from other solid bodies. That, however, is because the food gives off vapors or gases which we know nothing about except as we smell them. So through the sense of smell we learn something that none of our other senses tells us. The sense of smell is also of use in warning us of the presence of injurious gases in the air.

The Sense of Taste. — *The Tongue.* — The sense of taste is located in the mouth, partly in the tongue and partly in the roof and sides of the mouth. We know by the taste whether what we take into the mouth is pleasant or not. Whatever tastes really bad is usually unfit to eat.

But this does not mean that we should not eat any food that happens not to please our taste at first. Children are often most unwilling to eat what is wholesome for them. This is not because the wholesome things taste bad to them, but because they like better the taste of certain other things, like sweets. Taste can be cultivated; we can learn to enjoy food that at first we disliked.

EXERCISES

1. Name the various kinds of messages your sense organs can send to your brain.
2. Which is the most sensitive part of your fingers? Why do you think that this is so?
3. What is the use of pain? Are pain spots close together?

CHAPTER XXVII

THE CARE OF THE EYES AND EARS

Something in the Eye. — We can wash our faces and hands when they are soiled, but it is not so easy to cleanse our eyes; to a great extent, they must take care of themselves. If a cinder or a bit of dust lodges in your eye, you feel a sharp pain, and very soon the tears are rolling down your face, the tear glands making more tears than usual in order to wash away the cinder. Unless it is caught tightly in some corner, or under the lid, the cinder will soon be gone and the pain will be over. If the tears do not quickly wash it out, take hold of the upper lid and draw it gently over the lower lid. This will often dislodge the cinder so that the tears can wash it away. If it is not removed by this means, a physician should be consulted. Never rub the eyes.

Bathing the Eyes. — If, when you first awake in the morning, you find it difficult to keep the eyes open, wash the lids with cold water. If the eyes ache, do not rub them, but close the lids and hold the fingers lightly over the eyelids for a few minutes.

There are some serious diseases of the eyes that may be carried from one person to another. These are caused by tiny germs that get into the eyes. The germs may be carried from one person to another, by using the same towel or handkerchief to wipe the eyes. It is therefore dangerous to use a *common towel;* that is, a towel that has been used by other people.

Using the Eyes. — The eyes were made to use, and unless we abuse them, they will serve us well all our lives. We may use them until they begin to ache. Then they are tired and need rest. It is a good plan, when we are studying, to look away from the book every little while, fixing the eyes upon some distant object. The green of trees or grass is a restful color to the eyes. If you can look out of the window at a bit of green once in a while, your eyes will return to the fine print much refreshed.

We should never read by a flickering light or in a dim light. We may go occasionally to the " movies " without harm to the eyes, but by going too frequently we are likely to injure them. We should not allow a bright light to shine on the book we are reading, or into the eyes. Never look steadily at a bright light. Reading when lying down or when reclining in a hammock is also injurious to the eyes.

Nearsightedness. — Children who read a great deal sometimes become nearsighted. This means that they cannot see clearly objects at a distance from their eyes. The trouble is usually caused *by holding the book too near the eyes or by leaning over a desk to study.* We should sit erect while reading or

A Good Position for Reading.

studying, holding the book about fifteen inches away from the eyes. Can you clearly see the words in this book when the page is twenty inches from your eyes? If you cannot, you should have your eyes examined by an oculist.

If your eyes pain you or if you have headaches when you study, tell your teacher and your parents, so that they may find out whether there is anything the

matter with your eyes. Headaches are often caused by trouble with the eyes.

Taking Care of the Ears. — Shouting or blowing into the ears of a schoolmate may be fun for you, but it may be dangerous to him. As you have already learned, the eardrum is stretched tight across the passage into the real ear. You know that a piece of paper can be punctured much more easily when it is stretched tightly over a hoop (such as the riders use in the circus) than if it were stretched loosely. So do not risk what might happen to the eardrum if it were struck by a blast of air such as is produced by a loud shout close to the ear. In order to deaden the sound and prevent injury to the eardrum, men who fire off cannon put cotton into their ears.

Nothing sharp, like a toothpick, or the head of a pin, should ever be put into the ear. If the ear wax is removed occasionally with a cloth or with the end of the little finger, there will be no occasion for using any sharp instrument.

Sometimes a bit of dirt gets into the ear, or an insect may fly into it. The first impulse one has is to put something like a pencil into the ear to push out the object. That is just the wrong way to go about it. The right way is to wash out the dirt or the insect.

Turn your ear down, and let some one put warm water into it with a syringe; that will wash the dirt out. In the case of an insect it is better to use oil in the syringe, for the oil will either bring the insect out or kill it, and then it can be readily removed without danger to the ear.

EXERCISES

1. Have you ever removed a particle of dust from your eye? Try the method of drawing the upper lid over the lower, holding it there while you count fifteen, and then allowing the former to go back.

2. Why may the use of a common towel or a borrowed handkerchief be bad for the eyes?

3. How can you rest your eyes when you are reading? Why are the moving pictures bad for the eyes?

4. Do you know any nearsighted people? Where do they hold books or papers when they are reading? Measure the distance at which you can best see the print of a book. Are you nearsighted?

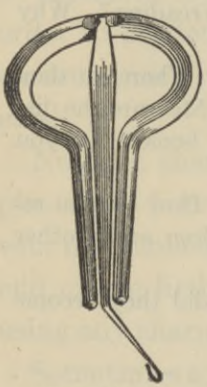
5. Does your ear ever itch in the inside? How do you remove the cause? Have you seen other children apply other methods? Which is the best way?

6. Do you know any deaf people? How did they become deaf?

CHAPTER XXVIII

THE VOICE

The Human Voice. — We sometimes say that a parrot can talk, but the parrot only imitates the sound of words it has heard, without understanding them, and cannot combine the words into new sentences. Human beings can not only change the tones of the voice, so as to make it pleasant or harsh, but they can form it into words and sentences by which they tell one another of their thoughts. The human voice is a wonderful thing.



JEW'S-HARP.

How We Make Sounds. — We know the **larynx** is located just at the top of the windpipe; we also know that the air from the lungs passes through the larynx when we breathe. A jew's-harp, such as is shown in the picture, may help us to understand how sounds are made. If you have ever played one, you have felt the wire

moving rapidly back and forth, vibrating, as we say. If you set a large bell to ringing and then touch the rim of it with your fingers, you can feel the quivering or vibrations. Indeed, all sound is produced by the vibration of something. If the object vibrates rapidly it gives a high sound; if it vibrates slowly, it gives a low sound or tone. To make the tone of a violin string higher, the violinist tightens the string and so makes it vibrate faster. The voice is produced by vibrations of which we are not conscious because they are made where we can neither see nor feel them.

The Vocal Cords. — Inside of the larynx are two tiny flat bands, called **vocal cords**. When we are merely breathing and do not want to make sounds, these cords lie loosely against the sides of the larynx. When we desire to make sounds, they are stretched tightly across the larynx, with only a little opening between them. When air is forced through this opening, the cords are set to vibrating, causing the sound, or voice.

Attached to the vocal cords are tiny muscles by which they may be tightened or loosened. When the muscles are loosened, the slit between the cords is widened; when the muscles are tightened, the slit is narrowed. Tightening them makes the cords

vibrate faster, and gives the voice a high pitch. When we sing we change the tightness of the cords with each different tone. It takes considerable practice to enable us to get these cords just tight enough to give correctly the tone we are trying to sing. When we are talking there is much less change in the tone, though we change it somewhat, either to give emphasis to words or to make the sound of the voice more agreeable.

How the Voice Is Shaped. — When the tone is formed by the cords and comes out through the mouth, it is shaped into different kinds of sounds by the teeth, the tongue, and the lips. You have discovered this in learning how to form the vowel and consonant sounds. When they are all carefully formed, the speech is very pleasing; we sometimes say that it is musical. If the voice were not shaped into speech, as we call it, all the sounds would be alike, or would differ only in tone or pitch. How, then, could we ever understand one another?

The Care of the Voice. — We need not pay much attention to the care of the voice, if we will remember just two things. When we scream, or try to sing at " the top of our lungs," we are likely to strain the vocal cords, thus making the voice rough and harsh. When the throat is sore or when we are hoarse, we

should not use the voice more than necessary, for then the vocal cords may be easily strained.

EXERCISES

1. While you are talking, feel your throat and find the larynx or "voice box." Speak in a low, "rumbly" tone and then in a very light, "squeaky" one. Did the larynx feel just the same?

2. Hold something in your mouth. Can you speak clearly? Hold something between your lips. How does this affect your speech? Can you speak without moving your tongue?

3. Which of your friends has the pleasantest voice?

4. Why do people take singing lessons? Which seems to you more important — to have a pleasant speaking voice or to know how to sing? Why do you think so? Are you satisfied with your voice?

5. Try speaking while you hold your nose. Is the result pleasant? It sounds as though you had a bad cold. Now try letting the voice go through your nose instead of your mouth. Does this sound any better? Do you see why we should use the nose for breathing, and the mouth, tongue, and lips for forming the words?

6. How may one correct the habit of "talking through the nose"?

CHAPTER XXIX

WHY WE GET SICK

WHEN we are sick there is always a cause for it; if everything is going right in our bodies, we keep well. Some of the causes that make us sick are easy to understand. When a person meets with an *accident*, breaks a bone, or cuts himself badly, it is easy to see that the action of his body will be more or less interfered with, until nature has a chance to repair the injury.

We know also that if one takes a *poison* through some accident, it will cause sickness almost at once, and that if much is taken, it may cause death. If there are poisons in the house, they should always be labeled POISON in large letters, and it is best to have these labels red, so that there may be no possibility of mistake.

Every one has heard stories about certain animals whose *bite* is poisonous, like the bite, or sting, of a rattlesnake. Fortunately there are very few animals in our country whose bites are poisonous. Some

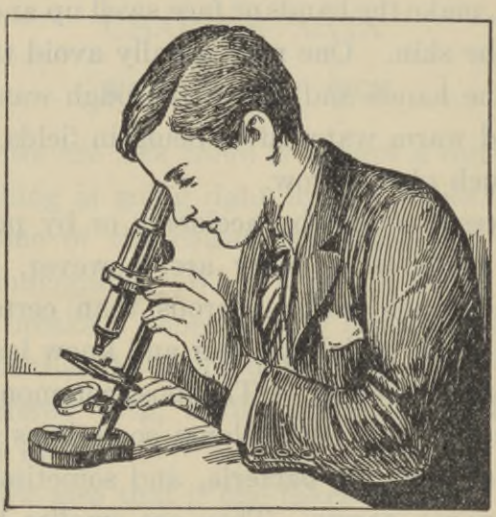
plants, too, are poisonous even to touch. You have probably heard of *poison ivy* and perhaps of *poison oak*, *poison dogwood*, or *poison hemlock*. They are not poisonous enough to kill us, but they may, if touched, make the hands or face swell up and perhaps blister the skin. One may usually avoid trouble by giving the hands and face a thorough washing with soap and warm water after being in fields or woods where such plants grow.

Sicknesses caused by accidents or by poisons are easy to understand; they are, however, less common and much less dangerous than certain other diseases about which we hear and know less.

Bacteria or Germs. — The most common causes of sickness are tiny little plants sometimes called by their family name, **bacteria**, and sometimes by the shorter name, **germs**. They are smaller than anything you can imagine, hundreds of them being able to cling to the point of the finest needle. Of course they cannot be seen with the unaided eye, but through a *microscope*, which makes things look a thousand times as large as they really are, we can see them. They are very simple little things, some of them shaped like balls, some of them like short lead pencils, and some like corkscrews.

Like all plants these tiny bacteria feed and grow.

One remarkable thing about them is the rate at which they increase in numbers. If you give one of them plenty of proper food and sufficient warmth, it may in one day increase to seventeen million



By Means of the Microscope We May See Germs.

germs. At that rate of increase, they may soon become so numerous that, tiny as they are, they can do a great deal of good or of harm.

Friendly Bacteria. — Bacteria are found almost everywhere. They are in the air that we breathe, in the water, milk, and other food that we take, and in the soil under our feet. In most of these places they *do no harm* and in some they really do good. For

example, they work in the soil, preparing it for plants, and thus by *fertilizing the soil*, help us to get our foods. They also help to give us the flavors we like so well in cheese and in butter.

Then, too, they are at work all around us, consuming various forms of refuse matter, thus helping to keep the soil sweet and clean. So you see that some of these tiny bacteria are really our invisible friends.

Destructive Bacteria. — There are other forms of bacteria, however, that like the same kinds of food that we do. When they get into our meat or our eggs or milk, they begin to consume them. We then say that the meat is *spoiled;* that the egg is *bad;* or that the milk is *sour*. The real fact is that the invisible bacteria are beginning to destroy the food, and as they do so they produce the bad smell with which we may be familiar.

Bacteria.

One way to protect our food from these bacteria is to *keep it cold*. We place food in an ice chest because the bacteria will not thrive or act on food which is very cold. We should be especially careful always to keep milk in an ice chest. Another way to protect

food is to *heat it* by cooking. This kills the bacteria, and thus it is easier to keep cooked food from spoiling. When milk is pasteurized, the germs that make it turn sour cannot act upon it so quickly, and so the milk stays sweet longer.

Bacteria are sure to spoil our food, in time, if it is not properly protected. Fresh food should be kept away from other food that has begun to spoil; otherwise the microbes in the stale food will pass into the good food and quickly spoil it also. Many fruits and vegetables are guarded from bacteria by their skins; as soon as the skin is broken there is opportunity for the bacteria to make their way in. Fresh meat is quickly spoiled by being placed near meat that is tainted. Fresh milk should never be poured into a pitcher that contains any stale milk. You will be able to apply these principles to many other cases.

Germs That Cause Disease. — We have seen that most of the bacteria are either doing us a service, or at the worst are consuming some of our food unless we take good care of it. But there are a few kinds of bacteria that are positively dangerous to us; they are able to live, feed, and grow in our bodies if they once get into them. We call these **disease germs** because they produce disease. Some of them like

to live in the lungs, others in the stomach, others in the blood or in the brain. You can easily appreciate that there would be trouble if some of them should get into the brain, or into any other part of the body.

If they really get into the body and begin to increase, illness results. We may wonder what we have done to cause the illness. We do not understand the aches and pains. It has been said that these disease germs are the body's worst enemies; but usually they can be made quite helpless when we understand how they live, how they are carried from one person to another, and how to prevent their being so carried. It is our ignorance and carelessness that make them so dangerous to us.

EXERCISES

1. Have you ever been poisoned by a plant? What was it and how did the poison affect you? What was done to help the sore places?

2. What insects or other animals have ever poisoned you? Did they bite or sting? What remedy did you use?

3. Take a small amount of fresh milk, divide it into two equal parts, putting each in a *clean* glass. Place one in the refrigerator and one in the warm kitchen. See how soon each sours. Explain.

4. Make a list of the good things and of the bad things that bacteria do.

CHAPTER XXX

DISEASE GERMS

How Germs Are Carried. — The germs that cause disease do not usually live very long outside of the body. If your brother is ill with one of these germ diseases, it means that in some way the germs have been carried to him from some one else. The bacteria cannot travel by themselves; they must be carried from person to person if the disease is spread. Let us see how they get a chance to travel.

When one is ill, the disease germs are about his body, in great numbers — on his hands, and his clothing, or in his mouth. If a healthy child should kiss the mouth of any one who was ill with diphtheria, he would almost surely get some of the germs into his mouth, and would be likely to catch the disease. So one who is well may get the germs directly from one who is sick. In most cases germs are not spread in this way, because we appreciate the danger and guard against it.

Getting Germs Indirectly. — Germs may be carried from a sick person whom we do not even see. *The*

dishes, *forks*, or *spoons* that are used are likely to have the disease germs on them. These should never be used again until they have been scalded in hot water to kill the germs. The *clothing* that a patient wears, his handkerchiefs, or anything he has touched, may hold the germs and thus be the means of carrying the disease to others. The discharges from the patient may contain germs; hence the safest way is to regard them as always poisonous.

When there is germ-caused sickness in the house, many dangerous disease germs may be floating in the air. These may settle on the furniture, on the walls and floors — everywhere, in the dust. You can readily see how easily they may be taken up on the hands and how easily they may get into the body, if the fingers are put into the mouth.

Food and milk sometimes contain the germs of disease, but the remedy is simple, for cooking or pasteurizing kills the germs. Several kinds of disease germs will live and grow in milk. Hundreds of cases of scarlet fever and severe sore throat in a single community have been traced to the milk of one dairy. Because it is difficult to keep milk clean it is becoming very common to pasteurize it before it is used, in order to kill the germs.

The water that we drink may distribute germs. In most cities the water supply is properly cared for.

Some Ways in Which Disease Germs Are Carried.

There is greater danger from this source in the country where many people have to depend upon their own wells than in towns where river water is used.

Getting Germs from Animals. — Animals are frequently to blame for carrying disease germs. You may have thought of the *fly* as a harmless creature, but you would know better if you could see the disease germs that flies sometimes carry on their feet and legs. They get these germs, especially those of typhoid fever, from the filth on which they feed. If they happen to light on our food, or in the sugar bowl, they may leave there a lot of these germs which we unknowingly swallow

The Common Fly.

with the food. Screening windows and doors will prevent the entrance of many flies. To get rid of them, however, we must destroy the places where they lay their eggs and raise their young — clean up the manure pile, cover the garbage can, and allow no filth to collect in the yard.

Mosquitoes trouble us by their sting, but that is not always the worst effect of their biting us. There

THE HOME OF THOUSANDS OF INSECTS.

are two kinds of mosquitoes that carry disease germs. One of these, which is found in most parts of our country, causes the disease that is known as *malaria*. The other mosquito, which is almost never found in cold climates, carries the germs of *yellow fever*, one of the worst and most fatal of diseases. Even the harmless mosquitoes are a great nuisance. The way to fight them is to prevent their laying their eggs

and rearing their young. For this they need standing water, so we should banish every receptacle that catches rain water, and drain pools or ditches where water collects. In addition to this every house should have its windows and doors guarded by mosquito netting.

How Knowledge Helps. — Now that people know about these germs and how they are spread, it is much easier to guard against them than it was a few years ago. Your grandfather can remember when there were all sorts of notions about the cause of certain diseases. Then nobody knew about germs. But now, having discovered how most kinds of disease germs are likely to be carried from a sick to a well person, we know what to do to stop the spread of the diseases. As a result the diseases caused by germs are far less common and do far less damage than they did when your fathers and mothers were children.

EXERCISES

1. Name all the germ diseases you know.
2. Mention three ways by which germs may be carried from a sick to a well person.
3. Why will covering the garbage can and tipping over rain barrels help to prevent disease? What diseases are prevented in this way?
4. How does knowing what causes sickness help us to avoid it?

CHAPTER XXXI

CONTAGIOUS DISEASES

Diseases That Are "Catching." — From what we have learned about germs we can see that we are likely to get the disease germs into our own bodies if we associate with a person who is sick with a contagious disease, or if we touch things he has handled.

Children's Diseases. — Some of the contagious diseases are often spoken of as children's diseases. This simply means that children frequently have them, while grown people seldom do. Before much was known about them it used to be believed that every child had to have these diseases at some time, and so no particular care was taken to prevent a child from taking any except the most dangerous of them. Now we know that boys and girls who escape these diseases until they are fifteen or sixteen years old are much less likely to take them at all, and may escape them entirely. With the knowledge we now have about these diseases we should use every possible care not only to avoid having them ourselves but not to expose other people to them.

Measles, chicken pox, whooping cough, and *mumps* are the less serious of the children's diseases. They make a child sick for a few days, but in ordinary cases they are not very severe. With measles and whooping cough, a child is sometimes very ill. All these diseases are contagious; keep away from exposure to them if you can.

Scarlet fever and *diphtheria* are children's diseases, contagious, and sometimes very serious. Our doctors have, however, found a way of treating diphtheria by what is called **antitoxin**; its use generally leads to a quick recovery. Both of the diseases are so dangerous and so serious in their after effects that children should be shielded, in all possible ways, from exposure to them.

Smallpox. — One of the most dangerous of contagious diseases is called smallpox. It used to be very common; but since **vaccination** has become general, the disease is more rare. In countries where all children are properly vaccinated, smallpox has almost disappeared. From this you will understand why many communities require all children who attend school to be vaccinated.

Most of the contagious diseases can be avoided if we are careful to keep away from those who are ill. Children should remember too that dangerous germs may get into their mouths through such habits

as putting lead pencils into the mouth, biting one's finger nails, drinking from a common drinking cup, using a common towel, or borrowing another's handkerchief.

Common Colds. — How often you hear some one say, "Oh, I am very well, thank you, except for this cold," as though a cold were of no consequence whatever. Most persons seem to believe this, and behave accordingly. They go to church, to theaters, to parties, to school, exactly as if their colds were nobody's concern but their own. And what is the result? The cold is passed on to many others. We say a cold "goes through a family" or through a school. The teacher of your school perhaps has to report sometimes that half her pupils are detained at home by colds, and people lay it to the bad weather — snow, rain, thaw, or whatever it may be. To be sure, the weather does have something to do with an epidemic of colds, because when our bodies are wet or chilled they cannot so easily resist any kind of disease, especially those diseases which affect the respiratory system.

In spite of all this, the blame rests chiefly upon the careless person who has gone about perhaps "giving" his cold to others. Yet we must not blame him too much, for he has been doing what nearly every one

else does. Simply because common colds are usually not very serious, at most making the patient uncomfortable and perhaps keeping him at home for a day or so, no one stops to think very much about his duty to others. Instead of keeping to himself, he tries to go about his business as usual.

It is serious to have many people even mildly ill for a short time, when all might have been spared this inconvenience if the first person to get the cold had been willing to give up and stay away from others for a few days. When it becomes necessary for a person with a cold to be in a room with other people, he should always avoid sneezing or coughing save with nose and mouth closely covered by a handkerchief.

Children with enlarged tonsils or with adenoids are apt to be subject to colds and other respiratory diseases. Children whose air passages are clear and who live much in the open air and little in overheated or poorly ventilated rooms, are least likely to contract such diseases.

Grip. — This is a name rather loosely used but generally applied to a severe form of cold accompanied by fever, pain, soreness of the muscles, digestive disturbances, etc., and it may be extremely serious. What seems to be a slight cold in one member of the

family may cause "grip" in another. The wise course is for persons with any form of cold to keep away from others. It is hard to make many people realize this. Nevertheless, when there are severe colds or "grip" about, there is no excuse for a person's exposing others to the disease.

Influenza. — Because of the suddenness and violence of its attack and because influenza is so closely associated with pneumonia, this disease has come to be one of the most dreaded of those of the respiratory system. Influenza itself is not a very fatal disorder, but unless it is properly treated and great care taken after recovery, it is apt to be followed by pneumonia, which, in the weakened physical condition resulting from influenza, was the cause of many deaths during the influenza epidemic.

During the great epidemic of 1918–1919, more persons died of influenza than we lost in the Great War. The Bureau of Vital Statistics of the Department of Commerce in Washington estimates the loss of life throughout the world due to this influenza epidemic at 10,000,000.

Many experiments were carried on during the epidemic to try to discover how the disease was spread, but no definite results were obtained. There can be little doubt, however, that, like the other

diseases of the respiratory system, it is carried by the discharges from the nose and mouth. Coughing and sneezing in public during such an epidemic is little short of criminal, so that in some places, during influenza epidemics, these acts have been made punishable by a fine.

One's duty at the time of any epidemic is to take extra good care of one's health; to eat pure and wholesome food, to drink plenty of pure water, to breathe plenty of fresh air, to avoid as far as possible all crowds and crowded or poorly ventilated rooms, and above all to keep one's own self-possession.

Tuberculosis. — Tuberculosis is another germ disease which has carried off great numbers of our people each year. We do not have epidemics of tuberculosis, but in every town there are persons who have this disease. It may attack various internal organs or even the bones, but the form in which it is most commonly known is tuberculosis of the lungs or consumption. This disease often results because the milder diseases of the respiratory tract have been neglected and the organism which causes tuberculosis finds weakened tissues which cannot resist it.

Did you ever see notices pasted up in street cars

or in buildings saying, "Spitting is forbidden"? Laws against spitting have been made in practically every state in order to protect citizens from danger. The sputum from the mouths of consumptives contains the germs of consumption. When this dries the germs are blown about, and are breathed by other people, who may in this way take the disease. This is why spitting in public places is forbidden. If spitting on floors and walks could be stopped, the lives of a great many people who die from consumption would be saved.

The only way in which people who have consumption are likely to give it to others is through the sputum that comes from their lungs. It used to be thought, before germs were understood, that if a mother or father had consumption the children were almost sure to have it. But it is known now that it is possible for the parents to be so careful that their children need never be in danger. And the more robust the child is, the more time he spends in the open air, the less chance there is that the germs could injure him even if they did get into his body.

Fresh air, sunlight, and good food are the weapons with which doctors now fight consumption. A life out of doors, all day long, summer and winter, has

cured many cases. It is now considered the only cure for the disease.

Protected by a Healthy Body. — Disease germs of all kinds find it difficult to live in a healthy body. If we keep strong and well, we may be exposed to germ diseases without taking them. This means that even though the germs get into our bodies, they are killed there without injuring us.

There is one fortunate thing about most of these germ diseases. When a person recovers from one of them, he is in no danger of having the same disease again for some time, and usually he never has it again.

The best protection against contagious and other diseases is a healthy body. The way to have a healthy body is to form correct health habits early in life and to keep them.

EXERCISES

1. Mention six children's diseases that are "catching." Are you always careful to avoid exposure to these diseases?
2. Does every one who is exposed "catch" a disease? Why not?
3. How can clothing, dishes, etc., used by a child with measles or diphtheria be made safe again?
4. Have you been vaccinated? For what purpose?

CHAPTER XXXII

THE YOUNG CITIZEN AND THE PUBLIC HEALTH

Why We Have Health Laws and Officers. — Many people can live together happily in a community, when each one is ready to do his part to make life safe and comfortable for all the rest. Some people in our communities are not good citizens, but are ready to fight or to steal, or to do other things to injure their neighbors. So policemen are appointed to protect the good citizens against the lawbreakers.

There are other evils from which a community must be protected. When people are crowded together, as in a city, they are running into a kind of danger from which they cannot protect themselves without some special help. It is so easy for disease germs to pass from one person to another that in a large community there is always danger of contagious diseases. Sometimes hundreds of people, or even thousands, are taken sick at the same time with the same disease; in such cases we say there is an *epidemic*.

We need laws and officers as a protection from epidemics just as much as from thieves or murderers. The officers who guard us against disease germs are called *Health Officers*. When we speak of the health of all the people together, we use the term *Public Health*.

Health Officers. — It is the duty of health officers to keep the supply of water and milk pure, and to keep the community clean. They must also know how diseases come into a community and what may be done to prevent their coming. This work is very necessary because the fact is that Henry and all his family are likely to get sick, no matter how careful they may be, if the family of his neighbor James, who has some contagious disease, goes about spreading the disease germs. When every family is free from contagious disease then all are safe.

Pure water is most necessary to health. In cities there are health officers whose entire work is to provide enough water for the use of citizens, and to keep the water free from disease germs and other things that make it unhealthful. All good citizens can help in this if they will. One way is never to wade or bathe in a stream or reservoir whose water is used for drinking; another way is never to throw anything (not even "clean" food or papers) into

any water supply. To do anything so thoughtless is not acting the part of a good citizen, for it is endangering the health of other people.

In general, however, we do not have to worry about the water supply of large towns and cities, for they are usually carefully protected from any form of pollution. You may perhaps have seen some big dirty looking river which, to your surprise, you were told furnished the drinking water for a near-by city. You saw boats on the river, boys bathing in it, possibly houses and barns close to the shores, and you could not understand how such water could be fit to drink. It isn't — not as it is. This is where the interest in public health has come to the rescue. The only possible way to supply those thousands of people with the tremendous amount of water they need was to make use of that river. But how to make it safe? That was the problem the health officers had to meet, and what they did was to *filter* the water. Great "filter beds" were built, filled with sand or other materials, and through one after another of these filter beds the water was made to flow, leaving in them not only the dirt big enough to be seen, but the disease germs as well.

The problem of getting pure water in the country, especially in villages, is more often a serious one, for

there is no great public water system carefully looked after by competent public officials. Instead, each family has to think for itself and decide whether its drinking water is or is not safe. In mountainous or hilly country there are usually springs of pure water bubbling out of the hillsides. These can be dug out and small enclosed reservoirs built, from which pipes carry the water directly to the individual houses or to a larger reservoir to be used for the village.

Even where there are pure hillside springs, care must be used to make sure that there is no possible surface drainage into the spring. The writer remembers being offered a drink from a mountain spring of ice cold water one hot summer day, and being rather disturbed a few moments after accepting it, to discover that from a house above the spring, the drain from the kitchen sink ran directly down the hill beside the spring.

Where pure spring water cannot be had, people must depend upon wells. These are safe only when they stand above houses and barns and are so constructed that surface water cannot get into them. Because a well is deep and cold and the water tastes good, is no sure indication that it is fit to drink.

Clean Milk. — It is the duty of health officers not only to see that the water supply of a city is kept

pure, but to guard the milk that is sold as well. They know about the disease germs that may be carried in milk; they know how important it is that the barns where the cows are kept should be clean; that the cows themselves should be in good health; and that the milking should be done in a cleanly way. In a city people often do not know where their milk comes from, so they cannot possibly guard against these dangers.

Milking Time in a Clean Barn.

For this reason milk inspectors are sent out to investigate the sources of the milk supply. Unfortunately, these inspectors are sometimes not very conscientious, and unclean milk still comes to the city to be mixed with clean milk and so spoil it all. Thus it can be seen that milk from all dealers should be frequently tested. Even the dealers with the marvelously clean "show places" should be carefully watched, for while a part of the milk sold may be produced under the most sanitary conditions such as to fill every visitor with the greatest confidence in the cleanliness of the milk, it may be that much milk sold under the name of the same dealer comes

in from farms where no precautions whatever are taken to keep it clean.

Like the problem of pure water, that of clean milk is often more difficult in the country village than in the city. The man who keeps one, or even a few cows, is less likely to exercise the same care as the man who runs a dairy, and moreover, he is apt to be far less willing to accept suggestions or criticisms. It is the duty of every citizen to report to the health officers any cases in which milk, produced under unclean conditions, is being sold, and also any cases where milk from sick cows or those suspected of being sick, is in use.

Whether in city or country, milk bottles should never be used for any other purpose than that for which they are intended. If you see children playing with them or putting anything into them, try to make them see how important clean milk is, and that the bottles in which it is placed should always be kept perfectly clean. Of course the milk dealer is supposed to boil the bottles before they are filled in order to kill any germs that may have collected in or on them, but the process of cleaning will be much more sure if nothing but milk is ever put into them.

Clean Food. — Children are often sent to buy food at the bakery, the market, or the grocery store.

For that reason they should know what places are sanitary and how food should be treated in order that it may be clean. Did you ever see a man carrying loaves of unwrapped bread in an open basket or, worse yet, piled on his arm, which was perhaps covered with a dirty coat sleeve? Did you ever see the baker drop a loaf on the floor and pick it up and put it in the showcase? Have you seen flies in the bake shop and even in the glass cases in which the food is kept? Does the clerk sometimes fix her hair and, without washing her hands, pick up cookies or doughnuts for her customers? Of course the bread should be wrapped if it is to be carried from one shop to another, and the food should never be handled with the bare hands by the people in the shop, for their hands cannot be clean when they are constantly touching money and other unclean things.

How about the grocer? Does he weigh all kinds of things, one after the other, in the same scoop, without washing it? And, what is worse yet, does he blow on it to remove anything which may remain after a weighing? Does he keep all groceries, which are not in sealed packages, closely covered so that no dust or insects can get at them? Does he keep his hands clean as well as his shop? Are cats and

dogs allowed to roam about the store as they choose? I think you can easily decide whether a grocer keeps his store so that the food he sells you is clean.

And how about the market where you get your meat and vegetables? Is it free from flies? Is the meat kept away from dust and dirt? Is refuse thrown away as fast as it accumulates? Are counters kept clean? Is there ever spoiled meat or vegetables about the place?

You can make up your mind about the market as easily as about the other food shops. If every one who buys food would insist upon its being clean and fresh and would refuse to buy from a dirty or ill-kept shop or one in which there are flies or other insects, we should soon have only properly kept markets, bakeries, and grocery stores.

Another place where people should demand cleanliness is in public eating places — hotels and restaurants. Of course, the kitchens of such places should be carefully inspected often by the public officials, but unfortunately this is all too seldom done. For this reason, it is all the more important that every person, eating in a public place, should refuse to accept any food which shows evidence of careless preparation or which is served on any but spotless dishes. Above all, the silver and glassware

should be most carefully washed and scalded. The writer once inspected a huge basket of silver, ready for use, in a well-known restaurant in a large city. Not one piece was clean! Yet people were using it without even noticing, or apparently caring, whether their dishes and silver were clean or otherwise. In this city there were health laws governing the cleanliness of restaurants, but they were not obeyed by this restaurant or enforced by the officials whose duty it was to see these laws obeyed. So you see that laws are useless unless they are upheld by the health officials.

We cannot live only for ourselves. There are many things one person could do which would be harmless enough, but which, if done throughout a community, might tend to lower the standard of public health. Public health depends on the health of each one of us. It is a national and a patriotic duty to keep well.

Importance of Public Cleanliness. — One of the inportant duties connected with public health is to keep the town or city clean. We are all proud of the street on which we live when every house on it looks neat and tidy, in front and at the back. A city must attend to the removing of dirt and refuse, because disease germs may find lodging in them and get from them into our homes and even into our

food. Large towns and cities employ men to go about with brooms and shovels taking up from the streets the dirt that accumulates and placing it in piles or in cans to be taken away by dump carts. Health and cleanliness go together. The removal of filth from the streets makes it safer for city children to play in them.

A Street Cleaner.

Surely we all ought to help as much as possible in this work of keeping the city free from filth. Children have done much in many places to keep the streets clean. Of course they began by making it a rule never to throw anything on the sidewalk or into the street — banana skins, orange peels, papers, nut shells, or litter of any sort. Then when they were making no dirt themselves they could easily persuade older people, who had perhaps never thought about the matter, to join them in the effort for clean streets.

To Prevent the Spread of Disease. — One of the most important public duties is to prevent the spread of contagious diseases. The health officers do all they can in this direction. When there is a

case of diphtheria or scarlet fever in the town, the Board of Health places a notice on the house where the sick person lives, to tell other people that some one living there has a contagious disease, and that they must keep away.

The Board of Health also decides when it is best that children should stay away from school lest they should carry the germs of some contagious disease to other children.

School children sometimes have a bad habit of exchanging hats or caps, which is nearly as bad as using another person's towel, for in this way various scalp troubles may be transmitted.

Public telephones furnish another means of spreading disease. Never put your lips against the transmitter of any telephone, especially one in a public place.

All of us must also do what we can to protect ourselves. One thing that we can all do, young and old, is not to risk such frequent means of contagion as the use of common drinking cups, brushes, combs, or towels. Washing a cup before and after using it makes it safer, but *not absolutely safe.* Diseases of the eyes are often passed on through towels; and certain diseases of the scalp are carried through combs and brushes.

EXERCISES

1. If there were an epidemic in your community, what steps would you take to preserve your health?

2. Are epidemics more likely to occur in a city or in the country? Why?

3. How does your health affect public health?

4. How do health officers prevent the spread of disease?

5. Milk for cities often comes from farms many miles away — perhaps several hundred miles. People in the city as a rule do not know about the cows or the condition of the barns or milk containers. How can they know whether or not the milk is fit to use? Is milk purchased for your home? Is it clean and pure?

6. How many reasons can you give why the streets should be kept clean? Are your streets clean? How can you help? Do you help?

7. Are your school yards, halls, and toilets kept clean? Do you do your "bit"?

8. Why should we be careful not to use a common towel, drinking cup, or hairbrush? Does your school provide paper towels and paper drinking cups? Why should they be provided?

9. Why is spitting forbidden in public halls and on sidewalks? Are you always careful to observe public and private health rules?

CHAPTER XXXIII

HYGIENE IN THE HOME

THERE are two good reasons for keeping the house clean. The first is that clean houses are far pleasanter to live in. If we see everything about the house in good order, it is an incentive to keep ourselves clean and neat. But if the home is dirty and disorderly, we are sure to take less pride and comfort in it. The second reason is that cleanliness and health go together. It is usually in the dirty parts of the city and in its dirtiest houses that one finds the most disease.

There are various reasons for this; one is that in a dirty house disease germs are carried, in dust and dirt, from the rooms of sick persons through the halls and courtyards to other rooms and other families. So a contagious disease may spread through a whole house and affect many people. In a well-kept house, dust and dirt do not collect and so such germs do not find a hiding place.

A sick room should be made as bright and cheerful

as possible. It is not, however, the place for carpets and heavy curtains or other draperies, for these hold the dust and may also harbor disease germs. Remember that germs thrive best in places that are dark and moist. If a sick room is kept spotlessly clean, they cannot stay there long, provided that the cleaning is done in the right way.

Cleaning a Room. — If you were told that you might give a thorough cleaning to the room where you sleep, would you know how to go about it? Let us see what that would mean, and then we can tell better how to do it. What you want to put into the room is fresh air, and if possible sunshine. You can do that by raising the shades and opening the windows wide. What do you want to take out of the room? Dust and dirt of all kinds. Since the dust is likely to contain germs, you want to carry it out and destroy it; to get it out of sight will not answer the purpose. Cover your hair with a cap or a cloth, for it would be foolish to transfer the dust to your hair.

Dusting comes first. You will dust with a slightly damp cloth all the chairs and other furniture that can be taken from the room. In this way you get the dust (and germs) on the cloth instead of spreading them over the room. You then take out each nicely

dusted piece of furniture, covering up with cloth or with newspapers what you cannot move.

Sweeping comes next, and what is there to be swept? The walls, and the floor, and maybe a carpet or a rug that is too large for you to take up and beat out of doors. A cloth tied over the broom will do to brush down the *walls*.

Now you are ready to do the *floor*. A bare floor is easily cleaned. If you use a mop, wring it dry so that it will not leave water standing on the floor. An oil mop is better, because dust clings to the oil, and you know that you are getting it out of the room.

To clean a heavy *rug* or *carpet* takes more skill. It is full of dust which you want to take up instead of spreading over the walls you have just made clean. So you must find some way to catch the dust before it rises. Dampening the broom helps some. Moistened tea leaves or dampened strips of paper scattered over the carpet help still more; you will see how the dust is caught by them. Then how should you use your broom? Long swinging strokes of the broom will send the dust flying all over the room, so you should use short strokes in order to keep the dust down.

Now you are ready to *take the dust away* from your clean room. Remove the cloths or papers from the covered furniture, gathering them up carefully so

as not to scatter the dust that is on them. Take out your mop and broom and dust cloths, being sure not to shake off the dust collected on them. Boiling water poured over the cloths and mop will kill any germs there may be on them. Anything you cannot wet, like an oil mop, should be put out in the sun.

Go back now to your fresh, clean room, remove any dust that may have settled from your sweeping, and replace the furniture you took out. There is real fun in cleaning a room in that way; you are all the time running a race with the dust and the germs.

A Vacuum Cleaner Is the Best Means of Removing Dust.

A vacuum cleaner is a still better means of removing the dirt and dust from a room, for it sucks the dust into the cleaner, from which it can then be removed and burned. Those who have no such

cleaner must use their wits to plan how the dust may actually be removed from a room when they clean it.

Airing Bedrooms. — We spend a great many hours in bed, and the bed is like a close little room that

Sleeping in the Open Air.

needs to be thoroughly aired, to make it fresh and clean. So when you get up always remove the bed covers, one by one, laying them over the chairs, and tilt the mattress so that it may be thoroughly aired while the covers are airing. Before you leave the room throw all the windows wide open, and let them stay open for an hour or so.

Metal bedsteads are the best, because they are easily kept clean.

The whole house should be aired at least once a day even in cold weather. Any boy or girl who is old enough to go to school is old enough to learn how to air the home each morning.

Care of the Kitchen. — *The kitchen* should be kept very clean; it is the last place where dust (and germs) should be allowed to accumulate, for food cannot be pure and clean if prepared in a dirty room. Remember that boiling water kills nearly all germs; so nothing should be used in a kitchen that cannot be frequently boiled. In some countries the right preparation of food is considered so important that only the most particular person in the house is allowed to touch the food; to be allowed to prepare it is considered an honor.

The *kitchen sink* should have its outlet washed frequently in hot water and soap; and if there is any contagious disease in the house, a disinfectant should be used in the sink. The same thing is true of the closets and sinks in the bathroom.

Many houses, particularly in the city, are infested with cockroaches. These insects come into the house along the waterpipes. For that reason one species gained, in New York City, the name of

"Croton-bug." Cockroaches run swiftly, are flat and slippery, and come out chiefly at night. Consequently it is sometimes difficult to get rid of them; but when we stop to think how the dirty little creatures can go from one house to another, how they run over everything in their search for food, leaving their dirty tracks perhaps on something we are to have for lunch, it seems worth almost any effort. All openings about pipes in kitchen and bathroom should be stopped, so far as possible, and insect powder sprinkled about all cracks. Do not think that once free of them, you need watch no more. So long as there are any in your neighborhood in houses with the same water and sewage system, you are likely to get them again.

Water and Earth Closets. — In cities and towns which have a sewage system, each house is, or should be, provided with waterclosets. Such closets should have an abundant water supply for flushing, the bowl should be kept clean by frequent washings with hot water and soap, now and then with some good disinfectant, and the seat should be washed off daily. Any defect in the plumbing should be remedied at once. If there are cases of contagious disease in the house, the toilet should be treated with disinfectants as often as material from the sick room is thrown into it.

Where there is no sewage system and water-closets have to empty the sewage into *cesspools*, great care must be exercised that these vaults are built properly so that surface water cannot drain in, or any insects gain access, or any odors escape. Sometimes when cesspools have been improperly built, spring thaws force the contents of the pools back up into the toilets, leading to most insanitary conditions.

Where waterclosets, for one reason or another, cannot be had, earthclósets must take their place. These latter can be made just as sanitary as the others, but in most places they are far from it. This is due to many reasons, but chiefly because people do not stop to think very much about how dangerous these closets are. The earth closet should, of course, be placed where there can be no possible drainage from it into any water supply. The foundations of the vault should be of cement, or some other flyproof, odorproof, waterproof substance, extending for some distance below the surface of the ground. The floor of the vault should be made of a layer of gravel and sand, or other porous material, several feet deep. The house itself should be carefully screened so that no flies can get to the vault from above. Water should not be

thrown into this vault, but plenty of chlorinated lime should be put down every day. Flies find in the old-fashioned type of earthcloset an ideal breeding ground from which they come directly into the house to walk over the food on the table. Breeding in human excrement, they may carry on their feet not only filth, but disease germs such as those of typhoid and diarrhea from sick persons to the food of the well. Directions for the building of sanitary earthclosets may be obtained from any state department of health.

The Stable and Barn Yard. — Cleanliness is important here as elsewhere. Filth always furnishes breeding places for flies and other insects. If there must be manure piles which cannot be kept in fly-proof vaults, then they should be so far away that the flies which breed in them cannot get to houses. Where there are but small quantities of manure, the fly larvæ can be killed with borax or hellebore sprinkled on the pile.

Besides protecting us from flies, clean stables and barns are essential to the rearing of healthy domestic animals. Barns used to be made dark and were often damp. Now we know that it pays to let plenty of sunshine into the barn as well as into the house, and we know too that it pays to screen stables so that

the animals shall not be tormented by flies. There is an excellent fly trap made to fit into a barn window screen. Flies so caught can be scalded and fed to the hens.

Our home hygiene motto might well be "Insect pests nowhere, cleanliness everywhere."

The Cellar and the Yard. — It is almost useless to keep the house clean, if the cellar and the yard are allowed to become dirty. Here is a chance for the boys to lend a helping hand in the family health campaign. Cover the garbage can and clean up dirt of all kinds which, as we have learned, furnishes breeding places for flies. No breeding places, no flies.

Mosquitoes breed in stagnant pools of water, or in barrels, pails or cans in which there is stale water. The way to get rid of mosquitoes is to destroy their breeding places, so we must take care that pails or barrels are not left with water standing in them and that stagnant pools are filled up or drained. Standing water should be screened from mosquitoes as we screen our windows from flies. If every family would do its duty by keeping the yard free from filth or from standing water, flies and mosquitoes would no longer have any breeding places and the community would be kept free from these disease carriers.

EXERCISES

1. How do you help to keep your home clean and well aired?

2. Why is a vacuum cleaner better than a broom? Why should the windows be opened during sweeping?

3. Is your sleeping room aired every day? Is your living room? How is your schoolroom aired?

4. Imagine the clothing of one of your schoolmates on fire. Show the class what you would do.

5. Why should the kitchen be the cleanest place in the house? Is your cellar kept clean?

6. What is the proper way to wash dishes? What should you do to dish-mop and towels after each dish-washing?

7. Have you flies or mosquitoes at your house? If so, see if you can find and put an end to their breeding places.

CHAPTER XXXIV

HELP ONE ANOTHER HINTS

Knowing What to Do. — When we meet with an accident we are very grateful to the one who helps us. We, too, should learn how to help in case of need. There is no use in reading long lists of things to be done for this trouble or that; for we would not remember them all, and when the time came would be of no help. It is much better that we should really know what to do in the case of a few common accidents that are always happening to children.

Reading about how to skate would not make you able to put on a pair of skates and dash off without a lot of practicing; nor will advice about what to do for a cut finger make you able to do it right the first time. First you must understand what you want to do, next you must understand how it can best be done, and then you must practice until you can do it well. Do not wait until the need comes. Learn in advance how to give the relief suggested; that makes as good a game as any other. If you

learn it well, you can really be of help to your playmates, and maybe some day you will have a chance to show father and mother what you can do for them when they have some injury.

Bee Stings. — Bees will not sting if they are let alone; their sting is their means of protection and

WASP.

HONEY BEE.

BUMBLE BEE.

Three insects that make us suffer if we do not let them alone.

they use it only when they think they are being attacked. The sting leaves an acid poison which makes the wound painful. If the wound is plastered over with wet mud, the pain soon grows less. A little ammonia is even better than mud, but often

there is none at hand, and mud can always be found or made.

Bites of Animals. — The bite of an animal is more dangerous than any other kind of wound, because of the germs in the animal's mouth, which may find their way into the wound. Those germs are present whether the animal is cross or friendly. There are other dangerous germs in the mouths of dogs besides those that cause madness. Few children ever encounter mad dogs, but they are sure to encounter dogs in whose mouths are germs that may make serious trouble if they do not take care.

If one is bitten by any animal, the wound should first be washed in clean water; it may hurt, but if you do not get rid of the germs, they will make more trouble later. Then a doctor should be seen. If it is not possible to get to the doctor right away, the wound should be more thoroughly cleaned so that any harmful germs that may have been carried into it may be killed. After the water you have used in cleansing the wound has dried, use iodine. The simplest thing is to put tincture of iodine into and all over the wound.

Bruises. — When the skin has been broken, the wound should be washed with water and witch hazel, in the proportion of half a teaspoonful of witch hazel

to a cupful of water. Then apply vaseline, and cover with a piece of cheesecloth.

If the skin is not broken, place on the bruise a piece of cheesecloth folded several times and wet with cold water.

Earache. — For a slight earache it is often sufficient to apply heat; holding a hot water bag over the ear may be enough. Or one may try putting warm pieces of clean soft cotton into the ear. They may be heated by holding them over a stove; be careful that they are not hot enough to burn.

Clothing on Fire. — When clothing catches fire there are just two things to remember: First, there is no chance of recovery if one has breathed in the flames, whereas most skin burns, although they hurt badly, will heal in time; second, no fire can keep on burning without air.

So make the person lie down flat upon the floor. Then he is not likely to inhale the flames. Throw around him any woolen clothing you can catch up or wrap a rug closely about him. If the accident happens to you, *don't run*, don't wait to hunt for any woolen stuff, *drop on the floor and roll over and over;* that will usually put out the fire.

Nosebleed. — Throw the head back and press a cloth wet with cold water to the nose. If the bleed-

ing does not stop soon, put cold cloths or a piece of ice against the back of the neck and raise the arms above the head, while some one holds the cold cloth to the nose. Do not blow the nose for some time after the bleeding has stopped. Why?

Poison. — If a person has swallowed anything that is poisonous, give him immediately a tablespoonful of mustard in a glass of warm water; this is to make him vomit. The doctor should be sent for at once, but while waiting for him to come, try in every possible way to make the patient throw up the poison. If there is no mustard in the house, salt will sometimes answer. If that does not work, run a finger down into his throat.

Something in the Ear, Nose, or Throat. — If anything gets into the *ear*, bend the head down on that side and shake it. If the object does not come out, pour into the ear some warm water or warm sweet oil. Then let the warm liquid run out. If this does not remove the object, you had better let the doctor take it out. Do not try to "dig out" anything that gets into the ear. Remember that an insect cannot get from your ear into your head; the eardrum blocks the way. Take care that you do not injure the eardrum by trying to get out the insect.

If something goes *up one nostril*, close the other

nostril and blow hard. If this does not bring the object out, tickle the nose until you sneeze. If it still does not come out, go to the doctor.

An object *in the throat* may cause choking. Coughing will usually help. If not, slap the person vigorously on the back; if a child is choking, he should be held up by the feet and shaken, and slapped on the back. This may save his life before the doctor can arrive.

Wounds. — For common wounds, like cuts, bruises, or bites, there are three things to do.

1. Stop the bleeding by binding the wound till the blood clots.

2. Wash the wound with clean water so as to get rid of any troublesome germs.

3. After thorough drying apply some antiseptic, like tincture of iodine, to kill whatever germs may be left in the wound. After this the wound should be bound with a clean cloth or with surgeon's tape.

Burns. — Slight burns are relieved most quickly by protecting them from the air. The most common remedy, and perhaps the best, is to cover the burn with a paste of baking soda and water, bound on with a clean cloth. Some people prefer to use sweet oil or vaseline. "Oil of Salt" is also excellent, and lard does very well when nothing else is at hand. If

there is a blister, great care should be taken that it does not get broken, thus giving a chance for infection. If the burn is severe it should be treated by a physician.

Broken Bones. — In case of broken bones, of course the first thing to be done is to send for a doctor, and meanwhile make the patient as comfortable as possible. If the patient *must* be moved, the greatest care must be exercised to keep the broken bone straight, since any bend at the fracture may cause splinters of bone to stick into the flesh or even tear through to the outside. In case a broken leg or arm has to be lifted, one person should place a hand on each side of the break so that the two parts may be lifted together and so avoid any possibility of bending.

Sunstroke. — Sunstroke is an illness, sometimes very serious in its results, due to the heat of the sun shining directly upon the head. The patient first becomes dizzy and faint, and then may become unconscious. Carry such a person out of the sun. Do not let him lie down, but prop him up in a *sitting position*. Loosen his clothing and apply *cold* water or *ice* to his head and to the rest of the body. Give him plenty of *cold* water to drink.

Heat Prostration. — This is an illness often con-

fused with sunstroke, but really quite different, and requiring different treatment. While sunstroke is due to too much and too hot sunshine on the head, heat prostration is brought on by too great heat applied to the whole body, as might be the case in an overheated kitchen on a suffocating summer day, or in the boiler room of a great ship.

Of course the first thing to do is to remove the patient to a cool place and loosen the clothing. Make him *lie down* on his back. Give him *warm* drinks, rub his hands and feet, and bathe the body in *warm* water.

Fainting. — People faint from many causes, with which we are not now concerned, but it is well that every one should understand how to restore to consciousness a person who has fainted. Fainting comes about simply because the blood leaves the brain, and when that happens, a person can't think. To get the blood back into the brain, the patient should be placed flat on his back or with the head a trifle lower than the rest of the body. He should be given plenty of fresh air, and an application of cold water to the face often helps. If this does not restore him, a doctor should be called.

A person often feels faint in a close or overheated room, in church or at the theatre. If he only under-

stood what to do, he might usually avoid the unpleasantness of fainting in public. A certain teacher used to tell her students, "If you feel faint, drop your handkerchief, or anything else you have, on to the floor, and then be a long time picking it up. You simply cannot faint, for the blood has to flow back to your brain when your head is so low." This is a good thing to remember, for no one likes to faint, but many people do not know how easily it can be avoided.

The attention of small children is easily attracted by glittering or bright-colored objects like a broken needle or a bit of glass. Such things should be disposed of properly at once before the baby wants to play with them or they get into some one's foot. There is apt to be trouble if the baby swallows a bead or if some one has a bit of broken needle in his foot, and yet both these accidents are quite avoidable by taking a little care at the right time.

THE FIRST AID CUPBOARD

Every house ought to have its "first aid cupboard," where are kept the few simple things that may be needed in a hurry when there is an accident. It is not only important to have needed remedies in the house but also *to know where they are.* There is not

time after an accident to look on closet shelves or through bureau drawers to find what is needed. An ordinary box will answer, fitted with two shelves. Then when it is fastened to the wall, and a little curtain hung in front of it, we have an excellent first aid closet.

First Aid Cupboard.

Into this cupboard should be put the various articles that may be wanted in case of accidents. A bottle of *witch hazel* for bruises and sprains; a bottle of *tincture of iodine* with which to treat cuts and bruises; a bottle of *vaseline;* some *baking soda;* and some *sweet oil.* It is also a good idea to have a bottle of *ammonia* for use if one happens to get burned with an acid.

There should also be in this cupboard a pair of *scissors;* a spool of stout linen *thread;* a ball of *twine;* some *pincers* to help remove slivers; and a box containing *needles* and *pins.*

Then there should be a roll of *surgeon's tape*, for use in bringing the edges of cut flesh together, and a supply of *absorbent cotton* for washing blood from a cut. A little of this cotton dipped in warm water may be bound around the wound to stop the bleeding.

Do not fail to have plenty of *bandages*. These are sold in little parcels ready for use. They cost less if one makes them, and they are easily made. Buy two yards of cheesecloth, and cut it into two pieces a yard long. Then cut strips of different widths, — some bandages an inch wide, some two inches, some two and a half inches. Fold these strips loosely into bundles and wrap each closely in a piece of old cloth, like sheeting, and sew it up firmly. Then boil these bundles for several hours and hang them in the sun till perfectly dry. Put away in a jar or box. Boiling has sterilized the cheesecloth, and the wrapper protects it from all impurities.

Every little box and every bottle in this cupboard should be *plainly labeled*. Nothing that is poisonous should ever be kept in it, and there should be no medicines there. All medicines are to be given with care, by the doctor or by some experienced grown person. Medicines may easily do more harm than good if they are given at the wrong time. They

do not belong in a first aid cupboard; we might call them "second aid."

SOME EVERYDAY HEALTH RULES

1. Rise early and go to bed early.
2. Eat good, nourishing food.
3. Drink plenty of clean, fresh water.
4. Let tobacco and alcoholic drinks alone.
5. "Work while you work," and work cheerfully.
6. "Play while you play," and play heartily.
7. Take plenty of out-of-door exercise, especially in winter. Live out of doors as much as possible.
8. Keep the lungs active by taking long breaths.
9. Exercise the skin by cold baths and rubbing.
10. Do not wear tight clothing of any kind.
11. Be sure that the rooms you live and sleep in are well ventilated.
12. Do not bite your finger nails, and keep your fingers out of your mouth, as well as pencils, erasers, pens, money, or other objects which other people have handled.
13. Train yourself to be the skillful engineer of your body engine. Be very ambitious to possess a strong, healthy, and graceful body.

CHAPTER XXXV

SAFETY FIRST

Avoiding Minor Injuries. — In Chapter XXIV you were told what to do for various common injuries such as cuts and bruises, slight burns, stings, bites, and so on. Sometimes, of course, such injuries are unavoidable. But in many cases they could be prevented by a little forethought and care. If you keep your mind strictly on what you are doing, you will greatly reduce the probabilities of cutting yourself, even though the knife or tool you are using is a very sharp one. If you watch where you are going, you are not likely to injure yourself by falling, to bruise yourself by running against something, or to cut yourself on a scythe, or other sharp-edged instrument left lying about. Burns, too, are frequently due to carelessness, and could be avoided. As for hornets and bees, they will sting if they or their nests are disturbed. They are best let alone, except by those expert in handling them. If, however, a bee or hornet does come buzzing around you, remember that it is less likely to harm you if you keep still than if you attack it. Remember, too, that

sometimes, as for instance if you are driving a machine, slapping at the insect may result in an accident, and in injuries far more serious than a mere sting.

Dog Bites. — Most of the mishaps just mentioned are slight. Yet even in such cases it is well worth while to take thought *before* the harm is wrought instead of afterwards. But if "Safety First" is a good rule to follow in preventing such injuries, how much more important it is that we should think of safety *first* in connection with the vast number of more serious accidents which are likely to result in grave internal or external injuries or even, as frequently happens, in the loss of life itself.

The results of dog bites, as you were told in the last chapter, are often very serious. Yet the danger of being bitten by dogs is something that can nearly always be avoided. It is never safe to pat a strange dog. How are you to know that he has not been trained to be suspicious of people with whom he is not acquainted? Or it may be that other boys and girls have teased him until he mistrusts them all. Sometimes, too, a dog becomes so much attached to one master that he is jealous of anyone who, he thinks, is demanding too much of his master's attention. So it is best not to touch a strange dog, even though his master may be with him. Wait until

you are sure what kind of disposition he has, and until he feels well acquainted with you. It is hardly necessary to say that it is dangerous to provoke a dog. It is unkind besides, and the person who gets bitten for such a reason usually deserves the bite. Of course you know, too, that it is unsafe to try to attract the attention of any dog when he is eating. Perhaps you can mention some instances in which you think the dog was not to blame for using his only means of protection. Be reserved with strange dogs, and kind to those you know, and you will probably avoid being bitten.

Poisons. — Another mishap mentioned in the last chapter — that of accidentally swallowing poison — may be avoided if the bottle is plainly labeled **Poison.** To prevent the possibility of snatching the wrong bottle in the dark, a nail may be driven through the cork, with the point sticking up as a warning. It is also well to find out which of the most commonly used substances and liquids are poisons, when taken internally, and what the antidote for each is. Make a list of several such poisons and see if you can find out what should be done for persons who have accidentally swallowed any of them. Before you take medicine, make sure first that it *is* medicine, and that it is the particular medicine you want.

Safety First in the Prevention of Serious Accidents. — In addition to injuries from the causes already mentioned, countless accidents occur daily on the street, on trains or in railroad yards, and on the water. There are accidents from electricity, gas, and inflammable fluids, and accidents from firearms. Above all, there is great loss of life and property from fires. Serious as these accidents are, in the majority of cases they are due to ignorance or carelessness, meddling or haste. They could be avoided if people would stop to think what the dangers about them are, and act accordingly. They could be avoided if people would not meddle with things they do not understand; if they would obey the rules and slogans originated in the interests of "Safety First"; if they would remember that "it is better to get there late than not to get there at all."

Fires. — Some accidents result in injury only to individuals, or to small groups of people. But fires endanger the safety of entire communities, towns, and cities. Let us all make every possible effort to protect not only ourselves, but the people of our community, from the danger of fire.

For the protection of people in buildings, it is important that there should be exits which may be

easily reached. The doors of such exits should open *out* rather than *in*. Why? It is also important that fire extinguishers or other means of controlling fires be provided, and that the people in the building should know where this apparatus is, and how to use it. Find out about several kinds of apparatus for extinguishing or controlling fires. Give the advantages and disadvantages of each, and tell which kind you think would be best for use in your school. Where are the exits in your school? Are there sufficient exits for the number of pupils? Can they be reached quickly? Do the doors open the right way? Write a report on this subject.

Although fire extinguishers are of great assistance, a fire often gets so far under way before it is discovered that the extinguishers serve only to keep the fire under control while the people are gotten out of the building. But if the people are to be gotten out of a building in the least possible time, and with the least possible confusion, they must be trained by frequent fire drills.

The signal for the fire drill should be one that can be clearly heard by all, and that will not be confused with any other signal — and it should be promptly obeyed. A fire drill is of no value whatever unless it is conducted seriously, and with rigid discipline.

If those concerned take the matter as a joke, and linger in the building, they are likely sometime to find themselves trapped by a real fire. When the number of people in the building is large, certain ones should be appointed as fire captains, and others as fire lieutenants. These officers maintain discipline, direct the drill, and see that everyone is out of the building.

Only a few years ago, there was a fire in the dormitory of a woman's college in Massachusetts. The fire started about three o'clock in the morning. When the gong sounded, many of the girls supposed it was merely for a fire drill. But they had been trained to take fire drills seriously. So they got up, threw on dressing gowns or heavy coats, and hurried quietly down the stairways to the first floor. The building was an old one, and the fire spread rapidly. As the girls stood grouped in the " center " of the dormitory, they could see flames above them and outside of the windows. But they stood quietly until the roll had been called three times, and until the fire captains were absolutely sure that all were present. Then the doors were opened and the two hundred girls went out. The training of strictly conducted fire drills had saved their lives.

Almost as much to be regretted as the fires in towns

and cities are the fires that destroy our forests. The people who live in thickly wooded sections of the country appreciate the gravity of such fires. To them, guarding against danger of fire in the forests is a law never to be disobeyed. It is only the " tenderfoot " who throws a cigarette or anything else with the least spark left in it among leaves, pine needles, or dry grass. It is only the thoughtless visitor who leaves a campfire still smoldering. Trees are our friends. Remember that, and you will remember never to be guilty of carelessness which may result in their destruction.

One reason that fires in the country are much to be dreaded is that means of putting them out are not accessible. When a house in the country takes fire it usually burns to the ground. Sparks falling on dry shingled roofs often cause fires. For this reason, *never* put excelsior, or anything else that will send a shower of sparks up the chimney, in the stove or fireplace.

Here is a list of common causes of fire.[1] See if you can add to this list. Then make a set of rules for safeguarding your own home from fire.

1. Looking for clothing in closets with a lighted match, lamp, or candle.

[1] Used by permission of the National Council, Boy Scouts of America.

2. Kindling fires with kerosene.

3. Putting hot ashes and hot coals in wooden barrels or boxes.

4. Thawing out frozen water pipes with a torch or lamp.

5. Allowing waste paper, excelsior, and rubbish to collect.

6. Using gasoline for cleaning in the house.

7. Looking for gas leaks with a match or lamp.

8. Allowing lace curtains near gas brackets.

9. Allowing oily rags about the premises.

10. Using sawdust in cuspidors or on floors.

11. Throwing waste paper into a fireplace.

12. Throwing away lighted cigarettes or cigars.

13. Keeping matches in paper boxes or lying about carelessly.

14. Using snapping parlor matches. Taboo them. Matches are the beginning of many conflagrations.

15. Hanging clothing near open fires or stoves.

16. Filling lamps when lighted.

17. Allowing rubbish in hallways or on fire escapes.

18. Burning leaves and dead grass on windy days.

19. Neglecting to have the chimneys of your home cleaned once a year.

20. Failing to notify the Chief of the Fire Department of anything you may see that is dangerous and likely to cause fire. Remember that every day is fire prevention day. A post card will bring an inspector.

21. Making a bonfire, or burning rubbish, near a building.

Safety in the Street. — In these day of street cars, automobiles, motor cycles, busses, and trucks, the pedestrian who does not literally " watch his step " in crossing the street takes his life in his hands. One safety poster that is used on street cars shows a little girl running in front of a trolley, and bears the warning, " Too young to think of danger. Keep her out of danger." When a child is too young to know what danger is, he or she should be kept out of harm's way. No motorman or automobile driver wants to run over anyone. But when a child dashes unexpectedly in front of him, it may be impossible for him to bring the trolley or the automobile to a stop in time to save the child.

But even after children are old enough to know what danger is, they do not always try to avoid it, and sometimes even provoke it. A child who purposely dashes back and forth across the street for the excitement of getting almost run over is in the same

class with the child " too young to think of danger," and should be kept at home.

But many of the accidents which occur on the street are due simply to carelessness. Sometimes it is carelessness on the part of the driver. But often it is carelessness on the part of the pedestrian. Here are some rules which will show you what " watching your step " in the streets means.

1. Cross the street at regular crossings.

2. Do not go diagonally across the place where two streets come together. Cross one street at a time. Do not go diagonally across any street.

3. Look in both directions before starting to cross the street. Then cross as quickly as possible.

4. Do not run into the street from behind a standing automobile, street car, or wagon which obstructs your view, and at the same time hides you from the drivers of passing vehicles. Bear this warning in mind especially when you get off a street car or out of an automobile and then start across the street.

5. Wait until the car stops, and, when you step off, face in the direction in which the car is going.

6. Watch the traffic officer and obey his signals.

7. As you walk along the sidewalk, watch out for open manholes and cellar ways.

8. Never throw banana peels or anything else into the street or on to the sidewalk. Why?

9. Do not steal rides on the backs or running-boards of automobiles or trolleys.

10. Never use the street as a playground.

Mention some automobile accidents you have seen or heard of, and tell how each might have been avoided. Then make up a set of "Safety First" rules which drivers of automobiles should follow.

Safety on the Water. — The rules for safety on the water, like the rules for safety in most other cases, might be summed up in the one recommendation: Use your common sense. But although this one statement would be sufficient for those who know something about boats and canoes, and are more or less used to the water, it would not be quite clear to the novice what "common sense" on the water requires.

The first rule is: Learn to swim, and to float. Even after you become an expert swimmer, however, remember that it is not wise to swim long distances unless someone in a boat accompanies you. The longer you are in the water, the greater the liability that you may have cramps; and that would make it impossible for you to swim.

The second rule is: Don't rock a boat or canoe. Of course you must be still more careful in a canoe

than in a boat. But even in a boat it is not safe to change seats; and in a canoe you must take care not to lean over the side, or to make sudden movements. A canoe is safer when the weight is on the bottom, and for this reason, especially on a lake which is likely to be rough, the paddlers often kneel on the bottom of the canoe. When you are getting into a boat or a canoe step into the middle.

When you go in bathing, don't stay in too long. Moreover, unless you have gradually become accustomed to it, do not go in when the water is very cold. Lastly, do not go in too soon after eating or after taking brisk exercise. Wait at least an hour after eating before going in.

If you live in the country, you may know of accidents which have occurred in connection with old wells. All wells should be securely covered, or have walls built around them, so that people who do not know or have forgotten about their location will not fall into them.

Electricity. — Men who are accustomed to working where there are wires, some of which are charged with electricity, are careful never to touch a strange wire. They find out first where it comes from. It is a safe rule for other people to follow, too — to let strange wires alone. Remember, too, that certain

substances are conductors of electricity, and that if you touch a conductor which in turn is in contact with an electric wire, the result will be the same as if you had touched the wire itself. For this reason it is not safe to fly kites near live wires. If it touched the wire, the string would act as a conductor. As water is a conductor of electricity, never turn on an electric light with one hand when your other hand, or indeed any part of your body, is in contact with water. Name some substances which are *not* "conductors."

Gas. — The dangers from natural and artificial gas are so well known that it is hardly necessary to mention them. See if you can tell what these dangers are, and how they may be avoided.

Inflammable Liquids. — Do you know which of the liquids in common household use are inflammable? Benzine and gasoline are perhaps the most common. What are some others? These liquids should never be used near an open flame. Since the fumes of gasoline, and such inflammables, mingle with the air, and thus penetrate through small openings, and for a considerable distance, it is wiser not to use them in one room, even when the door is closed, if there is an open fire in the room adjoining. Accidents from inflammable liquids are very costly to all concerned.

The needless suffering and expense involved are very great.

Railroad Accidents. — Here is a list of the most common causes of railroad accidents.[1] Can you add any others? Make a list of " Do not's " which will correspond to the list of causes.

1. Walking on tracks or railroad bridges.
2. Playing and loafing around stations or cars.
3. Jumping on or off moving trains.
4. Crawling under, between, or over cars.
5. Ignoring gates when down.
6. Trespassing in terminal yards.
7. Standing too near edge of platforms.
8. Leaning out of windows.
9. Raking hot coals out on girders of bridge.
10. Coupling or working between cars on short side of a curve.

The driver of an automobile should always slow down when approaching a railroad crossing. He should " look " carefully in both directions along the track; and if the track is obscured in any way, so that he cannot see very far up it, he should " stop " and " listen." The pedestrian should also keep eyes and ears open when approaching a railroad crossing, and should obey danger signals.

[1] Used by permission of the National Council, Boy Scouts of America.

Firearms. — Unfortunately firearms have to be carried and used in the maintenance of law and order. And they are used also by hunters. But for those of us who do not need to use them, the less we have to do with them, the better. It is always dangerous to play with firearms. Even people accustomed to handling them are sometimes killed because guns which they thought were empty were really loaded. Then, too, a gun may go off unexpectedly because something hits the trigger. Never point a gun — even a toy one — at anybody. For even toy guns are dangerous. Once a little boy got into a large packing case, and finding a knothole, dared his playmate to shoot at the hole with his air rifle. The playmate laughingly went some distance away, and tried it, never supposing he would hit the hole. The boy inside put his eye to the hole, to see what was happening. At that moment the boy outside fired — and he did not miss his aim. As a result the boy inside the box lost the use of one eye — was handicapped for life. But one feels almost as sorry for the boy who fired the rifle. Why?

EXERCISES

We have mentioned some of the dangers which nearly everyone needs to guard against, and suggested some ways of avoiding them. But even these suggestions will not be of much value

to you unless you apply them to your own particular lives. As a help in doing this, think over these questions:

1. What are some of the dangerous conditions in your own home? (Presence of flies, exposed garbage, unprotected gas jets, defective wiring, improperly constructed chimneys, steep or defective stairs, matches, knives, slippery floors, boiling water, etc.)

2. What are some of the ways in which you need to "watch your step" on the way to school? (Street crossings, railroad crossings, getting on and off cars, etc.)

3. Is your school safe for the children and teachers who attend it? (Near a busy street? Safeguards against fire; precautions taken against the spread of disease, etc.)

When you have finished thinking over these questions, write three reports corresponding to the three questions. In each report suggest precautions which the people involved should observe, and outline methods of remedying the dangerous conditions you discuss.

GLOSSARY OF TECHNICAL TERMS

The vowel symbols are those used in Webster's New International Dictionary.

GUIDE TO PRONUNCIATION

ă as in *a*m	ĕ as in *e*nd	ŏ as in *o*dd	ŭ as in *u*p
ā as in *a*le	ē as in *e*ve	ō as in *o*ld	ū as in *u*se
â as in sen*a*te	ȅ as in *e*vent	ȍ as in *o*bey	û as in m*u*te
ȧ as in *a*sk	ē as in h*e*r	ô as in *o*rb	ů as in *u*rn
ä as in *a*rm	ĭ as in *i*ll	o͞o as in f*oo*d	ÿ as in h*y*mn
å as in c*a*re	ī as in *i*ce	o͝o as in f*oo*t	ȳ as in fl*y*

Italicized vowels have the obscure sound: *a* as in sof*a*, *e* as in recent, *o* as in connect, and *u* as in circ*u*s.

ăb-dō′mĕn. — The lower cavity of the body containing the stomach, intestine, and other organs.

ăd′ĕ-noids. — Useless growths sometimes appearing in the throat or nasal cavities.

ȧ-dūl′tĕr-ā′tion. — The debasing of a product by the addition of an impurity.

ăn-tĭ-tŏx′ĭn. — A substance which neutralizes poison produced by germs.

ăr-tē′rĭ-ăl blood. — Blood rich in oxygen after passing through the lungs.

ăr′tĕr-ў. — A blood vessel carrying blood away from the heart.

băc-tē′rĭ-ȧ. — A group of very minute plants.

ball-and-sŏck′ĕt joint. — A joint allowing free motion in all directions.

bīle. — The liquid secreted by the liver.

blood heat. — The ordinary temperature of the body, 98.6° F.

bow′ĕls. — The intestine.

breast bone. — The bone in front of the chest.

brŏn′chĭ. — The branches of windpipe entering the lungs.

căp′ĭl-lå-rĭes. — The small blood vessels connecting the arteries with the veins.

căr′bŏn dī-ŏx′ĭd. — The gas produced by burning carbon in oxygen.

cär'tĭ-läge. — The tough flexible material that forms the softer part of the skeleton.

cē'rē-ăls. — Foods obtained from grain, such as wheat, oats, rice, etc.

chĕst. — The cavity within the ribs, which holds the lungs and heart.

cŏm-mū'nĭ-cȧ-ble. — Capable of being transmitted from person to person.

cŏm'pound frăc'tûre. — A broken bone with the bone protruding through the skin.

cŏn-nĕc'tĭve tĭs'sûe. — Tendons, ligaments, and other tissues that hold parts of the body together.

cŏn-sŭmp'tion. — A very serious disease of the lungs and other organs.

cŏn-tā'gious. — The type of disease that easily passes from person to person.

cŏn-trăc'tion. — Shortening.

cŏn-vŏ-lū'tions. — The folds in the surface of the brain.

cŏrds. — See *tendons.*

cŏrn. — A thickening of the epidermis caused by friction or pressure.

cŏr'pŭs-cle. — A small body — as the cells in the blood.

cranium. — The part of the skull which contains the brain.

dī'ȧ-phrăgm. — The tough sheet of muscle separating the thorax and the abdomen.

dĭs-ĭn-fĕc'tion. — Destroying the germs of disease.

dĭs-lŏ-cā'tion. — The wrenching of bones out of position.

dĭs-tĭlled' lĭq'uors (lĭk'ẽrs). — Liquors made by separating the alcohol from a fermenting substance.

ear'drŭm. — The membrane between outer and middle ear.

ĕn-ăm'ĕl. — The outer hard covering of the teeth.

ĕp-ĭ-dĕm'ĭc. — Any disease spreading among a great number of people.

ĕp-ĭ-glot'tĭs. — The lid covering the opening into the windpipe.

ĕ-sŏph'ȧ-gŭs or **gŭl'lĕt.** — A tube extending from the throat to the stomach.

ĕx-crē'tion. — Waste material passed from the body.

ĕx'hȧ-lā'tion. — Breathing air out of the lungs.

fẽr'mĕn-tā'tion. — A change occurring in sugar solutions by which alcohol is produced.

fē'vẽr. — A condition in which the body temperature is higher than normal.

frăc'tûre. — A broken bone.

fū'ĕl fōods. — Foods used to develop force or heat.

gall (gôl) blăd'dẽr. — A sac which collects the bile secreted by the liver.

gās'trĭc juice. — The digestive fluid secreted by the glands of the stomach.

glŏt'tĭs. — The opening from the throat into the windpipe.

gŭl'lĕt. — See *esophagus.*

hinge joint. — A joint by which the bones can move in one plane only.

incisors (ĭn-sī'zĕrs). — The eight middle front teeth.

indigestion (ĭn'dĭ-jĕs'chun). — Inability to digest food properly.

ĭn-hā̆l-ā'tion. — Breathing air into the lungs.

ĭn-tĕs'tĭne. — The tube through which food passes after leaving the stomach.

ĭn-vŏl'ŭn-tā-rў. — Without the exercise of will power.

ĭ'sō-lā'tion. — Keeping a patient away from other persons to prevent his giving them disease.

joint. — A place where two bones come together.

kidneys (kĭd'nĭz). — Organs which remove certain waste products.

lā̆ch'rў-māl dūct. — The duct which carries tears from the eyes to the nasal cavities.

lā̆ch'rў-māl glānd. — The gland that secretes the tears.

larynx (lăr'ĭnks), or Ad'am's ap'ple. — An enlarged part of the windpipe containing the vocal cords.

lĭg'ā-mĕnts. — Bands of white connective substances, which join bones.

lĭg'ā-tūre. — A band drawn tightly around some part of the body to stop bleeding.

lime.—A mineral substance. Bone consists largely of lime.

lĭv'ĕr. — A large red digestive gland lying near the stomach.

lŭngs. — Two organs in the chest cavity which absorb oxygen and give off carbon dioxid.

mā-lā'rĭ-ā. — A disease accompanied by chills and fever.

mĕm'brāne. — Soft tissue in the form of a sheet or a layer, often covering some part of the body.

mō'lārs. — The large back teeth, twelve in number.

năr-cŏt'ĭc. — A drug that dulls the nervous system.

nasal (nā'zăl). — Pertaining to the nose.

nerves (nûrvz). — Long bundles of fibers that carry messages to and from the brain and spinal cord.

nutritious (nū-trĭsh'us). — Capable of building up the body or furnishing it with heat or force.

oxygen (ŏk'sĭ-jĕn). — A gas forming one-fifth of the air.

păn'crē-ās. — A large gland which secretes a fluid to digest proteins, starches, and fats.

păr'ā-sīte. — An animal or plant that lives on the body of another animal or plant.

pā-rŏt'ĭd glănds. — The salivary glands in front of the ear.

pasteurization (păs'tẽr-ĭ-zā'shun). — Heating food (milk) for 30 minutes at a temperature of about 145° to destroy disease germs.

plasma (plăz'mȧ). — The liquid part of the blood.

pōres. — Small openings in the skin through which the sweat passes.

preservatives (prẽ-zûr'vȧ-tĭves). — Chemicals added to food and other substances to prevent their spoiling.

pŭlse. — A wave of pressure that passes along the arteries with each heartbeat.

pū'pĭl. — The circular opening in the front of the eye that allows light to pass into the eye.

pū'trẽ-fȳ. — To undergo decomposition, resulting in very unpleasant odors.

quarantine (kwŏr'ăn-tēn). — The prevention of persons who are likely to carry disease germs from mingling with other people.

rĕs'pĭ-rā'tion. — The absorption of oxygen and elimination of carbon dioxid by the lungs.

sȧ-lī'vȧ. — The secretion that moistens the mouth.

săl'ĭ-vă-rȳ glănds. — The glands that secrete saliva.

sē-crē'tion. — Material produced by a gland for the use of the body.

sĕn'sŏ-rȳ nerves. — Nerves that carry messages to the brain resulting in sensations.

spī'năl côrd. — The part of the nervous system which is encased by the backbone.

spīne. — The name given to the backbone.

sprāin. — The tearing or straining of ligaments at a joint.

spū'tŭm. — Matter spit up from the throat or lungs.

stĕr'ĭ-līz-ĭng. — Heating a substance until all living organisms (bacteria) are killed.

sŭf'fŏ-cā'tion. — Stopping of breathing by closing the windpipe or by some other means.

taste buds. — The organs of taste in the tongue.

tĕn'dŏns. — Bands of white connective tissue uniting muscles with bones.

thō'răx. — The chest.

thrōat. — The cavity at the back of the mouth into which the mouth and nose open.

tŏn'sĭls. — Two rounded bodies at the back of the mouth.

trā'chẽ-ȧ. — The windpipe.

vaccination (văk'sĭ-nā'shun). — Treatment designed to prevent smallpox. Sometimes used as a means of protection against some other diseases.

vălve. — A mechanism to open and close a passage.

vein (**vān**). — A blood vessel carrying blood toward the heart.
vĕn-tĭ-lā′tion. — The procuring of proper amount of air in rooms.
vertebra (**vûr′tē-brȧ**). — One of the bones composing the spine.
vĭl′lī. — Little projections on the inside of the intestine for absorbing food.
vō′căl cŏrds. — Two membranes in the larynx whose vibrations produce the voice.
whōōp′ĭng cŏŏgh. — A disease characterized by violent coughing.
yēast. — Microscopic plants that cause the fermentation of sugar.

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