WESTERN CANADA SERIES

# HOW TO BE HEALTHY

HALPENNY AND IRELAND

An Outdoor Boy: Healthy and Happy

WESTERN CANADA SERIES

# HOW TO BE HEALTHY

BY

J. HALPENNY, M.A., M.D.

*Surgeon to the Winnipeg General Hospital, Lecturer in Surgery in Manitoba Medical School*

AND

LILIAN B. IRELAND

*Manitoba Normal School*


AUTHORIZED FOR USE IN THE SCHOOLS OF
BRITISH COLUMBIA, ALBERTA, SASKATCHEWAN, MANITOBA,
QUEBEC, NOVA SCOTIA, AND PRINCE EDWARD ISLAND

W. J. GAGE & COMPANY, LIMITED

TORONTO WINNIPEG

# FOREWORD

In preparing a book on some of the problems of health, to be placed in the hands of school children, the authors have departed somewhat from old and well-established lines. It has occurred to them that a study of the bony frame, or the intricate physiology of the body, cannot tend to develop right methods of living to any very great extent.

In the discussion of the various topics, the central thought should be the life of the body, and a study of the means at the disposal of the people by which it can be preserved in a state of highest efficiency. This leads at once to the problem of combating disease.

Emphasis has been laid on the fact that even when exposed to disease, the best way to avoid catching it is by living a sensible, normal life. Parents frequently ask if medicine cannot be given to prevent their children from catching measles or scarlet fever. It would seem wise to lay stress on the benefits to be derived from sunshine, fresh air and good food properly prepared. Therein lies the key to health and the means of warding off disease.

The last quarter of a century has seen the average length of life in Germany increased by six years. In India the average length of life is twenty-three years. In Great Britain it is forty-four years, and in Sweden fifty years. This difference represents exactly the comparative efficiency of methods adopted

in these countries, and illustrates very well what the Boards of Health are accomplishing in modern lands.

In England, in the time of Elizabeth, the death-rate per year was forty persons in one thousand. At the beginning of Queen Victoria's reign it was lowered to twenty-five. At the end of the nineteenth century this was as low as nineteen persons in one thousand, and at the present time it has been reduced to fifteen.

As an instance of what can be done to stamp out microbic diseases, the case of malaria fever in the Panama Canal zone in Central America might be cited. The story of this conquest is as full of real interest as any book of adventures. It was recognized that malarial fever was due to a microbe which lived in the blood of the victims. Mosquitoes carried the microbes from one person to another, and thus spread the disease. Steps were taken to quarantine, under mosquito netting, all infected persons. Everyone slept under a similar shelter. Means were employed to kill the vast hordes of mosquitoes while in the larval state. The results were marvellous. Before these precautions were taken it was impossible to do work on the canal. In one place the fever was so bad that the town was named "Matachin," which means "Dead Chinamen," because so many Chinese laborers died there from the fever.

The wonderful saving of life by the Japanese during their recent war with Russia illustrates just the facts emphasized in this text. For instance, in the Peninsular War three times as many men died from disease as by the acts of the enemy. In both the South African War and the Spanish-American War almost half the deaths in the army were due to typhoid fever

and dysentery. In the Japanese army during the war with Russia they lost only one soldier from disease for every three or four dying from injuries received in battle. Why? Simply because they chose camping grounds where good water could be obtained, and arranged their camp in a sanitary way. If, by attention to food, water and sleeping accommodation, the death-rate in an army can be reduced so materially, surely the same everyday matters are important, when the health of boys and girls is considered.

As an illustration of the importance attached to so common a matter as a water supply, the experience of Plymouth, Pennsylvania, might be cited. In 1885 its population was 8000. The bulk of the water for the town was brought from a stream on an adjacent mountain. The water was there stored in four large reservoirs. In a house on the river bank between the third and fourth reservoirs there occurred a case of typhoid fever early in the month of January. This patient had a severe relapse which kept him ill till the middle of March. The refuse from the patient's room was not sterilized in any way and was disposed of by dumping it over the river bank. During the last week in March a rapid thaw occurred. Just at this time it was found that the pipe connecting the third reservoir with the second was frozen up and the water in the first two was almost exhausted. The frozen pipe was thawed and repaired, with the result that for the time being water came largely from the third reservoir, running as it did almost directly through the first two because they contained very little water. Typhoid fever broke out in the town, with from fifty to one hundred new cases a day. In all there were 1104 cases in a very short time. A few houses got water from the

Susquehanna River, and no case of typhoid occurred in these homes.

It has seemed to the authors that school children should be taught such facts as these rather than anatomy and physiology. Right habits of living will keep people healthy without the knowledge of how many bones there are in the body, and even without knowledge of the details regarding the digestive tract and the wonderful vital and chemical processes concerned.

The authors wish to acknowledge the kind assistance rendered by the following: Miss Ida K. Bradshaw, Miss Irwin, Mrs. Lorne J. Elliott, Prof. Evatt, P. B. Justine; Doctors D. A. Stewart, T. Glen Hamilton, H. P. H. Galloway, S. J. S. Pierce, Howard McDiarmid, A. J. Douglas, W. Harvey Smith and Gordon Bell; and Prof. Mitchell of Manitoba Agricultural College.

# CONTENTS


| CHAPTER | | PAGE |
|---|---|---|
| I. | SUNLIGHT | 11 |
| II. | FRESH AIR | 18 |
| III. | VENTILATION | 25 |
| IV. | SLEEP | 31 |
| V. | RESPIRATION | 38 |
| VI. | PHYSICAL DRILL | 43 |
| | Winter Games | 48 |
| | Summer Games | 49 |
| | Arm Exercises | 49 |
| | Trunk Exercises | 50 |
| VII. | MENTAL HYGIENE | 53 |
| VIII. | CLOTHING | 55 |
| IX. | THE HOME | 63 |
| X. | THE COUNTRY SCHOOL-HOUSE | 70 |
| XI. | SUMMER HOLIDAYS | 76 |
| XII. | FOODS | 81 |
| XIII. | SELECTING AND PREPARING FOOD | 88 |
| XIV. | THE CARE OF FOOD IN THE HOME | 95 |
| XV. | GOOD WATER | 103 |
| XVI. | CLEAN MILK | 109 |
| XVII. | BAD MILK | 119 |
| XVIII. | ALCOHOL | 124 |
| XIX. | ALCOHOL AND ANIMALS | 127 |
| XX. | ALCOHOL AND MEN | 133 |
| XXI. | TOBACCO | 136 |
| XXII. | DUST | 141 |
| XXIII. | SWEEPING AND DUSTING | 144 |

| CHAPTER | | PAGE |
|---|---|---|
| XXIV. | Microbes | 148 |
| XXV. | Microbes in Action | 154 |
| XXVI. | Microbes and Disease | 157 |
| XXVII. | The Blood in Health | 160 |
| XXVIII. | The Blood in Disease | 166 |
| XXIX. | Infectious Diseases | 174 |
| XXX. | Tuberculosis | 179 |
| XXXI. | Disinfection | 192 |
| XXXII. | Home Nursing | 196 |
| XXXIII. | Skin | 208 |
| XXXIV. | The Nails | 214 |
| XXXV. | Care of the Mouth | 217 |
| XXXVI. | The Eyes | 224 |
| XXXVII. | Ears, Nose and Throat | 233 |
| XXXVIII. | Emergencies | 236 |
| | Drowning | 236 |
| | Bleeding | 238 |
| | Fractures | 238 |
| | Frost Bites | 239 |
| | Burns and Scalds | 239 |
| | Fainting | 240 |
| | Fits | 241 |
| | Street Car Accidents | 241 |

# HOW TO BE HEALTHY

## I. SUNLIGHT

FILL two window-ledges of your school-room with plants. Geraniums will be the best, for they are easily cared for and are rather thick in leaf and stem, and will show more easily what we wish to find out about the effect of sunlight upon plants. If possible, choose windows on the south side. In the first window put three or four geraniums. These plants must be cared for as geraniums need. They must be watered three times a week, leaves washed at least once a week, and the earth stirred with a pencil or stick, so that it will not become baked and hard. For the purpose we have in view, be careful not to turn the plants around. They must always have the same side to the sunlight.

In the other window place geraniums also. They must be cared for in the same way, only every day a different side must be turned towards the sun.

If you have a third window, fill it in the same way, only turn the plants around every two weeks.

Note carefully the results. You will find this:

1. In the window where the pots are never turned, the plants are all one-sided, and the leaves

have grown in such a way that the flat surfaces are turned towards the sun.

2. In the window where you turned them regularly, they are even and symmetrical, the leaves facing the outside of the plant.

WINDOW WITH PLANTS

3. In the third window you will find that in the two weeks the plant's leaves have turned towards the sun as in the first case. When you turned the pots and made the leaves face the dark room, they gradually bent back and in a short time were facing the light.

Look at the solitary trees in the open field, and you will find that, generally, the branches are all well developed and the leaves are so arranged that they will catch the greatest amount of sunshine. Notice the trees in a wooded section, and you will see that those in the centre have the lower branches poorly developed, the best branches being at the top, where they can get the sunlight. Notice, too, that the centre trees are the tallest, for nature has caused them to stretch up towards the sun. The grass under the trees on the lawn is very poor, and where the shade is very heavy, the ground is bare. The gardener will tell you that it is hard to get shrubs to grow, or flowers to bloom, in the shade.

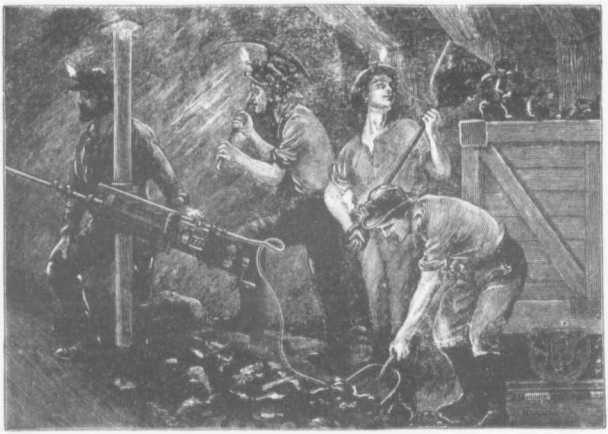
Have you ever raised a board which has been lying on the grass for some days? What do you see under it? There, on the sod, is the exact outline of the board, marked in very pale green or white grass. Of course, the weight of the board caused the grass and weeds to be flattened out of shape and not to grow so well; but what made the leaves white?

TREES WHICH GET PLENTY OF SUNLIGHT

Look in the vegetable bin in the spring, where the light is dim. The potatoes have begun to sprout. Examine a sprout. How frail it is! It breaks easily. See how pale it is! No board holds it down. It is free to rise right up into the air. The green color is not there. Why? There is no strength or toughness in the stems or sprouts. How different from the potato stems in the field! They are

woody and tough, and serve the plant in the way Nature intended. What causes the difference?

The green color of the leaves and stems is caused by the sun. Vegetable nature must have sunlight in order to grow. We have seen that if a plant is kept in the shade it does not grow well. If the sunlight is kept away altogether, the plant, if it lives at all, is delicate and without color.



MINERS AT WORK IN A COAL MINE

Does this apply to people? We have all read, in our history, of prisoners in the dungeons of castles becoming pale, sad and insane without the sunlight and fresh air.

In the polar regions, where night in the winter lasts long, weary months, the vitality of the inhabitants gets to a very low ebb. One of the party with Nansen,

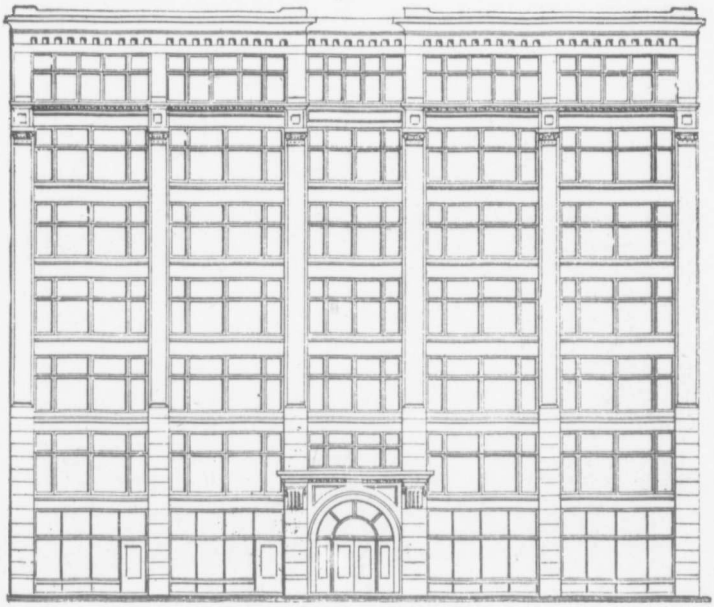
who spent three winters beyond the arctic circle, writes: "The last winter in the ice was simply awful. We had our fill of the darkness. We got sleepy and indifferent, and shaky on our legs. We were not ill, but weak and dead beat, and the doctor was anxious about our brains. When the day came with the sun,

A Well-Lighted Office Building
*Why not light our houses as well?*

it was like a resurrection for us all. We were electrified when we saw him. Nobody knows how fine the sun looks but those who have been six months in darkness. Then came we to strength again."

We do not have to go so far away as that. Notice the people that you know who seldom go out into the sunlight. Notice the girls and boys who have worked for some time in factories, where they go to work early

in the morning and return when the lights are lit at night. Read what you can of those who work in mines and seldom come into the sunlight. Men who work at night and sleep in darkened rooms during the day are usually



*A Modern Office Building

pale and seldom healthy. We are told that there is an underground river in Kentucky where fish are blind. See what an effect the absence of sunlight has upon physical nature. Look at the face of a farmer and then at that of a man who lives in the crowded part of a large city.

* Reproduced by permission of *Manitoba Free Press.*

This gives us some idea that sunlight is beneficial; indeed, it is almost absolutely necessary to good health.

We will later look into the effect of sunlight on disease germs. This will be one other great inducement for us to forget the fading of our lovely carpets and curtains, pictures and wall-papers. Sunlight is the best germ-killer there is. Doctors have made experiments all over the world, in crowded cities and on farms, in dark rooms, in sunlit rooms and damp cellars, trying to discover how these germs thrive, and they find that in the sunlight they have very little hope of an existence.

What a cheap way for us to become healthy! In our country there is no lack of this wonderful medicine, if only we are careful not to shut it out.

### WHAT TO DO

1. *Study plants in relation to sunlight and shade.*
2. *Study solitary trees and those in the woods.*
3. *Notice people who live in the sunlight.*

### HOW TO BE HEALTHY

1. *Let the sunlight into your homes.*
2. *Let the sunlight into your schools.*
3. *Take a sun-bath every day.*

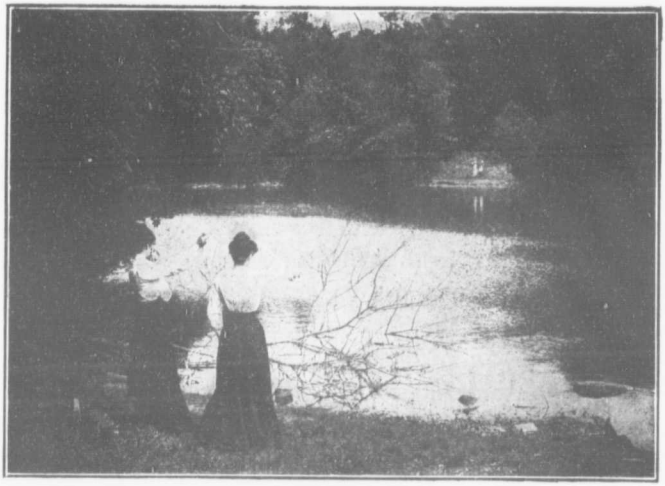
## II. FRESH AIR

During our summer holidays, we all like very much to spend the time in the open air, preferably by some nice body of water, surrounded by trees. The air seems so beautifully fresh we prefer holidaying here to anywhere else. Another pleasure which comes to us, due to fresh air, is found after a beautiful shower of rain that comes at the close of a hot and dusty summer day. Did you ever stop to ask yourself why we enjoy the fresh air so much at times? What is the difference before and after an evening shower which makes the air seem so much fresher?

Have you ever gone into a house which seemed stuffy? Have you ever gone out for a walk in the morning before breakfast and, returning, found that after the fresh outside air, the house seemed very close? Have you noticed on going upstairs after breakfast that the bedroom air was unpleasant to breathe? In the same way, have you ever gone out of the school-room into the fresh air outside just before the close of the day, and returned to find that the school-room air was almost stifling?

One day in a school all the children were tired. It was hard to think! It was hard to do things necessary for the day's work! Then the teacher opened the window and the door to let out the impure

air and let in the fresh air. The class stood and took some breathing exercises which let the pure air down deep into their lungs. What a change! How much easier it was for them to accomplish their work then. How much easier the studies seemed to the pupils. What was the cause of the change?



PLENTY OF FRESH AIR

Hold your breath as long as you can. Note how long. Note how you feel. Close yourself in a closet without ventilation. At first you feel all right. Soon you begin to pant. Why? Fill the room with smoke or gas from the stove. Why do you choke, or if left in long enough, why would you die?

In your history you have read about the "Black

Hole of Calcutta," that little room into which one hundred and forty-six prisoners were put that dreadful night during the War in India. In the morning only twenty-three were found alive. Why did the others die? All night long they struggled to get near the little window for fresh air, and died an agonizing death from suffocation. Living things must have oxygen, or they will die.

Along the coast of Australia, divers go beneath the sea for pearls; but no matter how precious the pearls, or how many there are, the divers cannot stay long under the water. They must have air. For this reason, suits are made for the divers and tubes attached to them by which a supply of fresh air can be sent constantly to the men beneath the water.

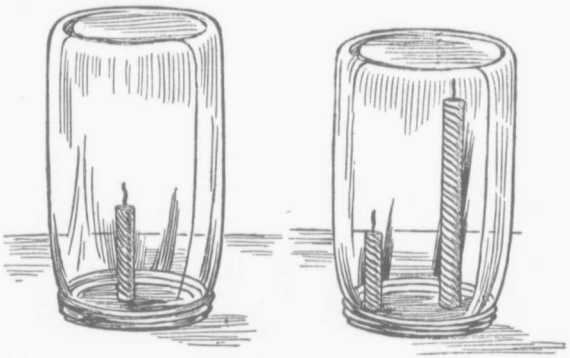
Let us try to find out something about fresh air. You cannot see it nor can you smell it, yet you can feel it, and know immediately when it is not present or is being exhausted. It is made up of several gases. The important one for life, is oxygen. You cannot live without it. This is why the prisoners in the Black Hole of Calcutta died. This is why the divers could not stay beneath the water.

If a room is small and there are no means of ventilation, the air spoils rapidly. In a larger room the pure air lasts a longer time. Even in a very large room or house the air will become impure in time, if people live in it, and care is not taken to ventilate it.

People have asked how much fresh air each boy or girl should have in order to be healthy. Those

who have made a study of the question say that every boy or girl should have 2000 cubic feet of fresh air every hour. This means that 2000 cubic feet of bad air must be removed to make room for the 2000 cubic feet of good air. Some of the new schools are so built that children get about that amount every hour, and this makes the school a healthy place to stay in.

Let us perform a few experiments to see if we can find what makes the difference in the air. Light a



TRY THIS EXPERIMENT

candle, place over it a glass jar which fits tightly to the table, and watch the flame. Take the teacher's watch and see how long the candle continues to burn. Take a smaller jar and a larger one, if you have them, and try the same experiment. Write down the exact number of seconds the candle burns in each case. Try two candles the same length under each one and

also write down the exact time they burned. You will need to be very particular in getting the time correctly in each case. Now compare the figures you have, and then try to account for the differences.

Next take the largest glass jar you can find. Under it place two lighted candles, one reaching almost to the top of the jar, and the other a very short one. Watch carefully to see which one goes out first. Why is this so? What has happened to the air, that the candles do not continue to burn and that they do not go out at the same time?

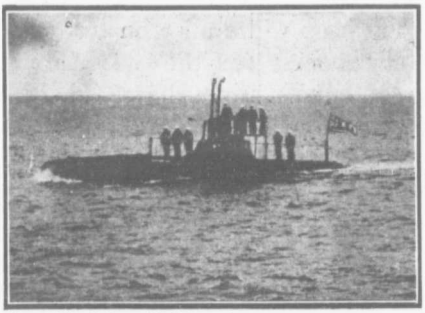
Now put a lump of lime the size of an egg into a quart jar. Pour in water till the jar is about three-quarters full, shake it well and let it stand for half a day. By this time clear water will have collected at the top and the lime will be at the bottom. This clear water is what is called lime-water. Carefully pour off the clear water into another vessel without shaking up the lime at the bottom.

Again, burn a candle under one of the glass jars. As soon as the flame has gone out, turn the jar over quickly, place the palm of your hand over its mouth as you turn it. Now slip your hand slightly to one side and pour in some of the lime-water, and again cover the mouth of the jar completely with the hand and shake vigorously. Now note carefully what happens to the lime-water. Why has it become cloudy? Is it that the air in the jar has changed? Is it the same change in the air in the jar which causes the candle to go out?

Now take the glass full of the lime-water and a small rubber tube, a glass tube or a straw. Put the end into the lime-water and breathe through the tube, continuing to do this for a few minutes. Note carefully what happens to the lime-water. Compare it with what was shaken up in the glass jar.

Now take a bicycle pump or the rubber bulb off an atomizer and force air through the clear lime-water. Do this both in the school-room and outside. Does the lime-water now become cloudy, and if so how long does it take in each case?

Let us ask ourselves why all this? What change is there in the air that it makes the lime-water become milky? Smell the air in the jar after burning the candle in it. You have tried the air from four sources, namely, that in the glass jar after burning a candle in it, that which you exhale, that of the room, and the air outside. In which case does the cloudy appearance come most quickly in the lime-water? Which air is the pleasantest to breathe?



*Copyright by Underwood & Underwood*

SUBMARINE SHIP

Your teacher will tell you that when the candle burned in the jar, carbon-dioxide was formed. The

oxygen in the air combined with the carbon of the candle. As soon as all the oxygen was used up the light went out. And it did not take long for this to occur. This carbon-dioxide was what made the lime-water milky. No matter where it comes from, it has the same effect on lime-water. And you found that air heavily laden with carbon-dioxide was not pleasant to breathe.

If it is unpleasant to breathe is it necessarily unhealthy? If you were to catch a mouse and put it into a tightly closed glass jar you would find it get quite dull and stupid in a very few minutes. If it were left there a little longer it would die for want of oxygen. This fact is made use of in submarine ships. There they keep white mice on board. These little animals very quickly feel the lack of oxygen, and faint. The men on board immediately look to the air supply.

### THINGS TO DO

*1. Hold your breath as long as you can. Note how you feel when choking.*

*2. Compare the air outside and inside your schoolroom just before four o'clock.*

*3. Try the experiment on lime-water with a tiny pinch of phenolphthalein. Get five cents' worth from your druggist.*

### HOW TO BE HEALTHY

*1. Live as much as possible in the fresh air.*

## III. VENTILATION

The experiments of the preceding chapter bring us to the question of Ventilation. If air becomes bad, if we must have oxygen, then how are we to supply ourselves with the necessary quantity?

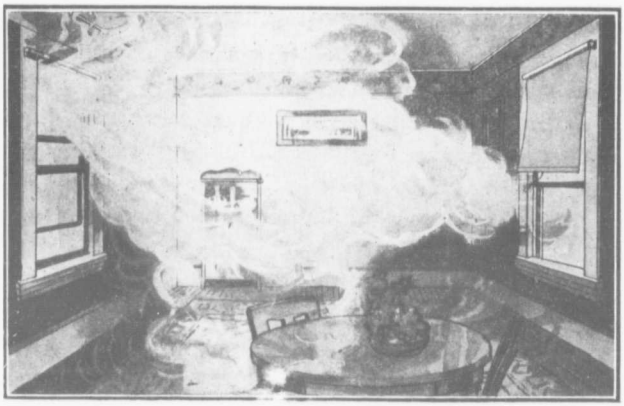
Try another experiment. Open the house door a very little. Light a match and hold it at the crack near the floor. See how the flame is blown back into the room. Now try the lighted match near the top of the door. Notice the flame. This time it is drawn out through the crack.

We have often watched the trees on a windy day. The wind is moving air. Drafts are just little breezes caused by differences in temperature. This fact is very useful to us in our work of ventilation, for we know that the cold air pushes into a warm room near the floor and the warm air rises and goes off at the top.

If our room or house or school is old-fashioned, we must ventilate by opening windows and doors. By opening a door and a window, we may change the air in any room quite easily, especially if the wind blows. But this causes a draft and is not good if people are sitting in the room. To sit in a draft is more injurious than to be out in the cold altogether. If possible, send the people out of the room and ventilate quickly. This can easily be done at recess if the teacher wishes

to ventilate the school-room. If we must change the air while people are in the room, lower one window from the top. This will make less draft.

If you wish to watch the air-currents, cause the room to be filled with smoke and then open one window



SMOKE-FILLED ROOM. WATCH AIR-CURRENTS

at the top and the other at the bottom, and watch the smoke go out at the upper part of the window and clear air come in at the opening in the lower sash.

If you have a furnace, ventilation will be easier, for furnaces are now arranged so that the fresh air comes in through the hot air registers in the wall, and the used air goes off through the cold air registers on the floor. Sometimes people cover the cold air registers with rugs or carpets. This is very wrong, for by so doing they are spoiling the circulation of the air. One

thing must be carefully looked after when the furnace is being put in: see that the fresh air supply comes from the pure air outside. There is a danger of the new supply for the furnace coming through the cold air registers, which means that the foul air drawn off from the floors of the rooms re-enters the furnace to be warmed over, and sent in again through the hot air registers.

In houses heated by steam or hot water, ventilation must be carried on by having flues built specially for the purpose, or by allowing fresh air to enter by the doors or windows.

Fireplaces and stoves are very good ventilators. Even when not lighted, the draft will draw off the air from the floor. This allows pure air to enter.

At the present time builders and architects spend a great deal of thought on how best to ventilate the buildings which they construct. In large buildings where many people stay every day, such as schools, stores, etc., there are very elaborate systems of ventilation. These are arranged so that the fresh air comes into the room warmed. One does not need to open windows or feel the cold winter air at all.

In summer, we live so much with our doors and windows open that generally we have good air. In winter, it costs money for us to ventilate properly, for we must bring in cool air either through the doors and windows or through ventilating shafts. In every case, whether coming into the room or coming into the furnace cold, it must be warmed before we are comfortable.

Cold or warm, we must have fresh air in order to be healthy.

When we stuff up the cracks in our doors and windows we not only shut out the drafts, we shut out fresh air and shut in foul air. Soon we use up the oxygen from the air. Not only this, but we poison it by breathing out carbon-dioxide. The air in such a room would feel very heavy to one coming in from the outside. It gets worse and worse. No wonder that we get tired out and cannot think properly. But, of course, people go in and out, and occasionally the door opens so that the air does not become absolutely poisonous.

Now there are some other things which poison the air besides the carbon-dioxide. Our clothing must be clean, or it will give off odors which will help to poison the air. Our skin also sends off in perspiration a poisonous gas.

Then, if the room is dusty or there is anything not clean in it, the air cannot be pure. It is impossible to have pure air, even when you try to ventilate carefully, if there is dust or dirt in the room. Some country school-rooms are not scrubbed, and though the teacher may try very hard to ventilate properly, it will be impossible unless the woodwork is washed carefully at least every fortnight. We have seen children sweeping a country school-room, raising clouds of dust which were most injurious. Some day a clause will be put in the law regulating government grants, providing that trustees who do not have the school premises scrubbed

at least once a fortnight, will not receive help from the government. This is far more necessary, in loyalty to our Dominion, than making a great show of the flag. We need the flag over our schools, but under that flag marches the race which is first in all things which betters humanity morally, mentally and physically.

One other thing which is most injurious to the health in our homes is the odor of cooking, especially of burnt food. Tobacco smoke is also injurious.

AIR LEAVING THE ROOM

We are careful all day in school to have fresh air; we air our living rooms, our parlors and dining rooms; we have ventilators over our stoves to carry off the odors of cooking; but we close up our sleeping rooms very carefully so that we will be cosy and warm. Instead, we need to be cool while we sleep and, above all, we need fresh air. Two or three holes in the storm sash are not sufficient for one person, let alone two, in a room. Even cold rooms need fresh air. Cold air does not mean fresh air. Always have your window open at night, and you will feel rested in the morning.

People who live in factories grow pale from being in close quarters and not getting relaxation, fresh air and

sunlight. Men who work in mines become pale and their blood becomes thin. We have a right to be healthy and happy, and we can if we will only live properly.

HOW TO BE HEALTHY

1. *Air the house well every morning.*
2. *Live as much as possible in the fresh air.*
3. *Always sleep with your window open.*

## IV. SLEEP

O sleep! it is a gentle thing,
Beloved from pole to pole!
To Mary Queen the praise be given!
She sent the gentle sleep from Heaven,
That slid into my soul.

—*Coleridge.*

When you are sleepy the brain is tired and must have rest. The brain is working when you are thinking, worrying or working. Of course, different parts of the brain are busy with these different tasks, yet each cell of the brain is connected with every other cell, and when part is tired it affects the whole. So when you worry you are tiring yourself out, just as much as if you were doing sensible thinking, or by labor of your body accomplishing some actual task.

If you open and shut your hand or raise and lower your arm and keep this up for some time, your muscles soon begin to stiffen, and even though you command them to continue, they cannot. It is the same with your brain. No matter how hard you may try, no matter how necessary it is for you to remain awake, no matter how strongly you command yourself, Nature is stronger than your will, and you must sleep.

Soldiers in active service have been known to go to sleep while marching. Little factory children, who are tired, have fallen asleep at their labor, even when

they knew they would be punished or dismissed if caught. When the brain and body are tired out you cannot remain awake.

We must judge for ourselves how long we should sleep. For instance, little children need more sleep than grown-up people, and delicate people need more than strong people. One thing we should be sure of is, that if we are tired in the morning, something is wrong, either with our health or with the way we sleep, and we must test and try till we make it right. Generally we should sleep as follows:—

Babies need to sleep most of the time.

Children of 4 years need 12 hours' sleep.
" " 7 " " 11 " "
" " 8 " " 10½ " "
" "11 " " 10 " "
" "12 " " 9 " "

Grown-up people need 8 hours' sleep.

The body needs this time, while we sleep, to repair the cells of muscle, bone, etc., which have been getting weak during the day. In children it needs the time, not only to repair the wasted cells but to build new ones. This is how they grow. Mothers often say that their babies just sleep and eat and grow. So while the brain rests, the old cells are repaired, and in growing children new ones are built up.

The brain work, then, is far more important than the work of any other part of the body. To lie down rests the body. It puts less work on the heart, and

because there is no action of the body, there is no wearing away of cells; but the brain may still work. When we dream, the brain is working a little. Only when we sleep the perfect, dreamless sleep, does the brain really rest.

When sleep is so important, we should be careful what habits we form. We can stay up late and sleep late in the morning, and get in the exact number of hours of sleep needful, and still feel sleepy in the morning. Better do home lessons in the morning and go to bed two hours earlier the night before. The hours before midnight are the most important hours. Why is this so? In fact, why do we sleep at night and work in the day time? Is it because it is merely inconvenient to do our work in the dark? No. It is because we actually sleep better and sounder when it is dark than when it is light; and since it is better to sleep in the dark, do not leave a light burning. When we go to bed early, therefore, we find we rise in the morning quite rested. Of course this does not apply where people have been in the habit for a long time of going to bed at midnight. They have formed a habit of not retiring till late, and will find it hard at first to sleep, even to rest, before their accustomed time. In a little while, if they persevere, they will sleep as easily two or three hours earlier, and feel rested at the proper hour to rise. Every time that you find yourself stiff and tired in the morning, go to bed a little earlier the next night. Soon you will discover just how much sleep you really need.

The next habit you must be careful of, is when you rise. Be sure that you rise very soon after you waken. To lie in bed after you are awake is one of the worst habits you can form. In the first place, you are almost sure to doze off again, though you do not go fast asleep. This makes the head heavy and the thinking not clear. Again, it makes your rising time indefinite, and thus there is danger that you vary the length of time you sleep.

Then last, but not least, Nature has awakened you; and as you should rest when tired, so all the forces should become active when you have rested. You can, by repeating an action three or four times, form a habit. For instance, you rise with a start the first time you hear a new alarm, then curl over and go to sleep again. You realize that it is only the clock. Next morning you hear it faintly, and in two or three mornings it does not disturb your slumbers. We are told that nurses can train themselves so that the slightest whisper or move of their patient will awaken them, while a fire-brigade would not disturb them. An admiral is said to have gone to sleep on deck in the midst of a naval battle, just six feet from a firing gun, and slept two hours, all unconscious of the awful din which surrounded him.

We can train ourselves in habits of sleep just as we form habits in other things. When people say that they cannot sleep before midnight or they must sleep late in the morning, or children must have a light, or cannot stand a noise, it all results from the habits

they have formed. Be careful that you are forming sensible habits of sleep. The old rule of: "Early to bed and early to rise makes a man healthy, wealthy and wise," is still a good one for those who wish to be a success in this world. Remember, too, that half your troubles and ailments are the result of habits formed without a thought of where they lead.

Then the best way to sleep is to go to bed early. In what kind of a bed? In what surroundings? The bed should be comfortable; there should be a soft, low pillow. If you will remember that you wish to be straight and not round-shouldered, you will form a habit of lying carefully in bed, and not hunched up or on a high pillow. Besides this, if the head is high, it gives more work for the heart to do in order to raise the blood to the head. The prime idea of sleep is that all the organs of the body will get as nearly perfect rest as possible.

THIS SCREENED-IN VERANDAH IS A GOOD PLACE TO SLEEP

The room in which you sleep must be clean and have one or two good-sized windows in it. Never sleep in a room in the middle of a building with no

window, or with only one which opens into an air-shaft. It is almost as bad to sleep in a room where your window is very close to the side of another house.

Windows are intended to let in light and sunshine and fresh air in the day time; at night their sole purpose is to let in fresh air. Now, in cold climates, it is necessary to put on double windows in the winter. On some houses these extra windows are all in one piece, and they have no openings in them. Then they are nailed on solid. Some of them have two or three auger-holes bored in the bottom of the sash. Imagine how little fresh air could enter through these holes. The storm window should have a pane of glass at least eight inches wide and twelve inches long, so made that it will slide. Thus the size of the opening can be regulated. If the wind blows directly in, the slide will need to be open only three or four inches. But if the wind is on the opposite side of the house, open the slide full length.

If your house has storm windows without these slides, have the whole window put on with two strong hinges at the top and a hook at the bottom. Thus you can be sure of securing plenty of fresh air.

And when you go to all the trouble of getting fresh air into the room, the head must never be covered; for no matter how fresh the air is in the room, if you cover your head you will not get the benefit of it.

Some people are very much afraid of catching cold if they sleep with open windows. The picture of the

baby in the carriage is from a photograph taken just to show you how it lives.

This baby slept out on this open verandah at least four hours every day during the winter, except when there was a storm blowing on to that part of the house. Surely you can stand a little fresh air in your room.

BABY SLEEPING ON VERANDAH IN WINTER

Because of the extreme cold in winter, there is some excuse for people not letting in a great deal of fresh air. In the summer, however, there is no possible excuse. Every one who possibly can should sleep on a screened-in verandah. Those who are not fortunate enough to have such a verandah should have the windows wide open except when it is storming.

If you are careful in these things, you should waken in the morning fresh and rested and ready to face whatever the day may bring.

HOW TO BE HEALTHY

1. *Go to bed early.*
2. *Rise when you waken.*
3. ***Be sure you have plenty of fresh air while you sleep.***

## V. RESPIRATION

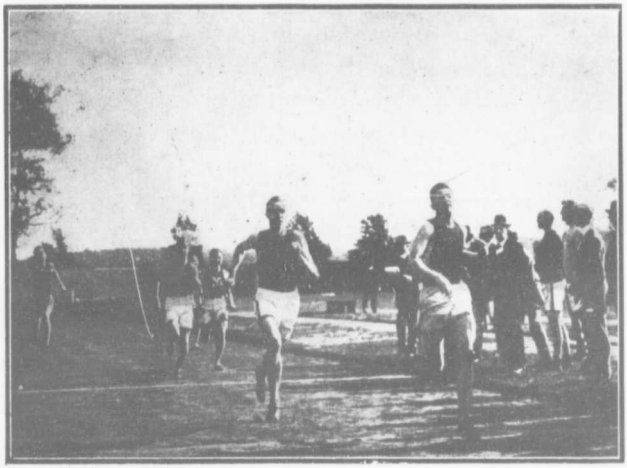
The means by which oxygen is taken up by the system is through our lungs. Here, the oxygen is taken from the inhaled air by the blood, and carbon-dioxide is given off with the exhaled air. This is what we call respiration.

Respiration is carried on automatically; it does not require any attention whatever on our part. The rate is regulated by the blood circulating through a certain portion of the brain. When the system requires more oxygen, the blood has the effect, on this part of the brain, of increasing the rate at which we breathe. For instance, if a boy runs hard in a race for 200 yards he uses up a great deal of the oxygen circulating in his blood. The demand for more oxygen is made on the appropriate part of the brain and immediately the boy begins to breathe very rapidly.

Respiration is carried on by means of the nostrils, pharynx and trachea, leading down to the lungs. In the lungs the interchange of oxygen is made.

One should always breathe through the nose, and not through the mouth. This is important for three reasons. In passing through the nostrils, the air is warmed, moistened and filtered. You all know that in the cold weather in the winter, if you breathe through your mouth, the throat feels quite sore and

hoarse and the voice becomes husky. This is due to the cold air going directly into the larynx and the trachea. In the larynx especially, where the voice is produced, cold air does a great deal of harm. The second function is also important; the mucous membrane of the nose is always slightly moist. The air





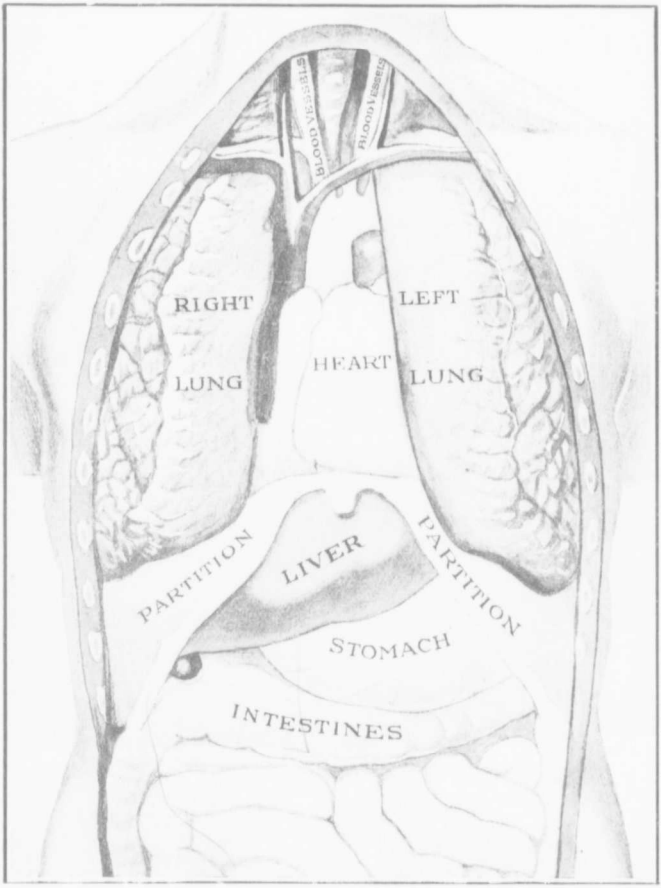
A Close Finish

inhaled through the nose takes up the moisture, and as it passes down through the trachea is less irritating than dry air. In breathing through the mouth, the air is still dry when it reaches the throat. The third function is probably as important as either of the other two. The nose is lined with tiny hairs called *cilia*. These fine hairs catch particles of dust in the air and prevent them from going down into the lungs.

Frequently amongst boys and girls, are seen those who always breathe through the mouth. This is sometimes due to little growths in the throat just at the back of the nose. These growths are called *adenoids*, and are usually associated with large tonsils. When the child catches cold these increase in size and close the throat off completely just below the nasal passage. The child would smother if he were prevented from breathing through the mouth. If mouth breathing is allowed to continue it has very serious results. The throat becomes dry and the voice frequently rough. The bridge of the nose becomes flattened, thus spoiling the appearance of the face. But the worst feature of all is that this habit robs a boy of his bright mind and the power of concentration.

The older boys and girls in the family, therefore, should watch their little brothers and sisters and their playmates to see if they are mouth breathers. If they are found to have acquired this habit, the parents and the family physician should be informed at once. There should be no delay in having the defect remedied.

The trachea is the tube leading from the back of the mouth to the lungs. At its upper end is the larynx, which is the organ of voice. This can be felt externally at the upper and front part of the neck. Here it has the appearance of a hard lump. It is composed of cartilages lined with mucous membrane. Across the inside are stretched two strong bands of elastic tissue called the vocal cords, by means of which we are able




Organs of Respiration and Digestion

to make sounds. These cords extend from the front to the back of the larynx. While breathing, the cords are quiet and the opening between them is large; but when sounds are made, the vocal cords come together, and the air inhaled passes between them.

Below the larynx the trachea is composed of rings of cartilage held together with fibrous tissue, and the whole lined with mucous membrane. This is what is called the windpipe. Just below the upper end of the breast bone the trachea divides into two branches, called the *bronchi*, one branch going to each lung.

After entering the lungs, the bronchi divide many times, until the last branches are very minute in size. At the end of each division there is a little air cell which is a tiny little sac. The walls of these air cells are very thin and highly elastic. They are capable of being stretched much like the rubber inside of the football. Surrounding the outer walls of the air cells is a dense network of minute blood vessels. Here the oxygen is taken up from the air by the blood, and the carbon-dioxide is given off. Thus the dark blood is changed into bright blood. These tubes, air cells and blood vessels form the lungs, which are situated in the chest, one on either side.

It is because this carbon-dioxide gas is poisonous to us, and because we must have oxygen in order to live, that we smother when fresh air is kept from us. You see, then, why the lungs are so important and why it is so necessary to keep them healthy. For this reason they are put in a bony case; and because they must

expand and contract like a bellows, the ribs are constructed as they are.

The deeper one breathes the more oxygen comes in contact with the blood. We should be careful, then, to wear clothing which will be loose enough to allow free expansion of the ribs. We should also take breathing and stretching exercises. When one does not breathe deeply, some air remains in the lungs for a long time, and it becomes loaded with carbon-dioxide. If the blood does not come in contact with pure fresh air it becomes poisoned by this carbon-dioxide. See how important it is to breathe properly. Babies breathe correctly. It is after they begin to grow and form careless habits that they need lessons about breathing.

THINGS TO DO

*1. Take a dozen deep breaths every morning in the open air.*

*2. Measure your chest during inspiration and expiration.*

HOW TO BE HEALTHY

*1. Breathe through your nose.*
*2. Always breathe fresh air.*
*3. Breathe deeply.*

# VI. PHYSICAL DRILL

## OUR ARTIFICIAL LIFE MAKES PHYSICAL DRILL NECESSARY

Our savage ancestors were lithe and alert. They had to be. Every cell in their bodies was active. Every minute of their lives they struggled for an existence. Food was hard to get, and everywhere wild animals or wild men lay in wait for them. Thus their days were filled with physical labor. Their nights, of necessity, were spent in sleep. How could they be anything else but healthy?

Our lives are different. So many things come to our hand that we rarely think of how they are produced. Our fire comes from the gas tap. We do not have to spend weary days in searching for fire, as our ancestors did. If we wish water we turn a faucet and there is an abundance. Even in the country, more and more of the luxury of civilization is becoming possible. So seldom do we have to go back to nature for our needs that we are getting to expect almost everything ready made. Some even resent having to cook, and often breakfast foods are advertised as predigested. What will become of us?

The illustrations in this chapter relating to Physical Drill are reproduced from "Bancroft's School Gymnastics," by permission of the Publishers, D. C. Heath & Co., Boston.

Our lives are artificial; of this there is no doubt. If we take the time to look at the men and women on the street, or better still, in the street car, we have evidence sufficient to prove to us what a bad effect this artificial life is having upon our race.

Look at that stiff man. He is not above forty, yet he is as stiff and portly as grandfathers used to be at sixty. There are hundreds like him. The women

LITHE INDIANS IN THEIR CANOE

are stiff and awkward too. Watch the people run for the car. There are few with easy, springy steps. Few run easily. To-day we make an ovation to the man who can win the Marathon. Runners among the ordinary are so few. Why are the people so stiff and clumsy? Because they eat food such as their savage ancestors ate—meats and other flesh-producing foods —yet they are not called upon to perform the same intense physical exercises. They eat fats, oils and sugars in great abundance, and yet they house them-

selves in comfortable apartments and clothe themselves warmly. Their ancestors slept under the open sky, and in winter were clothed in rough skins.

The men of this generation sit all day at their work. They ride home in crowded cars at night.

Don't you see where our life is leading us? If we have not used our tissue by work, then we do not need tissue-building foods, and nature packs away the surplus between the useful cells. This interferes with the movement of the muscles and accounts for the premature stiffness.

We have been thinking more of the cities and towns. Things are better in the country. It would be a blessing if every man had to do some farm-work and every woman some house-work. Sweeping and ploughing are excellent physical drills.

But it is impossible for us all to farm; and even the farmer exercises certain muscles and neglects others. The housekeeper also uses some parts of her body too much and others not enough. But physical work is necessary to health, whether we take it in drill, or in its proper field, actual labor.

By careful, thoughtful exercise, *i.e.* by Physical Culture, this useless tissue, which stiffens our muscles and joints, can be worked out and we can make every cell in our bodies alive and useful to us. This is why the athlete goes into training. Every part of his body must be under his control.

Then we think of another kind of people. We meet them so often. They are fussy and nervous. They

cannot sit still. Again the reason is lack of control. Remember, our brains are set over our bodies, as a general is set over a company of soldiers. Each has his own office to perform, but all are controlled by the head. The poor people who cannot rest are victims of our artificial life also. Because everything is ready to hand, things can be done quickly. They get the idea of hurry so fixed in their minds that they are never really still. Though outwardly calm they are still restless. Their nerves are never composed, and then there is nervous breakdown. If only our people could learn *repose*. Rest is absolutely necessary in order to get the nerves and muscles under control. The Hindoos of India are taught, when they are very little children, to rest. Every day they go alone and spend some time in repose. It is a part of their religion. While they rest they think great and noble thoughts and forget all the little worries of life, just as if they had left the world altogether. The result is that when they grow up they are not worried and flurried by all the little things which come daily to try the patience. These Hindoos laugh at our Saxon race for their wrinkled faces and useless bodies.

It is the hope of all who wish well for our Canadian people that the boys and girls who are now growing up will break away from this artificial life, which is spoiling the bodies, also the minds, of our men and women.

When we stand, let us stand correctly. Feet fairly and squarely on the floor, head erect, chest up. No need to think of our arms. Nature will hang them

correctly if we stand erect. When we sit, let us sit properly. Let us learn how to be active. Physical Culture gives us one way whereby we can keep our bodies all alive.

CORRECT STANDING POSITION

In school, because everything is so methodical, we can be more careful about our drill. But at home, when our clothing is removed, just before we go to bed and just as we rise, let us make a regular habit of exercising every part of the body. Stand before the mirror as you do this, and see that your shoulders are level and that you are erect.

Practice makes perfect; but remember it must be "thoughtful practice." Every exercise must have a thought behind it. You must aim at a certain development. This is why Physical Culture, so called, is so much better than Military Drill. The aim in military drill is to make a good showing—a pretty company. It forgets the individual boy or girl. All must stand just so—"Heels together and toes apart." This may look well. So does the check rein make the horse look smart and keep him prancing. There is style to the animal. There is pomp to the company. We want something better than that. We want our physical defects corrected.

INCORRECT STANDING POSITION
Showing hollow back and depressed chest.

This does not mean that Military Drill is not a good thing; it cannot, however, take the place of Physical Culture. The latter aims at overcoming physical defects frequently seen amongst school-children, such as a drooping shoulder or slight curvature of the spine. Military Drill, on the other hand, overlooks these points, though its discipline is an excellent preparation for after life.

Besides the exercises here given, there is great value in games. Remember that a game is a game. The goal is nothing if not fairly won. Here the physical is linked with right thinking. Never let yourself play unfairly. It's only a game. But what is a game? How were games invented? Again, our savage ancestors are our teachers. They told of their fights, of their triumphs and failures, around the camp fire at night. They acted it over again, so that those who had not been there with them could see how brave they had been. Then all joined in. Next day the boys and girls played it over again. It is the game of life played for fun. Don't you see that if the game is not played fairly, the game of life may be a failure too? Boys and girls, you show your true nature in your games.

Games for Intermediate Boys and Girls in any School:

WINTER GAMES

| *Inside Games* | *Outside Games* |
|---|---|
| Earth, Air, Water. | Prisoner's Base. |
| Charades. | Football. |

Fruit Basket. Basket Ball. Shinny. Coasting.
Pussy Wants a Corner. Volley Ball.
Squirrel. The Lost Ring. Dumb-bell Games.

### SUMMER GAMES

| *All the Children* | | *Small Children* |
|---|---|---|
| Drop the Handkerchief. | | Nuts in May. |
| Marbles. | Knife. | London Bridge. |
| Baseball. | Cross-tag. | Three Deep. |
| Hop Scotch. | Pom-Pom Pull Away. | |
| Jacks. | Tennis. | |

### ARM EXERCISES

*A. Arms stretched.* Standing position. Raise arms outstretched from sides to level of shoulders, palms downward; then lower to sides again in position of attention. Count 1 up; 2 down; 3 up, etc. Count, 1, 2, 3, 4, 5, 6, 7, 8, 8, 7, 6, 5, 4, 3, 2, 1.

CORRECT POSITION

INCORRECT POSITION

*B. Arms Circle.* Standing position (attention). Raise arms above the head, forming circle; touch the finger tips. Count as before, one up, two down. **Count 1, 2, 3, 4, 5, 6, 7, 8, 8, 7, 6, 5, 4, 3, 2, 1.**

## TRUNK EXERCISES

*C. Waist Bend.* Standing position. Hands on hips. Bend from waist to left. Body hinges at waist.

Don't let head bend at neck. Bend to left at one, erect at two, to right at three. Count 1, 2, 3, 4, 5, 6, 7, 8, 8, 7, 6, 5, 4, 3, 2, 1.

*D. Back Bend.* Standing position, hands on hips. Bend as in C from waist. Back, one; erect, two, etc. Count 1, 2, 3, 4, 5, 6, 7, 8, 8, 7, 6, 5, 4, 3, 2, 1.

*E. Front Bend.* Standing position, hands on hips. Bend from waist as in two previous exercises, keeping knees straight; front, one; erect, two, etc. Count 1, 2, 3, 4, 5, 6, 7, 8, 8, 7, 6, 5, 4, 3, 2, 1.

*F. Rotation.* Standing position, hands on hips or arms outstretched to level of shoulders. Rotate at waist. Arms up, one; rotate to left, two; front position, three; arms down by sides, four; repeat as before only to right. Count 1, 2, 3, 4, 5, 6, 7, 8, 8, 7, 6, 5, 4, 3, 2, 1.

*G. Head.* Standing position, hands on hips. Neck bent down on right shoulder, count one ; erect, two ; down to left shoulder, three ; erect, four. Count 1, 2, 3, 4, 5, 6, 7, 8, 8, 7, 6, 5, 4, 3, 2, 1.

*H. Neck Bend.* Standing position, hands on hips. Back bend, one; erect, two; forward bend, three; erect, four. Count 1, 2, 3, 4, 5, 6, 7, 8, 8, 7, 6, 5, 4, 3, 2, 1.

*I. Rotation.* Standing position the same. Rotate the head, turning slowly to the left, then to front, then to right, etc. Count 1, 2, 3, 4, 5, 6, 7, 8, 8, 7, 6, 5, 4, 3, 2, 1.

*J. Limbs.* Standing position, hands on hips. Rise on toes, up, down, counting as before.

NOTE. Be careful that the children rise and fall in erect position; the tendency is to sink back on heels and tip forward on toes.

*K. Half Squat.* Standing position, hands on hips. Bend knees, going down about five inches; shoulders erect, lower and rise in vertical position. Count as before, 1, 2, 3, 4, 5, 6, 7, 8, 8, 7, 6, 5, 4, 3, 2, 1.

*L. Knee Bend.* Standing position, hands on hips. Balance on right foot; raise left foot till knee is level with hip. Lower and balance left foot, etc. Count 1, 2, 3, 4, 5, 6, 7, 8, 8, 7, 6, 5, 4, 3, 2, 1.

*M. Toe Points.* Standing position as before. Balance on right foot—left toe pointed to left. Touch just the tip of toe to floor. Repeat to right. Count 1, 2, 3, 4, 5, 6, 7, 8, 8, 7, 6, 5, 4, 3, 2, 1.

*N. Toe Points to Front.* Same as *M*, only point toe to front. Also repeat with point to back. Also repeat with toe pointed obliquely.

CORRECT POSITION

There are exercises with wrists, ankles, toes, fingers, elbows and shoulders — exercising first the single joints. These can easily be worked out by yourselves with your teacher's help. There are also combinations of all the exercises with the toe points, etc.

INCORRECT POSITION

HOW TO BE HEALTHY

*1. Use all your muscles every day.*

*2. Enjoy your games.*

*3. Make a study of yourself and decide what exercise you need.*

*4. Be sure to exercise occasionally before a mirror to see that your shoulders are level and that you stand straight.*

*5. Do not carry your books on the same arm every day.*

## VII. MENTAL HYGIENE

*You never can tell what your thoughts will do
In bringing you hate or love,
For thoughts are things, and their airy wings
Are swift as a carrier dove.
They follow the law of the universe—
Each thing must create its kind,
And they speed o'er the track to bring you back—
Whatever went out from your mind.

—*Ella Wheeler Wilcox.*

Just as we have to form correct habits of eating, drinking and sleeping, so we must form correct habits of thinking. This has a wonderful influence upon our health. Every one believes that this is true. Just as going to bed regularly, and eating good food at proper hours makes us feel well and tends to make us happy; so being happy and, in fact, being sensible, makes us enjoy our meals, our sleep, our work and our play. It is our birthright to be healthy. Sometimes we worry ourselves ill with little things that are not important. Sometimes we imagine that a friend has slighted us. We worry ourselves and pity ourselves till we are sick. Whether people intend to slight us or not, we must not fret. Worries must not enter into our lives or affect our happiness, for nothing is gained thereby and much is lost.

*From "The Heart of the New Thought." By permission.

When real difficulties come to us, let us meet them manfully, and win or lose, but never hold on to them or brood over them. This is the cause of much ill-health. Our right to be happy must not be interfered with by anything. We find unhappy people in palaces and cheerful people in "The Cabbage Patch." Once we begin to brood, our power to do difficult things and our courage to face the trouble begins to fail. Thus we weaken ourselves. Thus we start the germ of discontent developing; and this "Unhappy Disease," like scarlet fever or any other deadly disease, leaves bad after-effects and makes us an easy prey to all other ills. Unhappiness also is very contagious. One wry face will spread discontent among many cheerful people.

The cure for this disease is plenty of fresh air, good physical exercise and careful mental gymnastics. Remember, your mind, like your appetite and your muscles, must be under control. It is wonderful what large profits in health and other things "Right Thinking" pays.

HOW TO BE HEALTHY

1. *Be cheerful.*
2. *Never brood over troubles or difficulties.*
3. *Smile a while.*

## VIII. CLOTHING

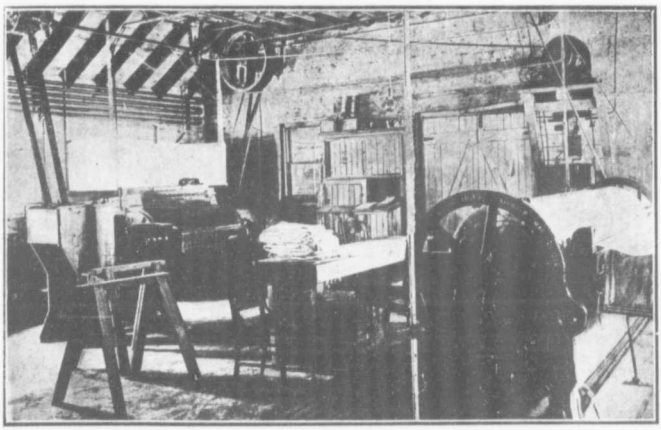
In the selection of clothing we should keep in mind our comfort and the necessity for not interfering with the free movement of the body. It is not necessary to state that we require heavier clothing in one season than another, yet it would seem well to draw attention to some errors in clothing ourselves both in the winter and summer. In the winter, for instance, we frequently see boys who wear short trousers and have nothing on the legs from the knees to the ankles except one pair of stockings. The same boy will wear a heavy overcoat and a fur cap, and many times leaves the collar of the coat unbuttoned in front, thus exposing his chest to the wind. He has, therefore, covered his body quite sufficiently except for his chest and legs. It is necessary to see that the underwear is long enough to reach the ankles. And it is better to wear an overcoat with a square collar which will button across the throat. Amongst the girls, during the winter season, are some very unwise customs. Quite frequently one sees a girl with good heavy clothing and a long coat with fur collar, and at the same time wearing low shoes, with her ankles covered only by a thin pair of stockings. Generally speaking, if one protects the feet and hands and the throat and head well, it is not

necessary to wear a great deal of heavy clothing on the rest of the body.

For those who spend most of the time indoors, such as school children and people working inside all winter, heavy underwear is not necessary. If one wears heavy underwear while working in a warm building one frequently perspires sufficiently to make the clothing damp, and on going out into the cold winter's day feels quite chilly at once. It is better to wear light clothing while inside, and be provided with overshoes, overcoat, fur mitts and good headgear for protection against the extreme cold. Regarding overshoes, all girls and women should wear either high overshoes or spats to protect the ankles. In the spring and fall, and during wet weather in the summer, we should wear rubbers to keep the feet dry. The rubbers, however, should not be kept on while in school. There is a certain amount of evaporation of the moisture of the feet through the leather of the shoes, but this is impossible if rubbers are worn all the time. The feet get damp and soon become cold and uncomfortable. Therefore rubbers should always be removed on going inside.

In the country districts, where children have long distances to walk to school through grass covered with dew, it is no uncommon thing to see the girls arrive at school with damp skirts and stockings. Here there is no opportunity of drying themselves. Even if no more serious results occur there is always danger of undermining the health.

With regard to our clothing, it is of great importance to pay attention to cleanliness. It is well, therefore, to select washable materials so far as possible. This can be done, of course, with all our clothing except outer garments. Even some of these may be made of such material that they can be washed. This applies particularly to the clothes worn by girls and young



INTERIOR OF MODERN STEAM LAUNDRY

children, especially during warm weather. Underclothes should not be worn longer than a week at most, and should be removed at night and hung up loosely to air. This is particularly necessary during the summer months when perspiration is more active.

Handkerchiefs are a necessity, but at the same time they are frequently misused. Remember that the handkerchief is brought in close contact with the

nose and mouth; therefore if it is unclean, it may become a medium for transmitting disease germs. One frequently sees the handkerchief used to dust a chair or some other piece of furniture. This, of course, forbids that it should be used as a handkerchief again until it has been washed.

The washing of our clothes is a very important matter. After garments have become laden with microbes from infectious diseases or other sources, they should be thoroughly boiled during the process of washing. In many homes the washing is done by some member of the household. This is true in practically all country homes. In towns and cities, however, a large part of the washing is sent to the laundry to be cleansed. It is well then to know what the laundry is like. It would indeed be a wise precaution for some member of the family to visit the laundry occasionally to see that it is a suitable place. In Winnipeg the Health Department had to take very stringent measures to insure sanitary conditions in certain laundries.

Considerable attention should be paid to the clothing made of such materials as cannot be washed. These clothes include many of the suits worn by ladies and practically all the suits worn by men and the larger boys. It also includes all fur goods and overcoats of all kinds. Since these coats cannot be washed, the only means left to us is to keep them well dusted and to have them cleaned by the process known as dry cleaning. This not only renders them

much more healthy, but it adds a great deal to their attractive appearance. It also adds to their wearing qualities by making them fit properly. As in the care of underclothing, so in the care of the outer clothes, they should be hung up loosely during the night, in order that they may be thoroughly aired before being put on again in the morning.

In the selection of our clothing we should aim at healthfulness, comfort and beauty, in so far as these can be combined, and the most important of these is healthfulness. Clothing is worn not only to cover our persons, but to equalize the temperature between the body and the surrounding atmosphere. Therefore the style of clothing and quality of goods worn in hot weather should be somewhat different from that worn in the winter. The quantity of clothing will also vary with the different seasons.

Our garments should be so constructed that they will not interfere with the free movement of all parts of the body. For instance, belts or tight garments about the chest in either men or women are a very great menace to health. The chest, we know, contains the lungs. The lungs can expand only if the ribs are allowed free play. We inhale air only if the lungs are allowed to expand. With tight garments about the chest the fresh air cannot reach the deeper parts of the lungs. Thus our garments should be made in such a way that all the muscles may be allowed free movement.

A surprisingly large number of persons suffer from

weak and painful feet. Some are tortured with corns and bunions, and cannot stand or walk for any length of time without suffering from an aching or strained feeling about the ankle, instep or some other part of the foot. After any unusual exertion many of these persons limp and cannot walk without distress. The great majority of foot troubles arise from wearing ill-fitting and badly designed shoes. The best proof of this is the fact that bare-footed and sandal-wearing races are practically exempt from the foot troubles which are so common among shoe-wearing civilized races.

The proper purpose of a shoe is to clothe the foot, keeping it warm and protecting it from injury; but our vanity leads us to demand various forms of foot covering which are fashionable and pretty, rather than those which are rational and hygienic; we foolishly desire to make the feet look smaller than they really are.

This illustration is reproduced from a photograph of a plaster cast of a natural foot, *i.e.* a foot which had never been distorted and spoiled by wearing shoes. It shows how nature intended toes to spread out under the weight of the body. In this natural, undisturbed and unhampered form the foot forms a

broad and strong foundation for the weight of the body, and does not tire easily; but you cannot find a shoe in any of the stores that would permit the toes to spread out in this natural way. Some shoes are much broader and less harmful than others, but many are quite pointed.

If you grasp the front of your foot firmly in your hand you will see that it is soft and the bones can be crowded together and the toes curled under, and that is exactly what takes place when a narrow, pointed shoe is worn. Even many shoes that feel to the wearer quite roomy always compress the feet more or less. An X-Ray picture of a foot with a shoe on would show this clearly, and form a striking contrast when placed beside a picture of the same foot taken with the shoe off.

NOT A GOOD SHOE

Next to being too narrow, the most common harmful feature of many shoes is that the heel is too small and too high. When the heel is small and high, it does not support the back part of the foot securely, and the foot is liable to be turned over on one side and strained if there are any irregularities in the surface trodden upon. Moreover, a high heel tends to make the foot slide forward into the narrow front part of the shoe, cramping the toes together and causing painful pressure and giving rise to corns. Further, small heels are objectionable, because they are very apt to become quickly worn off at one side; then the foot cannot rest

squarely under the body weight and is strained at every step.

While many other imperfections in conventional style of shoes might be referred to, the most important points to remember are that shoes should be broad enough in front to permit free action of the toes, and that the heel should always be large and low.

HOW TO BE HEALTHY

1. *Wear comfortable clothing.*
2. *Never sit in damp clothing.*
3. *Do not wear your rubbers in school.*
4. *Wear proper fitting shoes.*

## IX. THE HOME

One of the uppermost thoughts in the minds of parents and children should be to help make the home attractive. We fear that some boys and girls in the country are anxious to leave the farm and go to the city, because the home is possibly too much of a place of drudgery and too little a place for enjoyment. The responsibility of making the home a happy one does not rest altogether with the father and mother. The brothers and sisters, by cheerful manner and kindliness toward their parents and toward one another, can do a great deal toward making a happy home. One is sometimes struck with a marked politeness and thoughtfulness exhibited amongst the members of one family. In some cases, however, we fear that polite language is reserved for strangers, and harsh, abrupt and even cross words are used in the home. Surely the mother deserves more thoughtful consideration than is usual. If we practise being kind and thoughtful to the mother in the home, the habit of being polite will become so fixed that one will treat all members of the family with equal courtesy. Gentle treatment of brothers and sisters, or servants is an excellent preparation for taking our places in the world later on as men and women.

In a former chapter we have spoken of the need for regular habits in the matter of sleep and food. In many other ways about the home regular habits aid very much in having the household run smoothly. In those homes where each of the children has some duty to perform, it is much better that the task should be done as nearly as possible at a regular period. It thus saves the mother considerable time and attention in seeing that the various little things are done.

We have referred several times to the great value of sunshine. Be sure to let the sun stream in at the windows during the whole day, except in the heat of summer. Then it is well, during the middle of the day, to draw the blinds and thus keep the house cool.

A Well-Lighted Home

In many homes the clothes-closets are built without windows. This is a mistake. Dark closets are frequently damp. Clothes often hang in them for weeks. Sometimes they are laden with microbes. These will multiply in the dark, whereas sunshine kills them. Where possible, therefore, the clothes-closets should be provided with windows.

A still worse form of dark room, however, is the bedroom. Under no circumstances should anyone sleep in a room without a window or door leading directly to the open air.

In towns and cities having a system of sewers, most houses are provided with a bathroom. In Winnipeg all houses must be provided with a closet. It is a very bad custom indeed to have a joint bathroom and closet without a window. The only way for bad odors to get out of such a closet is through the rest of the house. It is just as necessary to have a window in the joint bathroom and closet as it is to have a door into the house, and a house without a door would be rather useless. Needless to say, the bathroom and closet should be kept scrupulously clean.

It is a good custom in the home for each member of the family to have his or her own individual towel. Outside the home this is absolutely necessary if one wishes to avoid, under all circumstances, catching diseases caused by microbes.

The average boy and man hate curtains, although perhaps not without some reason. On a warm summer night, even with the window open, curtains closely hanging prevent the breeze from entering. One often notices that a lace curtain over a window becomes very dirty opposite that part of the window usually opened, while the rest of the curtain may be fairly clean. If the curtain were placed there to strain the dust out of the air it would be all right. In addition to that, one will notice that very light

curtains are easily shaken by anyone passing by and sometimes clouds of dust are thrown off.

In homes where cost is not an important feature, the floors are better made of hardwood, well polished. Sometimes hardwood is too expensive. Then the floors may be painted. This makes the scrubbing much easier. This is undoubtedly a good plan in farm houses, more especially in the living room. But whether the floor is hardwood or not, whether it is polished or painted or left bare, it can at least be kept clean. Then it fulfils the one requirement; it is not a menace to the health of the occupants.

A Well-Polished Hardwood Floor

During recent years there has been quite a change in the minds of people about carpets. In many homes nicely polished hardwood floors are left uncovered except for a few beautiful rugs. Let us ask ourselves why we put carpets on the floor. Is it to make the

house warm, beautify it, or to save work? If it is to save work, carpets are difficult to sweep, and they are never really clean unless they are taken up. We cannot watch men beat a carpet without realizing that many months' dirt has remained in it. It is true vacuum cleaning does much toward removing this menace to health. One could not say that carpet should be banished from the home, for a touch of homeliness is added by having some rooms covered with it. All the rooms should not be carpeted, however. Only one or two rooms should be so furnished, and these the rooms used least.

The humblest home in the land makes some attempt at decoration. This instinct is born in the breast of all people, and deserves cultivation. The tastily decorated house, however, does not need a very great variety or quantity of things. For one reason, a large amount of drapery on shelves, windows and arches only provides a greater chance for dust to lodge. A few carefully selected articles, not necessarily expensive, add more to the comfort and beauty of the home than a great profusion of things which do not harmonize.

The decoration of the walls is done in various ways. Paper may be used. The walls may be calcimined or painted. From the standpoint of health, paper is not the best. The ordinary paper for the walls of the house will not stand wiping with a damp cloth. The lighter shades of paper will hardly permit of being wiped with a dry cloth without more or less streaking of the walls. Thus, at least with some grades of paper, the walls can

scarcely be cleaned without spoiling the pattern. Painted walls are much more easily cleaned, but are more expensive. Calcimining is much cheaper, and therefore can be done several times a year. In the humbler homes of towns and cities and in the log homes in the newer districts, a good way of having the walls look clean is to whitewash them three or four times a year. This is really one of the healthiest ways of caring for the walls.

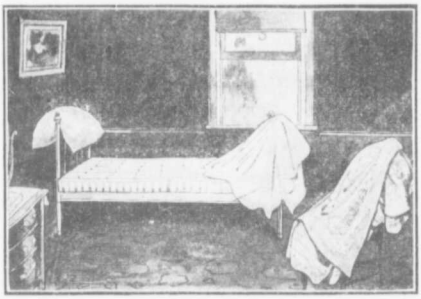
In selecting wall-paper, care should be taken to have light shades for those rooms which are not well lighted. Patterns of paper which do not fade readily are preferable to the delicate tints easily spoiled by sunshine. Since sunshine is so important to health, we should not have any furnishings in the home which will in any way interfere with allowing plenty of it to enter. This applies to wall-papers, carpets, draperies and furniture.

During the night fresh air should be secured in every bedroom. And the sleeping rooms must be thoroughly aired in the morning. But it is not enough to air the sleeping apartments. The whole house should be aired thoroughly every morning.

In airing the bed, the blankets and sheets should be turned down over the foot of the bed, the pillows put on a chair in the sun and the mattress left bare for an hour or so while the windows are open.

After the clothes are well aired the mattress should be dusted with a whisk and turned over. The sheet should be drawn quite tightly over it, and thus made quite smooth. The covers should be put on with

equal care. The pillows should be slapped between the two hands or pounded with a small stick, and this done before a wide open window or on a balcony. Occasionally pillows should be washed. The feathers should be removed and placed in a bag large enough to leave them quite loose. They should then be well washed and the bag hung up in the sun till the feathers are dry. The cotton form of the pillow should be washed at the same time.



A Good Way to Air the Clothes

During the day our clothes become more or less damp with perspiration, even in the winter time. They should be hung up in such a way as to get well aired before morning. The night robes should be hung up to air, during the day, and never rolled up under the pillow.

WHAT TO DO

*1. Try each day to be thoughtful of the others in the home.*

*2. If the clothes-closets are dark, air them well each day. Hang the clothes in the sunlight occasionally.*

*3. Be sure to air the bedclothes every morning.*

REMEMBER

***Regular habits in the home help** make it happy.*

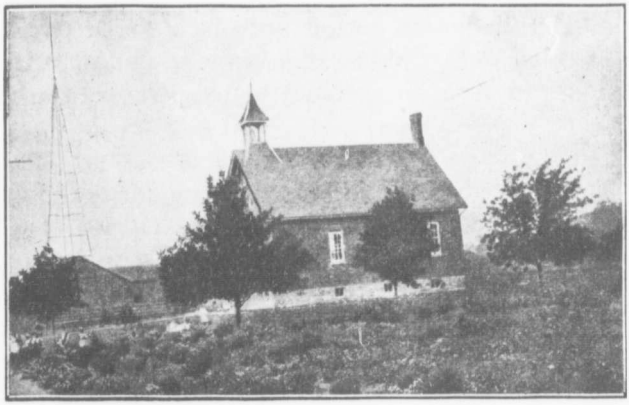
## X. THE COUNTRY SCHOOL-HOUSE

Much depends on the interest taken both by the teacher and pupils whether a school presents an attractive appearance or not. At all times in the year the wood should be neatly piled. This is particularly important in the winter when the snow drifts about the building. If the wood is left lying in a heap, it becomes so drifted in that it is very difficult to get at it. During the summer a pile of wood carelessly thrown together gives the whole yard a very untidy appearance.

Each spring, as soon as the ground begins to dry, it should be the custom for the teacher and pupils to take time to clean up the whole yard. All of the sawdust, chips and old grass about the building should be raked into heaps and if possible taken completely off the lot and burned. A little later in the spring, any trees about the yard should be carefully dug about and cultivated; also flower beds should be laid out and dug up neatly and left for a little time before planting. On Arbor Day, seeds should be planted in the beds. Some new trees and shrubs should be set out if space allows.

Inside the school-house as well as outside, each pupil should take an interest in securing as attractive an appearance as possible. The boys and girls cannot

build a school, but they can do a great deal towards making it look pleasant. During the summer months, flowers should be kept in some of the windows. For the study of plant life, seeds may be planted in the spring, and the growth of the shoots noted from day to day. This would be a good opportunity to study the effect of sunlight on plants, as was pointed



AN ATTRACTIVE SCHOOL-HOUSE AND GROUNDS

out in the chapter on sunshine. Something can be done also toward removing the barren appearance of the walls. Attractive yet inexpensive pictures are often available in the homes. As these pictures become soiled or slightly torn, they may be destroyed and replaced by new ones.

In the winter months the heating of a country school is quite a problem. The stove should have a

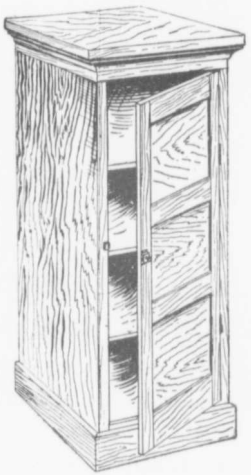
tin jacket about it, and rising above it, so that those sitting near may not be too hot. Someone living near by should be engaged to light the fire about two hours before school is to open. During the day one of the larger boys should be held responsible for keeping on the fires. He should be given permission to fix the fire at any time without asking leave from the teacher. In this way a fairly uniform temperature can be maintained much better than if done by different pupils. A thermometer should be kept in the school some little distance from the stove, and the temperature marked on a chart every hour.

In the chapter on dust there is a reference to the different methods of doing sweeping and dusting. In no place is it more important that strict attention should be given to this subject than in a country school. Here, the pupils frequently stay inside during the noon and recess hours. Here, they eat their lunch and play their games. If sweeping and dusting are badly done it will be injurious to the health of the pupils. No sweeping should be done while lunches are being eaten. Before the sweeping is commenced the floors should be littered with damp sawdust or something else to prevent the great cloud of dust from rising. The sweeping of country schools should be done after four o'clock. The following morning, while the school is getting warm, the dusting can be done. These should both be done just as carefully as the storekeeper does his work.

In the summer months the windows should be

open all the time, except when there is a storm or a dusty wind blowing. For ventilation in the winter some artificial means should be provided for drawing off the foul air. Several times during the day the door and two or three windows should be opened wide for five minutes. While this is done the pupils should have drill or calisthenics so that they would be moving about quite briskly and thus avoid catching cold.

During the winter every school should be provided with some means of keeping moisture in the air. Where the heating is done with a stove, an open vessel should be kept on top of it all the time. If the heat is supplied from a furnace, small tin pails containing water should be suspended in two or three of the grates.



CUPBOARD FOR SCHOOL-CHILDREN'S LUNCHES

In every school where many pupils take their lunches with them, a closed cupboard should be provided where the lunches can be stored out of the way of dust and flies. The pupils should all eat their lunches at the first of the noon hour and while doing so, they should remain in their own seats. No one should be allowed to run about the schoolroom during this time. In the summer, if shade trees are close by, it is much better to eat lunch there; but

remember that it will not do to throw crusts and bits of paper about under the trees. These should be put back in the dinner pail and disposed of at home.

Close wire netting should be provided for each window and also a screen door provided. The window screens might be reinforced with several iron bars outside them. If screens are thus provided, the school will

CHILDREN AT PLAY

be quite free from flies. If the cupboard is provided for the lunches, even a few flies getting into the school cannot spoil the food.

In former days it used to be the custom to have the school-house scrubbed twice a year; namely, in the spring and in the fall. In the homes of every one of the children attending school the floor of the house is scrubbed at least once a week, and sometimes oftener. Why should boys and girls have clean floors and clean

furniture in the home and not have just as clean in the school? Surely the school-houses should be as clean and attractive as possible. The floors and desks should be scrubbed once a week, or at least twice a month.

One of the pleasures of school life is the playing of games during recess and noon hour. Know as great a variety of games as possible, so that the same game will not have to be played all the time. The variety of games will depend somewhat on the size and age of the pupils and also on the character of the school. Some games are suitable for the winter and some for the summer. Some are suitable for playing inside and some for the outside. A list of games is given in the chapter on physical drill.

### WHAT TO DO

1. *Help to keep the school ground neat and clean.*
2. *Help to beautify the grounds.*
3. *Be careful of the trees.*
4. *Help to make the school-room attractive.*

### HOW TO BE HEALTHY

1. *Have your own drinking cup.*
2. *Be sure that the school is clean.*
3. *Be careful of your lunch.*
4. *Keep the school-room well ventilated.*

## XI. SUMMER HOLIDAYS

In practically all Public Schools the longest holiday season is given during the summer months. Therefore, in discussing holidays and what to do, it really resolves itself into a question of discussing those of the summer. During vacation it is well for all, both young and old, to have as great a change as possible. For instance, those who live in the towns and cities should spend the holiday time in the country on a farm or at some summer camping place. For those who live in the country, part of the time spent in the city or a large town is very desirable. In any case it is well, when convenient, to have a change in some way, even though we do not go from the country to the city or from a city to the country. Thus for boys and girls on the farm it is an excellent thing to visit in a more or less rolling district, where there are brooks and rivers, along the banks of which are wooded areas. Here will be found many points of interest not found in an open country. The mere fact of being allowed to play along the beautiful wooded banks of a stream is pleasant in itself. There is also a great difference in the vegetation in the two districts, particularly in the flowers.

One frequently notices very irregular habits acquired by both children and adults who are camping out.

For instance, amongst those by the lake shore, after breakfast a party is made up and they go off prospecting among the beautiful islands. They forget all about lunch until two or three o'clock in the afternoon. Then under the shade of the large trees on a beautiful point of an island they take a large meal to make up for being late. They rest a little while and return

AN IDEAL SUMMER RESORT

home. The evening meal is taken possibly at the usual time and they find themselves not at all hungry. The long twilight of the evening is very tempting, and they go out boating in the immediate vicinity of their own cottage. They sing songs and float about till after midnight, when they return home, again feeling hungry; the boys demand another meal and a second supper is served. They then retire some time after

midnight. The following morning they lie in bed till a late hour and feel much the worse for the irregular course the previous day.

It is important, therefore, that, while holidaying, one should lead a regular life, having meals and sleep at regular hours. Holidaying is good for the appetite, particularly in a camp on the lake shore. And if the appetite has increased, it is all the more reason for taking care to have the meals at regular hours.

A Good Place for Summer Holidays

After all, holidays are chiefly for the purpose of rest and recreation. One should remember, therefore, that instead of spending many hours of the night gently floating about the lake, one should retire in good time each night and always about the same hour. Both children and adults ought to have on the average at least nine hours' rest during the twenty-four while vacation lasts. Sleeping in the morning till nine or ten o'clock does not refresh one nearly as much as retiring earlier and rising earlier. Morning air is as fresh and pure as evening air, then why should we spend the midnight hours out of bed and the morning hours asleep?

Moreover, as was pointed out before, sleep is more beneficial during darkness than it is during daylight.

Not only boys and girls, but men and women also, should sleep in the open air while out camping. By the lake shore the air is always free of dust. It is not so in the home by the side of a dusty, paved street. Here will be found more or less dust in the air all night.

HEALTHFUL SPORT

Do not fear that you will suffer from sleeping in the open air. You can as well afford to sleep in the open air as to play in the open air. When camping, therefore, be sure that the end of the tent or cottage is wide open while you sleep.

Sunshine, as was noted in the first chapter, is one of our best friends. It is well to get a great deal of it. Yet during the hot summer months it is not well to be out in the sun during the mid-day hours.

It is better during these hours to spend the time in shady nooks fishing or playing some game.

Regular bathing is surely a good thing. In the hot summer it is delightful. There are certain rules, however, which should not be forgotten. After being overheated at some game you should not go in bathing immediately. Wait for a little until the perspiration has ceased and then take your daily dip. Some boys, and even girls, are tempted to stay in the water too long. In places where the water is at all cool this is very bad for the health. Even in warmer water long stays are not healthful. In no case should the stay be longer than an hour.

## XII. FOODS

Hunger is an instinct, and instincts are the records of the thousands of generations before us. They are the *result* of all the experiences of our ancestors.

How did our ancestors live? Very differently from us. They did not get three comfortable meals a day. They had to forage for all they got. If the hunting was bad they did not eat. If it was good they gorged themselves until they had to go and sleep while the first part of digestion was going on.

In the present day we do not have to seek our food. It is delivered at the door. There is plenty of it. Yet some of the old cravings of our forefathers cling to us, especially in childhood. Take the case of the small boy or girl who longs for sugar or candy. Sugar is a very needful thing to the human system. It produces heat and gives the person power to work; but the system needs very little of it. Our early ancestors, when they lived in trees and later in caves, and even when they began to till the soil, had little or no sugar. Their only supply came from fruits and from honey. How they craved it! Thus they developed such a desire for it that they would brave almost anything in order to get it.

It is different now, yet the old craving remains, especially in children; and the small person will do anything to get an extra amount of the sweet stuff.

Our daily occupations have also changed with the onward march of civilization. No longer do we spend days in the chase, either hunting or fighting. No longer do we enter into intense muscular activity, except in a few cases. Machinery does all heavy work. We walk a little for exercise, but many of us sit at our labors most of the day. We do not need the same amount of strong food as our ancestors. We are often hungry for the kind of food which they ate, but we must remember how they lived and that they needed a strong meat diet. We must remember, too, how we live, and that we do not need strong food. They needed great energy-producers. They had not the comforts we have, hence they craved heat-producing foods. Thus we should not indulge our appetites. In this way, at least, our instincts are not good guides. We must make the matter of our eating and drinking one of very careful thought. There are so many physical and nervous wrecks at the present time that we should endeavor to better conditions. One way to do this is to study about our food, not only that we may be able to choose what we eat, but also how to prepare it. Remember that fine head work and coarse stomach work make a poor combination.

Then we must choose food suitable to our bodily conditions, and must prepare it in such a way as to make the task as light as possible for our digestive organs.

There are many things which we must take into account when we stop to think about our food. We

must have nutriment for our flesh. That is Tissue-making Food. We need food to produce heat and energy so that we can do our work—Heat-producing Food. We need something to tone up our system and supply food to our bones—Blood-Toners and Bone Foods.

THREE CLASSES OF FOODS

(A) Tissue-builders (proteids).

(B) Heat and Energy-producers (carbohydrates, fat and oils).

(C) Blood-toners and Bone Foods (mineral, fruit, vegetables, etc.).

A. Tissue or Flesh-making Foods.

All these foods contain nitrogen as a principal element. No tissue can be built up without nitrogen. The body cannot take nitrogen from either the earth or the air, but plants can. We eat vegetables and in that way get part of the amount which we need. Animals also eat plants and store up a great amount of nitrogen. We eat animal food and thus get a greater supply. With these foods containing nitrogen, the tissues which have been wasted away by the day's work are repaired. Children also use food to build new cells, and thus they grow stronger and taller. Nitrogenous foods also help to produce heat and energy.

Eggs and Milk.

It is clear that the people of the present day eat too much meat. This is the cause of so much liver and kidney disease. Eggs and milk are tissue-making

foods. With the exception of the shell, there is no waste in an egg. There is twice as much solid matter in it as in milk. Let us compare eggs and beef.

| | Water | Proteid | Fat | Mineral |
|---|---|---|---|---|
| Eggs | 73.07% | 14.8% | 10.5% | 1% |
| Beefsteak | 61.9% | 18.6% | 18.5% | 1% |

*Eggs.* Then eggs ought to make a good substitute for meat. Raw whites are more easily digested than raw yolk. The more an egg is cooked, the less digestible it becomes.*

*Meat.* Like eggs, meat is almost all absorbed. There is very little waste. The cost of meat is greater than almost any other foodstuff which we use, but it gives greater value in energy and tissue produced. Meat is expensive because it is hard to keep.

Other tissue-making foods are: bread, cheese, legumes and fish. Fish can be substituted for meat. All these give good value in proteid. Flour in the form of bread gives one pound of proteid for twenty-seven cents.

B. Heat and Energy-producing Foods.

(a) Carbohydrates, as starchy foods and sugar.

(b) Fats and oils.

The carbohydrates are food substances which contain carbon, hydrogen and oxygen. They produce heat and power to do work. The starchy foods come

* "Foods and the Principles of Dietetics." By Robert Hutchison. Second Edition, 1905.

from the vegetable kingdom and are found in roots, stems, leaves and seeds.

(a) The largest percentage in seeds as: wheat, oats, etc., called cereals.

(b) Tubers or potatoes, etc.

(c) Legumes, as peas, beans, etc.

(d) Nuts.

(e) A small amount in parsnips and turnips.

Uses of Starchy Foods:

Starch is the most important heat and energy-producer of all our foods.

(a) We never tire of it.

(b) It is more concentrated than other heat and energy-producers.

(c) It is cheaper and more plentiful.

(d) Useful in the kitchen in preparation of other foods.

Note carefully that the body does not digest starch easily. It must be carefully cooked before being eaten. The little grains of starch have a coating, which must be burst while cooking. Starch should be cooked by moist heat, for it must absorb water before we can digest it readily. Raw starch can be digested, but the process is slow. Cooked starch is more easily digested.

Sugars.

We get both vegetable and animal sugars. The bulk of the sugar we use comes from vegetables, as: roots (beets, etc.), stems (sugar-cane, maple, etc.),

fruits (apples, grapes, etc.), and honey. The animal sugar we get from milk.

Sugar is good for people in active work, especially at manual labor, because very little trouble is necessary on the part of the digestive organs to get it ready for absorption. People who do not work hard with their muscles should take very little sugar. The great danger of sugar is that too much will be used. Sugar is very readily absorbed by the blood. Remember this, that too much candy is very harmful, as is too much alcohol. Do not criticize the drunkard, if you are just as intemperate in the use of sugar or candy.

Fats and Oils.

Substances containing fat or oil are heat and energy-producing. Fats come from both animals and vegetables.

Vegetable fats are coming more and more into use. They are contained in chocolate, cocoa, nut oils, olive oil, cotton-seed oil, banana, etc. It is not always well to take pure fat or oil, for it is often hard to digest. Each person must study his own constitution and understand whether this form of heat or energy-producer is better for him, or whether the starch or sugar foods are sufficient. Fats are most important for people in cold climates, as they produce a greater amount of heat per pound than the carbohydrates. They are also good as winter foods. For warm climates and for summer, the starchy foods are better. But fats are among our most expensive foods. Though they are expensive and can be substituted

by starchy foods as fuel, still we need some fat to keep all the organs of the body running smoothly.

C. Blood-toners and Bone-making Food.

(a) Minerals.

(b) Fruit Acids.

An ordinary mixed diet supplies enough mineral food under most circumstances. If there is not enough, serious illnesses occur, such as scurvy, etc., and in children, rickets.

Salt is the only mineral which we take directly. It is in all meat foods, but we add more to make our food more palatable. It stimulates the appetite. Taken in excess, salt is injurious.

Calcium. This mineral is found in milk, fruit, eggs, vegetables, hard water and cereals. This is the great bone-making material

Iron is found in beef, blood, egg yolk, spinach, cabbage, oatmeal and other cereals. It gives color to our blood and skin. The blood cannot absorb oxygen without iron.

Phosphorus is found in meat, milk, eggs and vegetables. It is necessary to the tissues, to the bones and to the nervous system.

HOW TO BE HEALTHY

1. *Eat only three meals a day.*
2. *Eat slowly and chew your food well.*
3. *Be careful not to eat too much.*
4. *Do not eat a hearty meal if over-tired.*
5. *Do not drink ice water during a meal.*

## XIII. SELECTING AND PREPARING FOOD

The art of preparing food for the nourishment of the body is known as Cooking. To give anything but a very general outline of the und rlying principles of cooking in a short chapter would be impossible.

Our food is cooked in order that new flavors may be developed, making the food more palatable and more digestible, and that what are known as micro-organisms (harmful germs) may be destroyed.

Heat, air and water are essential in cooking. The principal ways of cooking foods are: boiling, stewing, broiling, frying and baking.

We learned from the chapter on foods that proteids are very necessary as part of our diet. Meat is one of the most important sources of proteid, and is composed of several nitrogenous compounds with more or less fat, water, and mineral matter. Meat is the name applied to the flesh of all animals used for food. Beef, however, is the most largely used, and is probably the most nutritious. Good beef should be firm and fine in grain, bright red, well mottled with fat. The fat should be a yellowish color.

The part of the animal where the muscles are used but little, gives much finer-grained and tenderer cuts, which will take less heat to cook. These are the more expensive cuts. The cheaper cuts, however, are equally

if not more nutritious, when properly cooked. Tough meat must be cooked a longer time and with a lower heat in order to make it palatable and easily digested. For baking and broiling, tender meats should be used. By boiling and stewing, the tough cuts are made delicious.

Remember this, that when you harden the outside of a steak or roast in order to keep the juice in, you lose part of your meat, for the body refuses to use the hardened parts. Yet to roast or broil, you must keep the juices in. To do this you have to sacrifice part of your meat in order to add to the value of the rest. But a whole roast overdone is spoiled for food as well as for taste. In soups, etc., you wish to use the juice, so you must draw it out of the meat. To do this, put the meat in cold water and bring it slowly up to the boiling point. Remember that salt will draw the juices out, so do not salt meat which is being fried or roasted till after it is cooked.

If you read the chapter on keeping and caring for foods you will notice that when first your meat comes it must be wiped off with a perfectly clean, damp cloth. All foods which come from the shop must be carefully cleansed at once and then laid away.

Fish is a very valuable part of our food, because it gives variety to the diet. It is not as nourishing as meat, but is more easily digested. Fish should be perfectly fresh. If so, the flesh will be firm and will not retain the impress of the finger. The eyes should be bright and glossy and the gills red. Fish must be

thoroughly cooked. Better to boil, steam or roast it than to fry it, for it not only fills the house with an unwholesome odor, but the fat used in frying causes part of the fish to be indigestible. When done try it with a fork. If it separates easily it is sufficiently cooked; if not, it must be cooked more.

Remember that all foods must be carefully and thoroughly cooked to be wholesome, but must never be overdone. Then they are useless. When underdone they are sometimes harmful.

Eggs are very rich in food material. Scarcely any other food contains fifteen per cent. of proteid or tissue-making substance. But eggs lack in carbohydrates, and therefore must be combined with starchy material, such as potatoes, bread, etc. Nine eggs, or one pound of eggs, is equal in food value to one pound of beefsteak. Thus eggs may be used as a substitute for meat. The white of the egg contains albumen in its purest form, but this albumen is spoiled by great heat. Raw eggs are more easily digested than cooked, therefore they must be cooked carefully. Never boil eggs hard. Better never boil eggs. Cook them in water just below the boiling point. Boil the water, put in the eggs and set the dish on the back of the stove for twenty minutes. Then the white is not tough but thoroughly cooked and easily digested. Generally speaking, the effect of cooking an egg is to develop the flavor and lessen its digestibility

Milk contains all the food substances necessary to sustain the life of a child. But milk will not do as the

only food for an adult, because the food substances are not in the correct proportions for them.

In the chapters on Good and Bad Milk, notice what is said about the care of the milk. After the milk has stood in a clean, cool place for a time, the butter-fat (cream) rises to the surface. From this butter-fat our butter is made. Butter is an easily digested fat, and is one of our most valuable foods. From the heat-producing standpoint it is two and one-half times as valuable as a carbohydrate. Skim-milk and butter-milk are both valuable foodstuffs. Cheese can be made into palatable and nutritious dishes. One pound of cheese is equal in proteid to two pounds of beef, yet cheese is not substituted for meat as often as it might be. This is probably due to the fact that many people find it hard to digest. This indigestibility is somewhat overcome by cooking the cheese with the addition of a pinch of baking soda.

Legumes, such as peas, beans, and lentils, are rich in nitrogen; that is, the supply of proteid. They are also rich in carbohydrates, but poor in fat. They may be substituted for meat, especially in summer. Legumes are among our cheapest foods. This is an additional reason why they may be used in place of meat. Perhaps we would be the healthier for it. Legumes are usually boiled. Beans are sometimes cooked in the oven. A little soda should be added to them when they are soaking before cooking.

By starches we mean foods which contain starch,

such as flour, potatoes, cereals, etc. Starch is the most important of the heat and energy-producers, because it is cheaper and more plentiful than fat or sugar, and does not pall on the appetite. It is made up of innumerable, tiny and distinct granules. These granules have a cellulose or fibrous covering. The effect of cooking is to make the starch granule take in warm water. It then swells and finally bursts, setting free the pure starch which is inside the cellulose covering. All starchy foods are indigestible if not thoroughly cooked.

Cereals take the first place among the vegetable foods because of their cheapness and great nutritive value. Experiments show that cereals, which are largely composed of starch, taste better and are more easily digested when well cooked. It has been also proven that oatmeal is the most nutritious and economical of breakfast foods. Wheatmeal is another. The ready-to-serve breakfast foods are less nutritious and are very expensive. It would greatly reduce the cost of living if we could banish them from our food lists. The oat products are richest in proteid and fat and poorest in carbohydrates. Corn and rice food are lowest in proteid and highest in carbohydrates.

Sugar is needful in foods for its own value as a heat and energy-producer, but quite as much to make foods tasty and appetizing. Sometimes we forget that the whole duty of the cook is not in the prosaic business of cooking foods thoroughly; there is a more artistic side. The cook must make the food tempting in appearance.

Fats and sugars are used in combination with other foods. They add to the flavor of the foods as well as fill their place as energy and heat-producers.

Vegetables and fruits in salads, and cooked vegetables, are needful as blood-toners and appetizers. Fresh fruit and cooked fruit also add to the taste of our foods. These two facts are most important. It is not only necessary that our food be prepared, but that it be prepared in an artistic way. We should not take our food merely as a fuel. The way in which we masticate it and our mental attitude while eating are essential requisites to good health.

Minerals, principally obtained from fruits and vegetables, are necessary for the building of bone. Iron is needful for the blood and other tissues. When we live on a mixed diet we get the different minerals required by the system from our food. Salt, the only free mineral which we add to our food, is taken as an appetizer.

Just a word about fruit, since it is the principal source of supply of mineral matter for our bodies. It refreshes, stimulates, regulates and nourishes. The plentiful varieties, such as apples and pears, are as desirable as the more costly kinds. As a common article of diet fruit is beneficial, but should not be used when unripe or over-ripe. Generally speaking, cooked fruits are valuable with a meal, while raw fruits are best when taken alone, either before or after meals. The composition of fruit is largely water, combined with sugar and a little mineral acid.

REMEMBER

*1. Cooking makes meat and starch more digestible.*

*2. Cooking destroys harmful germs.*

*3. Be careful in the selection of foods when buying.*

*4. Under-cooked food is dangerous.*

*5. Over-cooked food is useless.*

*6. Over-ripe or under-ripe fruit is not desirable.*

*7. Do not waste money on ready-to-serve breakfast foods.*

*8. Cereals, legumes, milk and eggs have great food value and may be substituted for meat.*

## XIV. THE CARE OF FOOD IN THE HOME

If the tradesmen deliver clean, wholesome foodstuffs at the home, they have done their duty. But if proper care is not taken of these foodstuffs after they have been delivered they may become dangerous as articles of food, especially for babies and children. Food may become contaminated and unfit for use through the following causes:

(1) Being exposed to flies.
(2) Being placed in unclean vessels.
(3) Being exposed to impure air.
(4) Being kept in a place not sufficiently cool.

All changes in foodstuffs—decomposition, putrefaction, and fermentation—are caused by the action of microbes. Indeed, one of the commonest ways by which people become infected with disease-causing bacteria is by taking them into the system through the medium of the food they eat.

Bacteria grow and thrive in warm, dark, damp and dirty places, but cannot live for very long periods in cool, light, dry, clean places. It is very important, therefore, that food be kept in a clean pantry in which there is plenty of light.

In many houses the pantry consists of a dark cupboard under the stairs, and is used for storing away

every kind of rubbish in order to get it out of sight. It should be well lighted and ventilated, and, in summer time, should be provided with properly fitting fly screens for the windows. The shelves should be made of plain boards, or may be painted white. They should rest on brackets, as this will permit of their being taken off and scrubbed. It is a common practice to cover pantry shelves with paper. This is not a good custom. The walls are best left unpapered and a coat of whitewash applied to them; but, if they are papered, the paper should have a glossy surface. It can then be washed or wiped with a damp cloth. The best floor covering for pantries is linoleum.

The refrigerator should be thoroughly washed with boiling water at least once a week, not only that part in which the food is kept, but the ice chamber also.

We will now talk about the best ways of keeping different kinds of foods in order that their health-giving properties may be retained and cleanliness ensured.

Bread should be put in a tin box with a properly fitting cover, or in a large earthenware crock with a wooden cover. If this latter method is adopted, the cover will also serve the purpose of a bread board on which to cut the bread. Bread kept in either of these ways will remain moist for several days, but if it is left exposed on a plate it soon dries and may become contaminated by flies.

Meat, poultry and fish should be removed from the wrappers immediately they are delivered at the home, and placed in a refrigerator. If you have not a refriger-

ator, cover the articles with a wire screen in order to protect them from flies and place them in the coolest and cleanest part of your house. Meats, if left wrapped in paper during hot weather, soon become unfit for use.

Butter should be kept in the refrigerator. If a large quantity is kept it should be packed as tight as possible in an earthenware crock and covered with a piece of clean white muslin or cheesecloth. Over this should be spread a layer of salt about an inch thick. Butter can be kept in this manner for months, and, whenever a supply is needed, it is only necessary to lift off the muslin cover and remove as much as is required.

Tea, coffee, spices, pepper, salt, mustard, etc., should be kept in tin boxes with tight-fitting covers. This latter precaution is necessary if you wish to retain the natural aroma and freshness for any length of time. If kept in paper bags, as very often happens, the strength and flavor are lost, and the contents sooner or later become contaminated by dust and flies.

Sugar, flour, rice, etc., should be kept in large galvanized iron cans or earthenware crocks with closely fitting covers, in order to exclude anything unclean or unwholesome.

Soft fruit, such as berries, plums and peaches, should be laid in a cool, well-ventilated place, and protected from flies and dust. Apples and vegetables keep best packed in barrels in the cellar where it is dry, but they should occasionally be picked over and the decayed ones removed, otherwise they will soon

all be bad. Another good way is to cover vegetables, such as potatoes, carrots and beets, with dry, clean sand. Even if this method is adopted, it is always wise to sort over your vegetables at certain times in order to make sure that none are spoiling.

Canned goods should be kept in a cool place. Before a can is opened see that it is not blown or bulged out at the ends. If this is the case it is a sign that the contents are bad and dangerous as food. The acids formed by decomposition may eat into the can, and ptomaine poisoning would result. Therefore, beware of cans with bulged ends. When the can is opened the contents should be placed in a clean dish; they must on no account be left in the can or they will soon become unfit for use.

Although we have left milk until the last, it is the most important article of food. It is the only food which thousands of babies get; and many of the diseases which they are subject to, such as summer complaint or infantile diarrhoea, are caused by the improper care of milk in the home

The usual improper method of handling milk in the home is to put it in a jug with an open top. This exposes it to the air, to flies, and to dust.

Now, in the very cleanest of rooms there are numbers of bacteria which are brought into the house on the clothes and in many other ways. Some of these bacteria may be of the disease-producing kind, and one of the favorite breeding places for such bacteria is in milk. If they can gain access to the milk which

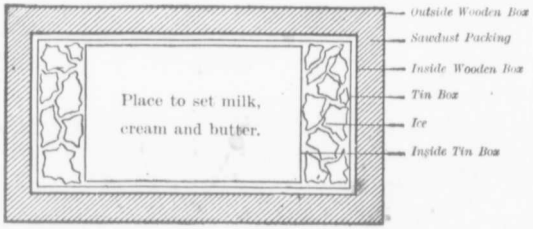
is not kept cold, they will multiply in hundreds of thousands. Milk should, therefore, be kept cold because the growth of bacteria is retarded at 50 degrees and stopped at 45 degrees. It will be seen, therefore, how important it is that milk should be kept covered in order to exclude bacteria as far as possible. It is equally important that the milk should be kept cool, that the growth of those present should be stopped.

Someone should go to the door to receive the milk when the dairyman arrives. If no one is at home, a large glass bottle or jar, with small openings, should be placed in a covered box where the milkman can find it. On no account should milk be left exposed to the heat of the sun or in contact with dirt and flies until the return of some member of the family. Never leave an uncovered jug or basin on the doorstep in which to receive the day's supply, nor place tickets or money in the dish for the milkman; even money usually has dirt on it. It is preferable that the dish for the milk should be one of glass, fitted with a cover, but not a perfectly tight one, and used for no other purpose. When empty it should be washed in cold water, then scalded with boiling water and turned upside down to drain. Do not wash it in dirty, greasy dishwater that is only lukewarm, and then half wipe it with a dirty cloth. If you do this, you may be the means of killing your baby brother or sister.

Do not pour milk from this glass bottle into an open jug and expect it to remain wholesome after it has been exposed to the air for hours. Pour out only

what is actually needed, and replace the container in the refrigerator or other cool place without delay.

You may not be seriously affected by drinking unwholesome milk, because you are strong and able to resist the effect of disease germs in your system. Besides, you only drink milk occasionally, and then it is often mixed with other food. But think of the baby who drinks nothing else, and you will surely take good care of the milk.



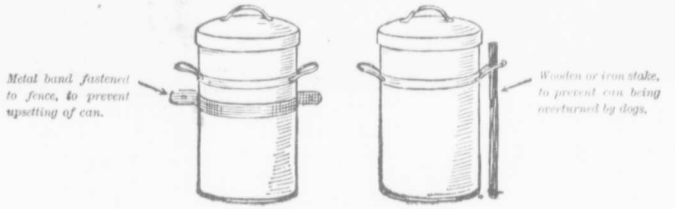

AN IMPROVISED ICE BOX

If you have no refrigerator you can easily make one. Take two wooden boxes, one several sizes smaller than the other. Place the smaller one inside the larger, but first see that you have about two inches of sawdust in the bottom. Then pack tightly between the sides with sawdust. In the smaller box place a tin large enough to hold the milk bottle, and then pack it all around with ice, providing a tight-fitting cover for the top. This makes a very good refrigerator. Its construction is simple, and very little ice is required for its use.

In washing up after meals, see that the water is

boiling hot, and use plenty of it. This makes washing up an easy task and sterilizes the utensils. First of all, wash the milk bottle (after rinsing it out with cold water); then all the cups and saucers. Scrape all the grease and scraps from the plates, rinse them, and place them in scalding water. They will get so hot that they will almost dry themselves when taken out. Next wash the knives, forks and spoons. Then give the dishcloth a wash and hang it up to dry.

All the grease and scraps should be burned in the stove, but if placed in the garbage-can they should first be wrapped in a piece of newspaper. This answers the double purpose of preventing it from sticking to the sides of the can, and keeping flies away from it. See that the can is fixed so that it cannot be upset by dogs. They will scatter the garbage all over the yard. It can be made solid by driving an iron spike or wooden stake into the ground and putting one handle of the can over it, or by placing a band around the can, thus:




A GARBAGE-CAN SUPPORT

Wash the garbage-can out every week with boiling water and see that it is kept sweet and clean. By doing this, and putting properly fitting screen doors

and windows on the house in the summer time, you will be able to keep the flies away. Flies breed in garbage, manure and other filth, and it takes only eight days for their eggs to hatch out. Flies will gather where there are convenient places in which to lay and hatch their eggs.

You would not knowingly eat food that has been in contact with filth. Neither does the idea of drinking milk in which flies have previously been bathing appeal to you as being in accordance with the best mode of living. Therefore, see that all such insect life is rigidly excluded from your home, and on no account allow them to come in contact with the food you eat. This is a duty you owe not only to yourself, but to the tiny babies in your household who are unable to protect themselves.

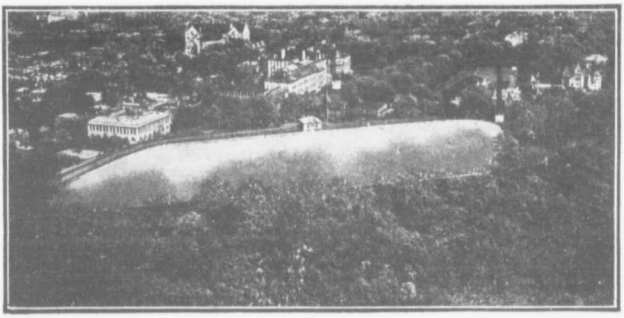
You require food in order to live. It is also required that your food supply should be clean and wholesome in order that you may derive the full benefit of every particle you eat, otherwise you endanger your health by taking impurities into the system.

HOW TO BE HEALTHY

1. *Keep food covered.*
2. *Keep food clean.*
3. *Keep food cool.*
4. *Keep flies out.*
5. *Have a window in the pantry.*
6. *Do not eat food from cans having bulged-out ends.*
7. *Take especial care of the milk.*

## XV. GOOD WATER

If we were to analyze the body of a man weighing 154 pounds, we would find 111 pounds of water and only 43 pounds of solid material. You will all agree, then, that water is of such value it should be given considerable attention.



A Reservoir

In towns and cities water is supplied to houses by a system of waterworks. This means that there is one central supply. From this place pipes are laid to all parts of the town. The water is then forced through these pipes. In some cases the pressure is due to the source of supply being a large reservoir situated on some hill or mountain near by, and higher than the

town. In other cases the supply of water is on the same level as the town and is then pumped through the pipes by machinery. In the smaller towns and in the country, however, water is got from wells.

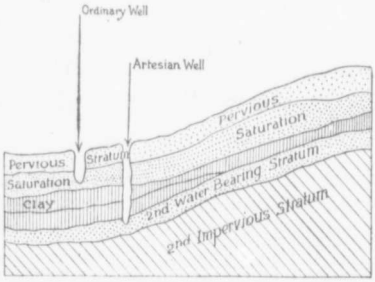
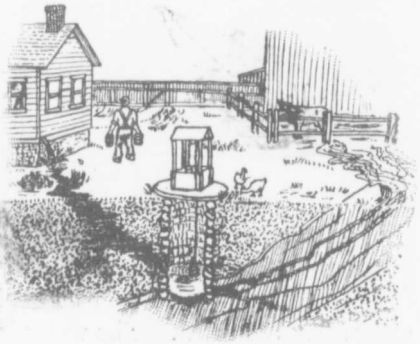



DIAGRAM OF ORDINARY AND ARTESIAN WELLS

The location of the well is an important consideration. If a barn or stable be built somewhere on the slope above the well, the refuse and manure would certainly contaminate the water. This is well seen in the following illustration.



THIS WELL IS BADLY SITUATED

Some farmers and dairymen in cold climates, to supply water for their stock, have the well in the stable. They do this because of the severe weather in midwinter. Such a well sunk here can scarcely escape being contaminated by seepage. A better plan is to have it some little distance

away. From the well to the stable a pipe can be laid which is buried deep enough to escape the frost. In the stable a suction-pump can be used to draw the water. This plan avoids spoiling the water.

WELL CONNECTED TO PUMP IN STABLE YARD

The top of the well should be so close that no dust or small animals can get in. The curb should rise about eighteen inches above the level of the ground, and the earth thrown up about it to give a gradual slope away from the curb.

Even in supplying water for our cows and horses, we should keep these facts in mind. It is particularly important for our cows, since they are good enough to supply us with milk. And if we give them water from a stagnant pond or from a well on the side of a slope lower down than the stable, they surely cannot be healthy. Neither can they give us good milk.

Since it is important to have a source from which to get pure water, all will agree that it is equally important to keep it pure after it is obtained. Water pails should not stand about the kitchen uncovered. This

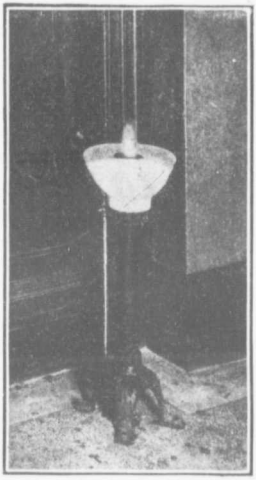
is particularly important while the sweeping is being done, or during the summer when the windows are open and the wind is blowing. In country schools where water is brought into the school-house in a pail, a cover should be provided to keep out the dust.

Much of the water that enters our system is in the form of soups or tea, and much is present in other forms of food, such as meats, gravy, fruits, and vegetables. Celery has 90 parts of water out of 100. The cooking of foods purifies the water contained in them. Sometimes water which has not been boiled is unsafe to drink. Tea and other hot drinks made from the same water may be perfectly safe.

THE OLD TIN CUP. WHEN WAS IT WASHED?

But we all love to have a drink of cold water at times. This is particularly true in the hot weather in summer. At schools and other public places it has long been the custom to have a tin cup chained to the pump or water-tap. The faithful tin cup will do service for possibly six months and is used by every one who passes by, no matter whether he is well or ill, clean or dirty. During one day, probably, a man with

consumption, a little girl daintily dressed, a boy with whooping cough, a woman with mumps, and a child just developing diphtheria, have all used the cup. And between times the wind merrily plays with it, covering the damp surface with a coating of dust. Do you think you want to drink out of a cup at school right after a little boy who has a sore throat? That sore throat may be the commencement of scarlet fever. Cold water soothes it and the boy drinks often, so that during the day half a dozen different children may have the cup in their lips immediately after him.



*A Drinking Fountain without a Cup

What can we do about it? Must we stop drinking water? Oh, no! that is not necessary. We do not need to all drink out of the one cup. In fact, the best way is to have a cup for each pupil in the school. Where three or four children come from one home, it would do to have a family cup. Under no circumstances, however, should two little girls lend their cups to one another, just because they are good friends. Would they lend their tooth-brushes? Then why should they lend their cups?

* Reproduced by permission of *Manitoba Free Press.*

In towns and cities having a system of waterworks, a drinking fountain like the one illustrated here should be provided in every school. This shows the first fountain in Western Canada. There is a continual flow of water so that one's lips cannot touch any part of the apparatus. All the lips can touch is the running water. This fountain is somewhat wasteful of water, however.

TANK FOR DRINKING-WATER

Other fountains are so arranged that the water runs only when the thumbs press down a metal ring. This kind is less wasteful of water.

In schools where water is got from a well, the best plan is for each pupil to have a family cup. The cup should be kept in a covered pasteboard box in the desk.

The supply of water in the school-house should not be kept in a pail. A covered tank should be provided, having a faucet attached to fill the cups from. This would avoid removing the lid and dipping in a more or less dirty cup.

HOW TO BE HEALTHY

1. *Be sure the water supply is pure.*
2. *Drink plenty of good water.*
3. *Always use your own cup if possible.*

# XVI. CLEAN MILK

For little children, good milk alone is quite sufficient food. Adults could live on it if they were not engaged in any active employment. Indeed, in a number of diseases milk is the only food given until the patient is practically well.

But whether we live in the city or in the country, we must remember that to get pure milk we must have good healthy cows. We must care for them well, and also take good care of the milk after it is taken from the cows.

In selecting cows to give milk, they must be free from disease. Probably the commonest ailment of cattle is tuberculosis, and this is more particularly the case where the animals are shut up in poorly-lighted, poorly-ventilated and damp barns. Cattle that run on the great ranges in Alberta, and feed outside all winter, are not frequently infected with tuberculosis.

But it is not enough to think only of selecting a healthy cow; she must be properly cared for. Not only should the stable be well lighted, ventilated and drained, but it should also have a tight ceiling and a cement floor. The walls should be whitewashed twice a year and all manure removed twice daily.

Illustrations appearing on pages 112, 113, 114, 116, 120 are reproduced by permission from Hygienic Laboratory Bulletin 56, U.S. Public Health and Marine-Hospital Service.

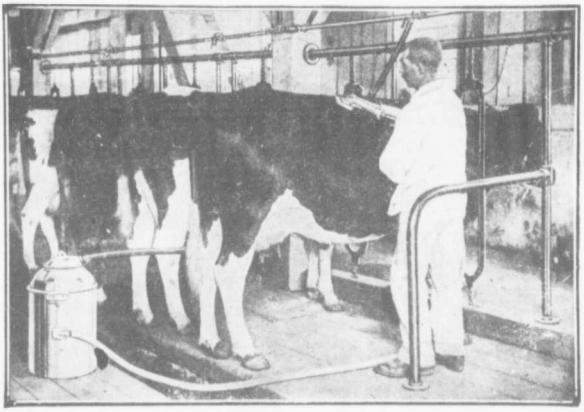
Water is the constituent of the blood in which the food, after it is digested, is dissolved and carried throughout the system. Milk itself is composed largely of water, there being 87 to 88 pounds of water in 100 pounds of average milk. It must be perfectly evident, therefore, to the thoughtful boy or girl, that where a cow has access to impure water it is practically certain to contaminate her milk. Other, and even worse, troubles come from allowing cows to wade into dirty ponds or sloughs to drink. These will be mentioned later. Cows should have a plentiful supply of pure water. It means healthier and cleaner cows and much purer milk, as well as a much greater yield. If the water supply is procured from a well, the latter should be so placed that no seepage could take place from the manure about the stable.

A Good Milch Cow

The food of the cow should be carefully looked after. In the summer she should not be allowed to feed for long in a new pasture of very rich grass, more particularly after a rain. At this time the grass is

much more likely to spoil the flavor of the milk. In addition to this, cows sometimes take too big a meal of some very tempting kind of food the first few times they are allowed to have it. This will give them indigestion and again spoil the milk.

Cows should be groomed daily. This is so important that a machine has been invented something like the vacuum cleaner used in houses in large cities.

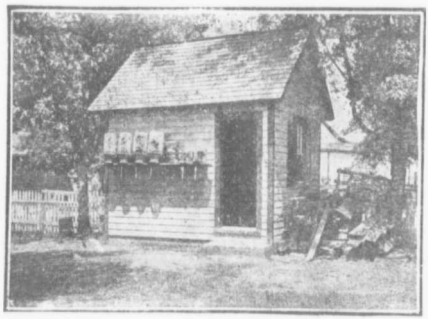


*A Vacuum Cleaner in Use

Immediately before the milking is done, the udder and flanks of the cow should be washed thoroughly and dried. The milkers should wear clean white suits and ought, immediately before milking, to wash the hands as carefully as before going to church. Care must be taken to prevent dirt from getting into the milk.

*Reproduced by permission of D. H. Burrell & Co., Little Falls, N.Y.

It is a well-established and well-known fact that milk will readily absorb taints from an impure atmosphere or from particles of dirt that fall into it. Whether milking be done in a stable or in a yard, it is essential that the surroundings be such as to insure as pure an atmosphere as possible. But, at best, these are not ideal; hence, it is essential to remove the milk from the stable or yard as promptly as possible after milking and keep it where the atmosphere is pure. Here the milk should be strained through a very fine wire gauze and then cooled to 50 degrees Fahrenheit, and maintained at this temperature till delivered to the customers. The best way to handle milk is to place it in bottles within fifteen minutes of the time of milking.



A NEAT MILKHOUSE

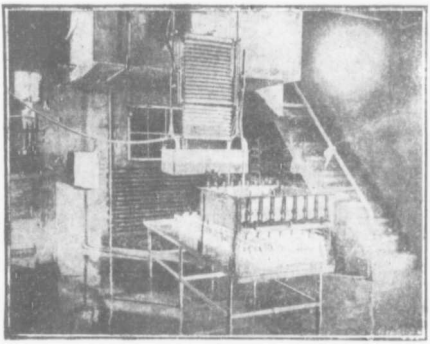
But undoubtedly the greatest danger regarding milk is that it may become infected with disease-causing microbes. Generally speaking, the undesirable organisms may be said to gain access to milk through carelessness and ignorance and under uncleanly conditions, while the less harmful organisms gain access under clean conditions. Disease organisms may come from diseased cows or from persons who either have a

contagious disease or are just recovering from it, or from those who come in contact with disease. Diseased cows should be disposed of; diseased persons, or those exposed to infection, should have nothing to do with the handling of milk.

Microbes gain access to milk in various ways. The following are some of these:

1. Milking in unclean surroundings. Milking should be done in a clean place.

2. The body, udder and teats of the cow unclean. Keep a cow as clean as possible and, before milking, wipe her flank, udder and teats with a damp cloth. A damp cloth will not only clean her best, but will dampen the hair so that particles of dirt adhering to her are not so likely to fall into the milk pail. These particles are laden with undesirable forms of germ life.



Bottling Milk

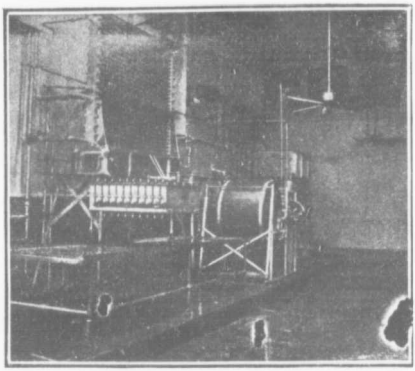
3. Milking in a dusty atmosphere. The feeding of dry foods to cows just before milking fills the air with dust particles laden with undesirable bacteria. The feeding of such foods should take place after, not just before, milking.

4. Unclean clothing on the milker. This is a source

of contamination of milk. His clothing and person should be clean.

5. Milking with wet hands. This is a very faulty habit and should be discarded. Liquid dirt is almost certain to drop into the milk where this practice is followed. It is preferable to smear the teats, very slightly, with clean vaseline.

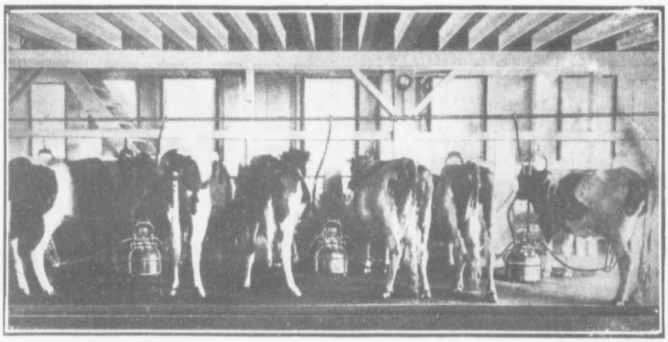
6. Allowing cows to wade into dirty ponds or sloughs to drink. We have mentioned the evil effects of cows drinking such water. Besides this, the dirt in these ponds is composed of the droppings of the cows and other decaying organic matter, which are laden with putrefaction and other undesirable forms of germ life. Dust particles, which adhere to the cow after she dries off, fall into the milk at milking time, and are a fruitful source of trouble to the dairyman later on, it being practically impossible to clean the cow sufficiently to entirely avoid this. In order, if possible, to insure keeping the milk clean while it is being taken from the cow, a milking machine has been invented. Milk drawn in this way



PASTEURIZING PLANT

is much freer from microbes than milk drawn by hand.

7. Faulty and dirty utensils. Dairymen should use only utensils made of the best quality of tin, and so constructed that they can be easily cleaned. Utensils with the tinning off should be discarded, as it is impossible to keep them clean. There should be no crevices to harbor dirt, but all seams and corners should be filled with solder.



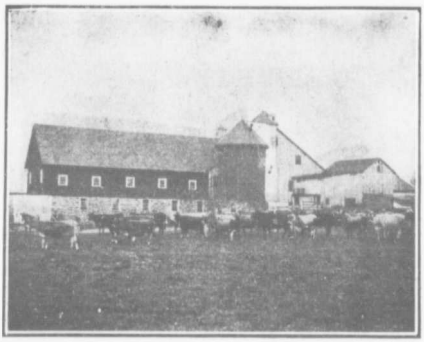
*Milking Machine in Use

8. Cleaning of utensils. There is only one right way of cleaning dairy utensils. There is in milk a substance, albumen, which resembles the white of an egg, and hot water will cook this on the tin. Hence, a utensil that has been holding milk or whey should first be rinsed with cold or lukewarm, not hot, water, then washed with hot water containing

* Reproduced by permission of D. H. Burrell & Co., Little Falls, N.Y.

some good washing powder and then scalded with boiling water or steam. After this the vessel should be placed in a pure atmosphere, in the sunlight, in a position to drain. Sunlight is a good natural disinfectant. Use a good fibre brush, and not a cloth, in washing dairy utensils, and never wipe them out after scalding, but allow their heat to dry them.

9. Allowing the milk to stand in an impure atmosphere. Not only will milk absorb taints from it, but such an atmosphere is invariably laden with dangerous forms of germ life, which, when they gain access to the milk, set up serious troubles. Milk should be removed from the place of milking immediately after it is taken from the cow. It should then be strained through a clean strainer and kept in a clean atmosphere at all times.



CLEAN STABLE AND WELL-LIGHTED BARN

But since it is impossible to produce milk entirely free from germ life, we should understand how to control, or hold in check, those that do gain access to it. Like all other forms of life, germs require, for rapid development, a suitable food, suitable surround-

ings, and a suitable temperature. They find the food conditions practically ideal in milk. Hence, to destroy them or to prevent or check their growth, we must make the temperature unsuitable. The higher the temperature, up to 90 or 100 degrees Fahrenheit, the more favorable they find it. A sufficiently high temperature will destroy them, and this is what is aimed at in pasteurization of milk. This consists in heating it to 140 degrees Fahrenheit, or above, for twenty minutes.

Low temperatures prevent or retard the growth of germs but do not destroy them. City dairies combine these two principles, that is, they first pasteurize the milk and cream to destroy germ life in as large a measure as possible, then they cool both promptly to a low temperature, put into clean, sterilized containers with close covers, and hold at a low temperature until delivered to their customers.

After a careful study of milk defects, their causes and remedies, may we not state the conclusion of the whole matter in the words, CLEAN MILK; COOL MILK.

### WHAT TO DO

For those who live in the country:

*1. Get healthy cows and keep them in a healthy condition.*

*2. Feed no food that will injure the flavor of the milk.*

*3. Provide your cows with a plentiful supply of pure water.*

*4. Give your cows clean, healthy surroundings.*

*5. Salt your cows regularly.*

*6. Use only well-constructed utensils, made of good quality of tin, both for milking into and for holding the milk. Do not use either wood or galvanized iron pails.*

*7. Produce the milk under as clean conditions as possible.*

*8. Remove the milk to still cleaner surroundings as quickly as possible after milking, strain it into clean utensils of good quality, cover it, cool it promptly to a sufficiently low temperature until used, shipped or sent to the factory.*

For those who live in the town:

*1. At milking time visit the dairy from which you get your milk. Inspect the barns, the cows, the people who do the work, and the milkhouse.*

*2. Inspect your own refrigerator. See that it is clean. Look into the ice box, the draining tube and the drip pan.*

## XVII. BAD MILK

The seriousness of allowing milk to become contaminated by microbes which cause disease is well illustrated by an experience in the town of Elkton, in Maryland, in 1900.

Elkton at that time had a population of 2,542. The inhabitants were supplied with milk from four dairy farms. Mr. Jones was owner of one of these four farms. In the month of September, 1900, a case of typhoid fever occurred on a farm close by. Mrs. Jones, a tender-hearted woman, assisted in nursing the sick one for two or three weeks, up to October 5th. For some days before this date, both she and one of her sons did not feel well, but continued to milk the cows and care for the milk up till October 8th. Mrs. Jones also got the meals ready for her own family. On the 8th of October she and the son became too ill to work longer, both having typhoid fever. A little later still, another son took the disease. During all the time of their illness, Mr. Jones continued to deliver milk to 80 houses in Elkton. The rest of the family did the milking and the cooking and took care of the three sick ones.

By the 28th of October, when Mr. Jones was stopped selling milk by the Health Officer, 32 families had been invaded by typhoid fever. During the next

ten days seven more families had taken the disease, thus making 39 in all, or just one less than half the families Mr. Jones supplied with milk. In these 39 homes there were 64 cases of typhoid.

WOULD YOU LIKE TO BUY YOUR MILK FROM THIS MAN?

The jail was one of the places where this infected milk was delivered. Here there were 15 or 20 prisoners, none of whom were allowed any milk. They drank cold water. In the jailer's home, where milk supplied by Mr. Jones was used, five members of the family fell ill with typhoid. None of the prisoners took the disease.

The following table shows clearly the serious results arising from the criminal negligence of Mr. Jones:

| | |
|---|---|
| Population of Elkton . . . . . | 2,542 |
| Total number of cases of typhoid . . . . | 64 |
| Homes invaded . . . . . | 39 |
| Invaded houses using Mr. Jones' milk . . | 39 |

No cases occurred in the homes supplied by other dairymen.

Almost as serious results have been seen where there was scarlet fever or diphtheria in the home of a milkman who continued to supply milk to his patrons.

The following account of an epidemic of diphtheria will show how widely infection spreads from infected milk:

There were three towns, Milton, Dorchester and Hyde Park, close together, in one of the New England states. Mr. Peters had a dairy from which he delivered milk to Milton and Dorchester. He got his milk from six farmers: namely, Bell, Mills, Small, Large, Jones and Leech. Mr. Olson got his milk from Leech, taking one-third of all his milk. Mr. Peters got the other two-thirds of Mr. Leech's milk.

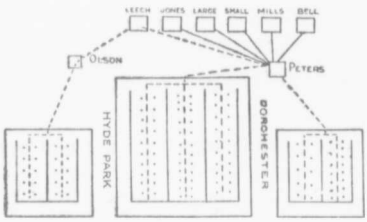



DIAGRAM OF MILTON, HYDE PARK AND DORCHESTER

On April 11th, 1907, a child was taken ill with diphtheria at Mr. Leech's home. The milk vessels were washed in the house by the person caring for the sick child. Mr. Leech continued to sell milk to Mr. Peters and Mr. Olson.

This table shows the rate at which the cases developed until the health authorities stopped Mr. Leech selling milk:

| PLACE | APRIL | | | | | | | | | TOTAL CASES |
|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | |
| Milton . . . . | .. | 1 | 11 | 1 | 4 | 1 | .. | .. | .. | 18 |
| Dorchester . . . | .. | 6 | 19 | 11 | .. | .. | .. | .. | .. | 36 |
| Hyde Park . . . | .. | .. | 2 | 5 | 6 | 1 | 3 | .. | .. | 17 |
| Totals . . . | .. | 7 | 32 | 17 | 10 | 2 | 3 | .. | .. | 71 |

It will be noticed that the outbreak in Hyde Park occurred one day later than that in Milton and Dorchester. This is accounted for by the fact that Mr. Olson called for his share of Mr. Leech's milk in the evening and sold it the following morning. Mr. Peters called for his in the morning and sold it the same day.

You will all agree that it is a very serious matter for a milkman to be so regardless of the welfare of the people that he will continue to supply infected milk.

From the serious results following the carelessness in these two instances it can be readily seen that if vessels containing milk get infected, the milk put in these dishes afterward may become infected also, unless the utensils are thoroughly cleaned by boiling them. If a case of diphtheria, scarlet fever or other infectious disease breaks out in your home, therefore, no dishes used by the patient should be used by the rest of the family until they have been boiled. Furthermore, all food left over by the patient should be burned and the fluids thrown into the sink. This left-over food will be infected, and if taken back to the kitchen may give some one else the disease.

It would be a good plan if the boys and girls would, whenever possible, visit the dairy from which they get their milk supply. If every dairy within easy reach of the town or city were visited by those who use their milk, it would have a very good effect on the cleanliness of the dairy. In the country districts people

have their own cows, and thus can see to it that the milk is clean.

For the making of butter, clean milk is of very great importance. There is nothing done in the process of making butter which kills germs in the milk. Even an unpleasant flavor in the milk will more or less taint the butter made from it. If butter is not good its unsavoury taste must be due to bad milk, bad churning or bad care of the butter after it is made. Those who produce milk from which butter is made, therefore, should be just as careful of the milk as they are when it is to be used on their own table. Boys and girls in the country should bear this in mind in caring for the milk or cream sent to the creamery.

REMEMBER

*Typhoid germs, diphtheria germs and scarlet fever germs are often spread by milk.*

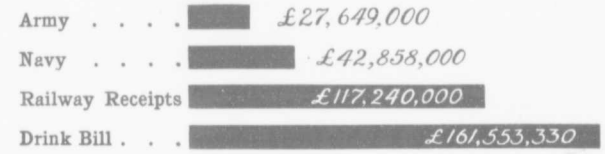
The names of the persons mentioned in the illustrations cited are fictitious.

# XVIII. ALCOHOL

## ALCOHOL AND THE NATION

It is not known to most people what exceedingly large sums of money have been spent on drink in years past in various countries. As an illustration, take the case of Great Britain in 1913.

Surely, in the light of what has happened since August 4th, 1914, no one can honestly say that it was a good thing to spend two and two-sevenths times as much money on drink as was spent on the army and navy combined.

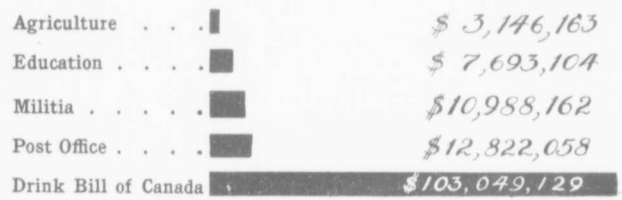



Facts taken from the "Daily Mail Year Book," 1914.

The following illustrations show something of the enormous waste in Canada due to our drink bill.

The total amount spent on Agriculture and Education by all Provincial Governments, and the total

expenditure by the Dominion Government on the Militia and Post Office Departments, are as follows:



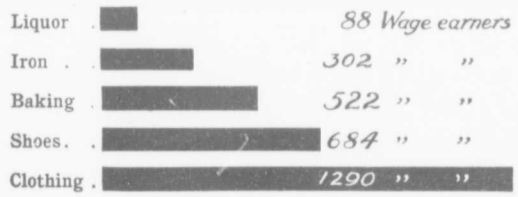

These figures are taken from "The Canada Year Book" for 1914, published with the authority of the Hon. Sir George E. Foster.

The following is the scale of prices used in figuring the total drink bill:

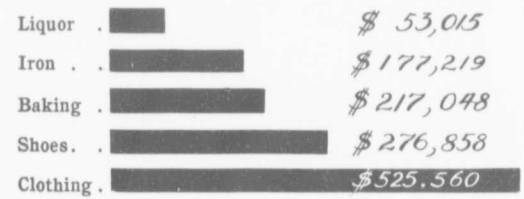
| | |
|---|---|
| Canadian Spirits | $6.00 per gallon |
| Imported Spirits | 8.00 " " |
| Canadian Malt Liquors | .70 " " |
| Imported Malt Liquors | 2.00 " " |
| Imported Wines | 5.00 " " |

## ALCOHOL AND LABOR

For every $1,000,000 capital invested in Canada in 1911 in the following manufactures there were:



For every $1,000,000 capital invested in Canada in 1911 in the following manufactures there was paid in wages:




These figures were taken from the Dominion Government Census, 1911.

Alcohol as a social beverage does nothing but harm, not only to the nation, but to the individual using it. In the interests of the human race it must be ultimately banished completely.

### THINGS TO FIND OUT

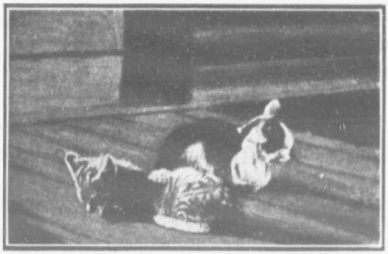
*1. What is the part taken by alcohol in crime?*

*2. If alcohol is ever the cause of insanity?*

*3. Are the deserted and orphan children in institutions ever sent there because of drink?*

# XIX. ALCOHOL AND ANIMALS

In trying to decide whether the long-continued use of alcohol is harmful to the body, it occurred to several men that they might learn something from animals. The best information ever given on this subject has been supplied by Dr. Hodge, Professor of Physiology in Clark University, Worcester, Massachusetts. In order to find out whether the use of alcohol stunted the growth of animals or not, Dr. Hodge secured several young kittens. From these he selected two that seemed quite healthy and fed whiskey to them. Now, kittens do not like whiskey even when mixed with milk, so Dr. Hodge used a stomach pump and fed them in this way. This was continued for some little time, when it was noticed that the kittens fed on alcohol were not growing nearly as well as the others. He also noticed that they were



Alcohol-diseased kittens, June 4, 1895: characteristic attitude. When the photograph was taken, 5 P.M., all the normal kittens were playing actively.

The illustrations in this chapter are reproduced from "Physiological Aspects of the Liquor Problem"—Dr. C. F. Hodge, by permission of the publishers.

less playful, less cleanly, and at the same time more timid and easily frightened. The poor little kittens simply sat sleepily about all day except when they were frightened by some noise. The picture shows one of the kittens fed on alcohol, and one of the other kittens.

The lesson learned so far is that the kittens fed on alcohol did not grow as well and did not have as

BUM TIPSY NIG TOPSY

This picture was taken shortly after Dr. Hodge commenced giving Bum and Tipsy alcohol.

much energy as their little companions who had no alcohol.

Dr. Hodge now turned his attention to dogs, and for this purpose he kept over half a dozen dogs for about five years, during which time he learned a great deal about the effects of alcohol on animals. He first secured two pairs of puppy spaniels, all healthy and

active. He called them Bum, Tipsy, Nig and Topsy. Each pair of dogs was to be in a separate kennel, and each kennel placed in a large yard where there was plenty of sunshine. Their homes were kept clean and neat and they were given good food.

The four dogs were treated exactly alike except Bum and Tipsy, which were given each day a certain amount of good whiskey mixed with their food. Dr. Hodge noticed that the pups very much preferred food without whiskey, and took the liquor only when other food was not supplied.

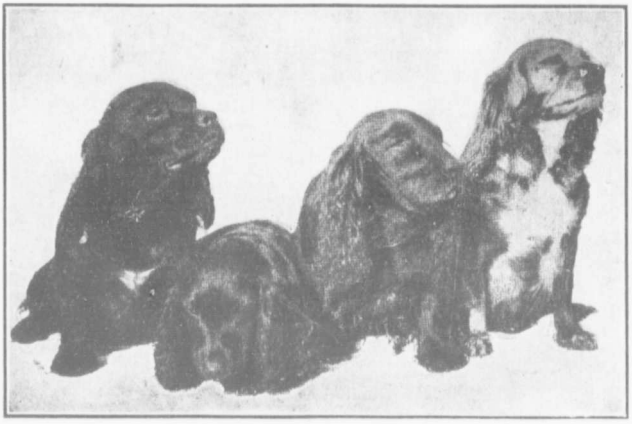
In two years the family of dogs increased to nine. The young dogs were called Frisky, Winnie, Berry, Teeto and Minnehaha. At this time a form of dog sickness broke out in the city, and Dr. Hodge now found that all the dogs who had been fed on alcohol were very much worse than those that had none. Bum, Tipsy, Frisky and Winnie all became ill very rapidly, were very weak and became very thin. They completely lost their appetites.

In about a week, Frisky improved somewhat. Poor Bum and Tipsy were not so fortunate; they were so ill they refused to take any kind of nourishment. The doctor had to pour milk and eggs down their throats to keep them alive. Their eyes became very sore and running with matter. This continued for over two weeks, and their keeper despaired of their lives many times. At the commencement of their sickness, alcohol was omitted altogether from their diet.

After their sickness the dogs all gained quite rapidly.

The eyes healed up with the exception of one of Tipsy's, which remained permanently blind.

Having gained this information from his friends, the doctor wished to find out which one of the dogs was the most active and playful. For this purpose, he arranged a little instrument which, when tied about



BUM TIPSY II * NIG TOPSY

This picture was taken about five years after he commenced the experiments. See how stupid Tipsy looks in comparison with Topsy.

the dogs' necks, recorded how much the dogs ran about when they were left to themselves. It was found that Bum showed about three-quarters as much activity as Nig, and Tipsy just about one-half as much as Topsy. These records, of course, merely show how active the dogs were when left entirely to themselves to play about the yard.

* After Tipsy I died Tipsy II was substituted.

Another ingenious test was devised to find out not only which dog had the greatest activity, but also to ascertain which ones were the brightest and the most teachable. The dogs were taken to a gymnasium one hundred feet long and taught to bring back a rubber ball thrown across the room. The first day of the test Nig and Topsy secured and brought back 922 balls out of 1,400, while Bum and Tipsy brought back only 478. This test was repeated over and over again with the same results each time, namely, that Nig and Topsy always beat Bum and Tipsy.

NIG
One year after the experiment was commenced.

BUM
One year after the experiment was commenced.

One other very marked difference was seen in the dogs. If any unusual sound was heard in the distance, Bum and Tipsy would crouch and shiver with fear, while Nig and Topsy would stand up and bark vigorously. Whistles and bells sounded in the distance would make Bum and Tipsy

tremble. In fact, if a stranger came near the kennel they would yelp and howl with great anxiety. Bum, during the first year of the experiment, would even have spells, when he would be afraid of imaginary things and go into fits of howling.

Three and one-half years after the experiments were commenced, alcohol was discontinued, in order to see whether the dogs would become as strong and active and bright as their companions. Unfortunately, Tipsy died shortly after this. Bum's activity increased slowly, so that by the end of a year he brought back 95 balls for Nig's 100; but during the following year poor Bum, without any apparent cause, got sore eyes again and by the spring was totally blind. An unsightly skin disease also broke out all over his body. This was very hard to heal. Thus, when Nig was still strong and healthy and active, poor Bum had the appearance of an old, feeble dog. And to the end of his life he never got over his extreme timidity when any unusual noise was heard.

## XX. ALCOHOL AND MEN

The continued use of alcohol in excessive quantities undoubtedly makes people less able to fight against disease. For twelve years the official reports, in fifteen of the largest cities in Switzerland, showed that in six and one-half per cent. of all deaths of persons over twenty years of age, alcoholism was either the direct or a contributory cause. Amongst men over twenty years of age, ten per cent. of the deaths were due to alcoholism.

A much larger number of people who are intemperate, die of disease than from the direct effect of alcohol. This is because their systems have been weakened by its continued use. Physicians generally recognize the grave outlook in pneumonia, cholera, erysipelas, scarlet fever and other infectious diseases in persons who habitually drink to excess.

The belief was once widely held that those who indulged freely in alcoholic liquor thereby acquired a certain degree of protection from tuberculosis. It was also held that a free use of alcoholic drinks was one of the best ways to cure this disease. Both these opinions are now completely discredited. Alcoholism, if it does not actually predispose to tuberculosis, certainly furnishes no protection against it. The course of consumption in patients who formerly used a considerable

quantity is even more rapid than usual. Thus it is seen that a continued use of alcohol is not only not necessary to health, but when disease actually takes hold of a person the system is not so well able to withstand the illness. And if alcohol reduces the power of resisting disease, it also reduces the capacity for work.

At Aschaffenburg, in Germany, Dr. Kraepelin carried out some investigations on the action of alcohol as affecting the work of a number of type-setters. Four men, aged 42, 36, 25 and 23, were selected; even the youngest had been engaged in the trade for over nine years. The oldest of the party was accustomed to take four glasses of beer a day except Sunday, when he drank from eight to ten glasses. The second took one or two glasses on each of the week-days and four or five on Sunday. The third took none on week-days but three glasses on Sunday. The fourth took three glasses each day during the week and five or six on Sunday. It was noticed that on Monday they could not work so rapidly, and they made more mistakes than on any other day of the week. Two of the men complained of headache, dizziness and sleepiness on Monday. In order to test more fully the effect of alcohol on the men and the quality of their work, the four men abstained entirely from the use of alcoholic drinks for twenty-four hours. The following day a record of their work was kept. The next day each one was given a little less than one-half pint of a light wine a quarter of an hour before commencing work. To make doubly sure of the results, these tests were

repeated eight times. A careful record of their work was kept, with the result that the amount of work was diminished about six and one-half per cent. on the days they used alcohol. In addition to this, there was a greater percentage of errors in their work.

We see about us some men who continue to take a certain amount of alcohol daily for a number of years. Some of these men appear to be able to do just as much work as other men. When illness comes, they apparently recover quite as quickly. This does not prove, however, that alcohol has not injured them. From the effects noted in the case of both animals and men, we are compelled to conclude that alcohol should never be used except as a medicine.

## XXI. TOBACCO

Boys are ever ready to copy from men those habits which they consider manly. This is commendable. But care must be taken in judging of the habits which are worthy of imitation. About some things there can be little doubt. Men are ever ready to defend the weak. This is a manly thing to do. They also take pride in defending and showing courtesy to their mothers, sisters, wives or other women friends. This is to be admired. So we might enumerate many manly qualities worthy of both commendation and imitation.

There can be but little question, however, that some habits of men should not be copied. Still others stand in a middle class and deserve our serious consideration before we pass judgment on them. One of these latter is the custom of using tobacco. Many men use it for years with no apparent injury to themselves. To many boys, the custom of smoking, more particularly the use of cigars, appears to be the one thing which graces a man in a highly dignified manner.

Now, for you to decide whether the use of tobacco is a necessary qualification for the man you wish to be, it will be well to look squarely at the subject without any prejudice either for or against. To simply condemn the use of tobacco solely because it is an

expensive habit, or a repulsive habit, or a selfish habit, is not enough. What evidence is there on this subject? What facts, if any, can be cited which will be of service in arriving at a correct conclusion?

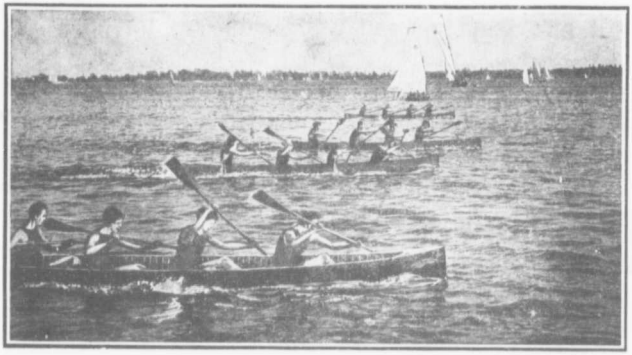
First, it would be well to consider what tobacco is and then to study its effects on the body. If these effects are for the good of the individual and the race, its use should be encouraged. If they are injurious, we should condemn the weed, not only for ourselves, but for others.

The tobacco plant belongs to the nightshade family. Several poisonous plants, as well as several vegetables, including the potato and the tomato, are also members of the same family. The tobacco plant grows from four to six feet high and produces broad leaves. The size, form, thickness and texture of these leaves are controlled largely by the methods of cultivation. Its rose-purple blossoms are arranged in terminal clusters, and present a very beautiful appearance when a whole field is in bloom.

The cultivation of the tobacco plant requires great care, especially during the first five or six weeks after the seed is sown. During this time it is usually kept in a hothouse, just as we care for cabbages and tomatoes. The plants are then set out in the fields, usually three feet being left between the rows. If it is intended to use the crop for seed, the blossoms are allowed to remain on and ripen. If, however, it is desired to use the tobacco itself, the blossoms are all nipped off by

hand. This allows all the energy of the plant to be expended in maturing large leaves.

The plant is harvested when the leaves begin to turn yellow. The plants are cut off near the ground and are then hung up in drying sheds or barns to be cured. The next step in the preparation of the product is the sweating process, which improves its aroma or flavor. For this purpose, the leaves are



A Canoe Race

packed in boxes or they are piled in large heaps and allowed to heat to a certain degree. Then the heaps are re-piled.

Tobacco contains nicotine. The latter is procured by distillation. Nicotine is an oil which turns brown in air, is soluble in water and alcohol, and has a peculiar stupefying odor. It is very poisonous. Even in minute quantities it causes vomiting and collapse. The effects of tobacco-smoking are largely due to the

nicotine present. Soon the body becomes accustomed to it and does not reject it as at first.

Professor Seaver, of Yale University, collected some very interesting facts about the young men entering that institution between 1890 and 1891. He found that smokers were on the average fifteen months older on entering college than were non-smokers. They were not able to take as much air into their lungs by about five cubic inches, and they were not so tall. Furthermore, only five per cent. of them gained the highest ranks in their studies.

In other words, the students who did not smoke were able to enter college at an earlier age; they were taller, they had greater chest expansion; and more of them stood high in their class lists than did those who smoked. On the athletic field, an even greater difference was seen, for here the smokers were almost completely outclassed by those who did not use tobacco.

Professor H. H. Surley, of the Iowa State Normal School, makes similar observations regarding the effects of its use:

"After making a study of several hundred boys, running through the period of ten years, I give only observed facts, and neither assume the condition nor jump at foreordained conclusions.

"1. Boys that begin the habit at an early age are stunted physically and never arrive at normal bodily development.

"2. Accompanied with the use of the narcotic were certain disordered physical functions, such as indigestion, impaired taste, defective eyesight, dulled hearing, nervous affections, and disease of the heart. I have not found a single case of early addiction to the habit of tobacco-using that did not suffer with one or more of these direful abnormal conditions.

"3. Tobacco, used in any form, destroyed the ability of a pupil to apply himself to study, and prevented his comprehending or remembering his lessons. The mental faculties of a boy under the influence of the narcotic

seem to be in a stupor, and since depraved nerve power stultifies and weakens the will power, there is but little use for the teacher to seek to arouse the dormant, paralyzed energies or to interest and foster the fagged desire. I have not met a pupil that is addicted to the habit who will go through a single day's work and have good lessons. I have not had one whose scholarship record was good, and in almost every case the deportment was below the average standard. At the regular examinations for promotion, nearly every one of the tobacco-using pupils fails in doing the most reasonable test work, even if this is not the first time the work has been passed over in class. I have had numbers of cases in which they have remained in the same grade for four successive years, and even then they were not ready to be advanced into the next higher class."

Most boys take delight in physical prowess and endurance, especially in the playing of games. Dr. Seaver made some interesting observations on his pupils regarding the effect of tobacco on muscular exertion. He says:

"Whenever it is desired to secure the highest possible working ability, as in athletic contests where maximum effort is demanded, all things which interfere with muscular strength are removed as far as possible. Tobacco is one of the first substances forbidden. Experiments carried out at the University of Michigan have shown that even moderate amounts of tobacco in the form of smoke lower the working power of the human muscle by a high percentage."

The foregoing facts are surely reliable, because the men who made the experiments were anxious to find the truth. What must the conclusion be, then, regarding its use? Answer this for yourself.

REMEMBER

*1. Tobacco stunts the growth of boys if commenced at an early age.*

*2. It dulls the mental faculties of a boy and causes him to take a low stand in class lists.*

*3. Boys who use tobacco, make very poor athletes indeed.*

## XXII. DUST

In prairie countries there is a great deal of wind, both in winter and summer. In the winter, when the wind blows, we have a blizzard. Even the sturdy boys sometimes do not like these storms. The air is so full of snow it blows into one's eyes and over the top of one's collar, making it very uncomfortable indeed. There is one good feature about a blizzard, however—the snow is clean.

In the summer we have equally strong winds, but, in place of snow, dust fills the air. In the city it is very dusty on the paved streets when the wind blows hard. In the towns and out in the country, dust storms quite frequently occur.

These dust storms are really worse for the health than are blizzards. The dust is so fine that some of it passes into the nostrils with the air we breathe. In the back lanes, or back yards of houses where garbage is kept, more or less filth and even disease microbes will be picked up by a strong wind and wafted into the faces of the passers-by. During the summer, too, a strong wind very rapidly dries up everything on the street. Men expectorate there, and a great many kinds of dirt and filth are present also. The wind gathers it all up and hurls it at every one in its track. Dust in the early spring-time in cities, towns and

villages is especially liable to be dangerous, because it contains much dirt which has accumulated during the winter. Such dust should be kept down by watering the streets.

The number of microbes in the air varies greatly with the different seasons, and the number of disease-



A BLIZZARD

causing microbes varies also. Professor Buller, of Manitoba University, made observations each week for a year regarding the number of microbes in the air in Winnipeg. During the winter months, he found a very small number indeed. In February and March there were practically none. In the summer and early fall many were found, the greatest number being found in September.

Did you ever notice that ice-cream wagons, with cones piled up, like to wheel near a school about noon hour or about four in the afternoon? Just think of all the invisible filth, with microbes of many kinds, on those ice-cream cones. And along the street, on the way home, candy and fruit are sometimes temptingly displayed outside the stores, so that you cannot get by without wanting some. But the wind has been there before you and distributed microbes in plenty over everything in sight.

Never buy candy except you see that it is kept in a clean vessel with a lid on. Never buy fruit, meat, cakes or biscuits when they have been exposed to the dust. The bread delivered to your house should be wrapped in paper and carried inside the rig, not on top of it.

REMEMBER

*1. Never eat ice-cream, fruit or candies which have been exposed to dust.*

*2. Dust is often laden with microbes.*

## XXIII. SWEEPING AND DUSTING

In country schools pupils sometimes sweep the floor at noon. Do you think it is a good plan? In the winter all the pupils remain indoors on cold days. The sweeping is frequently done by one pupil while all the others open out their lunches and eat them. The dust lights on the food just the same as on the desk. On the desk you can often write your name after the sweeping is finished. The sweeping should be done after four o'clock, previously scattering sawdust moistened with carbolic solution over the floor. As has already been pointed out, school floors should not only be swept in this way every day, but should be scrubbed frequently. The School Board of London, England, found that by having school-room floors scrubbed twice as often as formerly, the attendance of pupils was much more regular. This was due to the better health of the pupils. They did not so frequently have colds

GOODS COVERED UP IN STORE DURING SWEEPING

and other slight illnesses contracted from the dust at school.

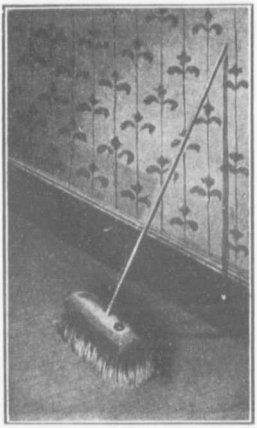
Did you ever see into a nice store while the sweeping was being done? See how careful they are to keep the dust off the things they have for sale. Surely it is worth while to avoid raising a big cloud of dust about our homes, our schools, our churches, in fact any place where people may be assembled shortly. Sometimes after the sweeping is done the air is heavily laden with dust which the people in the room must inhale. Therefore, no sweeping should be done in any school-room, whether in town or country, between 8 a.m. and 4 p.m.

SWEEPING WITH CORN BROOM

Every one is familiar with the good, old-fashioned broom. All have used it at some time. There are other kinds of brooms, however, which have some advantage over the corn broom. One kind has a place for coal oil which is put into it through a hole in the top. This keeps the bristles in the broom slightly moist and thus helps to keep down the dust. The best method of all is

to have a vacuum cleaner installed; by this means the sweeping is done without raising any dust. In the future, it is hoped that large schools will be equipped with these dustless sweeping machines.

Now, what is the object of dusting? Is it not to get each article of furniture in the room clean? Then the dust must not be stirred up. With a clean, damp cloth it must all be removed from the furniture on to the cloth. If a cloth dampened with water spoils the furniture, then use olive oil or some other vegetable oil. Such places as window sills, mantels, and large pieces of furniture can be dusted in this way. More delicate objects may be dusted with a soft, dry dusting cloth. Dusters may be made of cheese cloth or soft pieces of old cotton. After being used they can be shaken out of the window. They should be washed often.



BROOM BRUSH SHOWING METAL SCREW TOP FOR OIL

What has been said of the school-room is also true of the home. There we eat and sleep. If food is left without being closely covered, it will surely be unfit for use. You can scarcely dust bread or sugar, soup or milk. There the dust lights to stay. Sweeping must be done, therefore, with as little dust as possible.

And dusting must be done with a damp cloth in such a way that all the dust is gathered on to the cloth.

Compare the way this man is dusting the show-cases in the store with the method so often used. The worst way of all is to employ a large feather-duster. When it is used the dust is left in streaks on the furniture. At the same time the air of the room is laden with dust. This, of necessity, spoils the atmosphere for those occupying the room.

CORRECT WAY TO DUST

HOW TO BE HEALTHY

*1. Be careful to cover up your food while sweeping.*

*2. Always sprinkle the floor with damp sawdust or anything to keep down the dust.*

*3. Always dust with a cloth moistened with oil or water.*

## XXIV. MICROBES

Take a strong magnifying glass and hold it over your hand. The skin looks very coarse and rough. The glass makes clear many objects that cannot be seen without its use. If you take a pair of field or opera glasses and study distant objects, you will notice at once that the glasses seem to make them look nearer and larger.

Now, with an instrument called a microscope, which is much stronger than any ordinary magnifying glass, little objects can be seen which are not visible to the naked eye. Throughout the world there are thousands of minute forms of life, both animal and vegetable, which can be seen only by the use of the microscope. These little forms of life are called microbes. Many of them are harmless, some of them are our friends, and some our enemies.

For many years doctors have been studying these little microbes in order to find exactly which are really our enemies. Many of them are known now, and are as easily distinguished from one another by the microscope as cats can be distinguished from dogs, or thistles from wheat.

Not only are doctors able to recognize these little microbes, but they know where they like to live and also what climate they thrive best in. They have

some common characteristics. For instance, many of them like to live where it is warm, moist and dark; here they multiply very rapidly.

These microbes consist of a single cell, and many of them are reproduced by this cell dividing itself into two parts. Each new-born microbe is thus literally "a chip off the old block." This division, in some varieties, takes place every twenty minutes, in others only once every hour.

MICROSCOPE

This is, indeed, a much simpler way of producing their kind than we are accustomed to see. If you plant a grain of wheat, the seed must send down tiny roots, to gather food and moisture. Upward grows a stem with leaves round about it. In about two months from the time the seed is planted a head appears on the stalk. This head develops and ripens in about five weeks more, thus taking a little over three months to produce more wheat.

The microbe of cholera divides and produces two in place of one every twenty minutes. It might thus, if unhindered, produce 5,000,000,000,000,000,000,000 in twenty-four hours, with a weight of about 366 tons. Luckily competition, limited food-supply and other factors prevent this enormous increase; but still one

microbe has actually been observed to rear a small family of 80,000 within a period of twenty-four hours. This will show you how wonderful microbes are in respect to their reproduction.

If they are wonderful in this respect, they are equally wonderful in respect to their digestive capacity. If a microbe divides every twenty minutes into two, each equal in size to the first one, it is clear that it must double its weight every twenty minutes, or, in sixty minutes it will have gained eight times its own weight. Do you know anything else that will gain eight times its own weight in one hour?

The early Greeks and Romans believed in the spontaneous generation of life. Even in the seventeenth century it was thought that polywogs and other little living creatures had their origin in mud or sand. A learned man of that age announced that certain kinds of trees, after rotting in the sea, produced worms which engendered butterflies, which in turn became birds. Van Helmont, a distinguished scientist of the same century, even went so far as to tell how to make mice. He said that if soiled linen was squeezed into the mouth of a vessel containing some grains of wheat, the grains changed into adult mice in about twenty-one days. The following is his method of producing scorpions: "Scoop out a hole in a brick. Put into it some sweet basil, crushed. Lay a second brick upon the first so that the hole may be perfectly covered. Expose the two bricks to the sun, and at the end of a few days the smell of

the sweet basil, acting as a ferment, will change the herb into real scorpions."

All this seems very foolish to us in our time. But do we not believe almost as foolish things? Once in a country district three children were taken ill at the same time with diphtheria. The cellar was found to contain large quantities of decaying potatoes. This, the neighbors said, was the origin of the diphtheria. Now can diphtheria germs originate from decaying potatoes or other vegetable matter? Can consumption germs originate from a cold? Must diphtheria germs come from diphtheria germs, and consumption germs come from consumption germs, and typhoid germs come from other typhoid germs? This is important for us to know, for if microbes cannot originate except from microbes, if consumption cannot originate except from consumption germs, then that great man Pasteur was right when he said, "It is in the power of man to make microbe diseases disappear from the surface of the globe."

This great scientist spent years working on this problem, and in 1862 presented conclusive evidence before the French Academy of Sciences which convinced the world that microbes do not originate by spontaneous generation. Two years later he spoke the following dramatic words:

"And, therefore, gentlemen, I could point to that liquid and say to you, I have taken my drop of water from the immensity of creation and I have taken it full of the elements fitted for the development of inferior beings. And I wait, I watch, I question it, begging it to recommence for me the beautiful spectacle of the first creation. But it is dumb—dumb ever since

these experiments were begun several years ago; it is dumb because I have kept it from the only thing which man cannot produce—from the germs which float in the air; from Life; for Life is a germ and a germ is Life. Never will the doctrine of spontaneous generation recover from the mortal blow of this simple experiment."

All of the forms which cause disease, such as diphtheria, scarlet fever and typhoid fever, multiply most rapidly at a temperature of ninety-eight and one-half degrees by Fahrenheit's thermometer. This is the normal temperature for the body. If the temperature is lowered to fifty degrees or raised to one hundred and fifteen degrees, they do not grow. If the temperature is lowered still farther they do not die. In fact, many of them will stand to be frozen for months, and as soon as they are thawed out they become just as active as ever. Typhoid germs have been known to live five months in the winter. * If the temperature is raised to one hundred and forty degrees for twenty minutes, practically all of them are killed. Thus boiling is sure death to them.

We said that these little microbes love moisture. For the want of it, all of them stop multiplying, and many varieties die off rapidly. For instance, the germ of that dread disease, cholera, when dried, lives only a few days. If it lives in a moist place its life may be prolonged for almost a year. This is a very important fact to remember when we think of the diseases round about us caused by germs. We have already spoken about the danger of having damp closets and damp cellars in our homes.

*Pathogenic Bacteria, by Park. Third edition, p. 289.

But there is one thing these microbes like better than warmth and moisture; it is darkness. They hate sunshine more than almost anything else. The direct rays of the sun will kill the germ of tuberculosis in a few hours. Thus it is seen that sunshine is one of our best friends.

Some of these germs like very much to live in milk. There they multiply very rapidly. If a typhoid germ found a home in a nice jug of milk on a hot summer's day, in the kitchen, the next morning that one little germ may have produced sixteen million seven hundred and fifty thousand of the same kind.*

WHAT TO DO

*1. If each microbe becomes two microbes in an hour, how many will there be in twenty-four hours?*

*2. How many would there be if the cell division took place every half hour?*

*3. Boil the drinking water if there is any danger of it not being clean.*

*4. Keep the milk cool and the microbes will not multiply in it.*

*Text Book of General Bacteriology, by W. D. Frost.

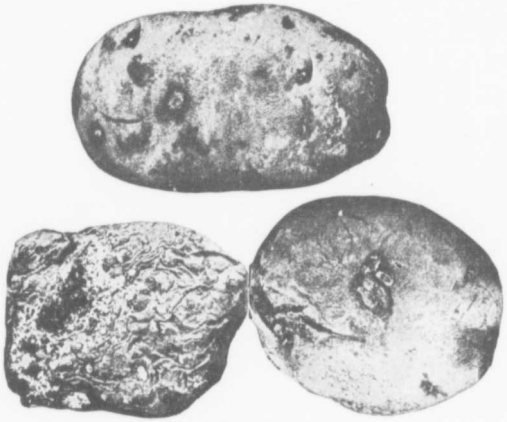
## XXV. MICROBES IN ACTION

Though most microbes do not concern us, some are harmful and some are useful. It is a microbe which turns milk sour, but it is a microbe also which gives the particular flavor to varieties of butter and cheese. They cause our fruits to decay, but they also make our vinegar. They cause our vegetables to rot, but they also prepare the soil so that the little roots of the vegetables can take the nourishment needed to make them grow. In all these cases they are present in great numbers. We might call a decaying potato a microbe city, for millions of microbes are living there together, and working as hard as they can night and day. They are also ready to go from such a city to a new one, and there the new settlement works just as fast as the old one.

Take a sound potato and a rotten one. Break the skin of the sound one, press the rotten one against it and leave them close together for a few days. Then examine them and you will notice that the good potato has begun to spoil. A few microbes promptly went over from the rotten one to the sound one and made their home there. After that nothing could save the potato except to cut off all the spoiled part. Even then it would not remain sound long, for when its skin is broken, microbes from the air get into it easily. This

is true of every kind of vegetable and also of fruit, in fact, of everything that can decay. The same thing holds true of people, for if one person is infected with disease germs, these microbes are very readily transmitted to others.

In the last chapter it was pointed out that microbes die if they are boiled. You must be careful, however,



POTATOES

to boil them all. Last fall the new cook undertook to preserve fruit. She took fresh peaches and pears and berries and washed them all well and boiled them. She then washed the glass jars well and poured in the fruit, put on the lids and screwed them down tight. Then she set the jars all away in the cellar for winter use. But, to her surprise, they nearly all spoiled. In looking into the jars which had spoiled, there was

always a whitish scum on top and usually a bubble of gas. One or two jars burst and let the contents run all over the shelf. What was the matter?

She had boiled the fruit well enough. But she had not boiled the jars and the rubber rings and the screw tops. Here, then, was the mistake. The jars look clean to her, but she did not know that these little microbes might be present without her seeing them. And just as soon as she put the well-boiled fruit in the jars, the few microbes on the jars and rubber rings and the lids began to work hard and soon spoiled the fruit. Thus you see what active little workers these microbes are.

WHAT TO DO

*1. Take two peaches, one partly spoiled and one perfect. Peel a little of the latter and press this part against the spoiled one. Watch what happens.*

*2. Notice bubbles of gas in jars of spoiled fruit.*

## XXVI. MICROBES AND DISEASE

Now that we know the habitat of these myriads of little objects, it will be wise to take heed and avoid them. That may seem a very difficult thing to do, since they cannot be seen. However, we know that they love darkness and hate sunshine. We know also that they multiply rapidly in warmth and do not multiply at all where it is cold. There is one other very important fact which is well known. None of these microbes can resist boiling. These facts should be of some great use. Moreover, a little further study will show that they frequent certain places more than others. For instance, a drinking cup was taken from a school to a doctor, who found a great many different kinds of germs, and over the whole cup he estimated that there were about twenty millions of microbes.

Though we cannot see the microbes, we can, if we are always careful to keep ourselves clean, avoid many of them. Before every meal we, each and all, should wash our hands with soap and water. We should never eat raw fruit without first removing the skin where this is possible. Apples, pears and peaches should always be carefully peeled before being eaten.

In school, pupils should not chew the top of the lead pencil, for someone may borrow it and do the

same. This will show you why no two pupils should use the same drinking cup, and lunches should be carefully stored away to avoid having them covered with dust and microbes. It also adds one very strong reason why the bad habit of moistening the tips of the fingers at the lips, before turning the pages of a book or counting bills, should be given up by every one. One may contaminate the pages or the bills, and one may receive disease germs by this means.

Disease-causing microbes are fairly abundant in the world. Even with the greatest care we frequently take them into our systems. If we are healthy and strong, they will do us no harm, for the body has a great fighting capacity against these intruders. Probably not two persons in one hundred get through life without, at some time, taking the germ of tuberculosis into the system. But when the body is really strong and healthy the germs are soon destroyed by the army of soldiers in the form of white blood cells.*

THINK OF USING A CUP LIKE THIS

We see, then, that one very important thing in avoiding infectious diseases is to keep as strong and vigorous and healthy as possible. This can be accomplished by paying attention to the rules of health.

*See page 164.

When a great many microbes enter the body at once, however, they are able to win in the battle, and thus the person gets sick.

No one would like to take poison. Now each kind of microbe in the human body manufactures a poison which doctors call a toxin. In a person who has contracted one of these diseases and has considerable vitality left, the system manufactures an antitoxin. This destroys the germ and counteracts the poison. Thus it cures the patient exactly on the same principle as one is cured by having an injection of antidiphtheritic serum, or antitoxin. For want of power to manufacture an antitoxin some people die.

You see, then, that if a child lives a healthy life, takes plenty of exercise in the open air, sleeps with open window and eats good food, it has a good chance of recovery if it catches one of these diseases.

REMEMBER

*1. Never put the end of your pencil in your mouth.*

*2. Never lend or borrow a drinking cup.*

*3. Disease-causing microbes are plentiful. If you are healthy they are not likely to harm you.*

*4. These diseases are cured when the system is able to manufacture an antitoxin. They are not cured by drugs.*

## XXVII. THE BLOOD IN HEALTH

If you bare your arm to the elbow, you will observe on the front of it large blue veins. If one of these veins were opened, dark blood would run from it in a constant stream. At the front of your wrist, just inside the prominent bone above the thumb, you can feel the constant beat of the blood as it flows through the artery. If this artery were cut, you would see much brighter blood than from the vein. You would observe, also, that the blood comes out in jets, not in a constant stream of the same volume. The blood from the vein is dark and from the artery is a bright red. The blood from the vein flows slowly and the stream is the same all the time, but from the artery it comes in jets spurting out as much as five or six feet. Why the marked difference between the two? Why is the blood from the one dark and from the other bright red? And why the difference in the way it flows? From what you know regarding the change which takes place in the blood during respiration, you understand the reason for the difference in color. But why the difference in the way it flows?

On the left side of your chest you can easily feel the beating of the heart against the chest wall. If you put the right hand on the left chest over the heart-beat and at the same time keep one finger of the left

hand on the pulse of the right hand, you will notice at once that the two beat exactly at the same time. Thus at every beat of the heart the blood is driven with great force through the arteries to every part of the body. This explains the spurting of the blood when an artery is cut.

As the arteries get farther from the heart, they divide and subdivide so that at the farthest away points, such as the finger-tips, the branches become so tiny they can scarcely be seen. These tiniest branches are called capillaries, and are found in nearly every tissue of the body, forming a very complex network, much more complicated than a spider's web. The walls of the capillaries are very thin, and the serum of the blood oozes out through the walls and bathes the tissues constantly.

Why all this constant flow of blood to and fro? What is its purpose? And what relation has it to the upkeep of the body? Ask yourself how the body makes use of the food we eat. What becomes of it before it makes muscle or bone, or brains, or fat or other tissue? The food as it is digested in the stomach and the intestines, is gradually changed by the juices from the stomach, liver, pancreas and intestines until it is of a liquid consistency. It is then gathered up from the intestines by absorption and is carried by the lymphatic vessels till it is emptied from a large duct into a vein close to the heart. Thus you see that the food is prepared for use by the digestive tract and is then emptied into the blood. But it has not yet

reached the place where it is needed. This task is imposed on the blood.

You have also been interested in the circulation of the blood through the lungs, where the blood gives up carbon-dioxide which makes it dark, and takes up oxygen from the inhaled air which makes it red again. Now, you have found by experiment that if you try to burn a candle under a jar, the flame is very soon extinguished. This tells you at once that oxygen is necessary for any flame to burn. You also learned that the exhaled air has the same effect on lime-water as has the air from a jar in which a candle was burned. This suggests at once that a similar process is going on in the body that takes place when the candle burns. And that is just the case. There is a kind of burning taking place all the time in the body. This is called oxidation. Complete oxidation cannot take place, however, without an abundance of oxygen. This holds true in the body just as it does when you burn a candle. When a candle was placed under a jar, you remember that it went out for want of oxygen. The candle did not all burn up. And so when we eat good food and sleep in a close room without fresh air coming in, the food is not all made use of because of the lack of oxygen.

Thus you can see that the blood carries the food to the tissues of the body and it also carries the oxygen to help change the food into muscle, nerve, bone and other tissue.

But the blood must do more than that. It carries

the carbon-dioxide to the lungs and there gives it up with the exhaled air. Thus you see that it is a scavenger carrying waste products from the tissues. It carries also to the kidneys those waste products which are excreted by them. Similarly the share the skin takes in eliminating useless products from the body, by perspiration, is made possible by the blood.

So far we have left unanswered one question asked at the beginning of the chapter; namely, why the difference in the stream of blood from the vein and the artery? Now, the purpose the blood has in carrying the food and oxygen to the tissues makes it necessary that the blood should come into close contact with the tissues. This it cannot do if it stays in firm, walled arteries. The arteries, therefore, divide and subdivide till the tiniest branches are formed, and these have exceedingly thin walls. As was already pointed out, the serum from the blood oozes out through the thin-walled vessels and bathes the tissues continually. The oxygen is also taken up from the blood to aid in the process of making use of the food. It is at this point that carbon-dioxide and other products are formed, and which must be got rid of.

These tiny capillaries unite to form larger ones, which ultimately form veins. The serum from the tissues now containing the waste products is carried off by the capillaries. It is owing to the gradual narrowing of the arteries into these capillaries, and the uniting again of the many capillaries to form veins that the force of the heart on the blood stream has lost

much of its power. The blood now flows in a constant stream and with much less force than when it was in an artery. In the large arteries the blood rushes along at the rate of a foot a second, in the capillaries it loiters at the rate of an inch a minute. In the veins, however, it gradually increases its rate till it again flows at the rate of a foot a minute.

The blood is composed of a liquid part called the serum, and several different kinds of cells which are carried about in the stream of liquid as it flows to and fro in the body. Some of the cells are colored, and it is due to their presence that the blood is red. Some of the cells are white, and of various sizes. There are about five hundred times as many red blood-cells as there are white ones. These little particles floating about in the blood were at one time taken for globules of fat. As to their size, Leeuwenhoek, over two hundred years ago, wrote regarding them: "These particles are so minute that a hundred of them placed side by side would not equal the diameter of a common grain of sand; consequently a grain of sand is over a million times the size of one of these blood-cells."

*"These cells that float about in the blood are not at 'loose end;' they fulfil a roving commission. They float about in the blood in millions, and seem to lead an idle, wanton life; but they are really hardworking citizens of the cell community. They are impelled by the heart, and must journey as the heart desires. Day

* From "The Romance of Medicine," by R. C. Macfie, published by Cassell & Co.

and night, they go hustling through the leathery gates of the heart round the body or through the lungs and back again. Several leagues—or should we say knots?—they voyage every day, and various are the ports at which they call—brain, lungs, liver, spleen; they can be truly said to know every inch of the body. They are the soldiers and sailors, the tinkers and tailors, the police patrol, the scavengers of the body. They fight for the community, they carry oxygen, they repair injuries, and some of the white cells occasionally leave the tubes in which they are contained and wander about in the thickets of the tissues. Moreover, they have much to do with the composition of the blood in which they swim."

There are about ten pints of blood in the whole body. In the course of a year its red currents "carry not less than three thousand pounds' weight of nutritive material to the various tissues, and three thousand pounds' weight of wasted material from the tissues."

If this continued labor of the blood is of such great importance in health, how much more important is it then, when the system is attacked by disease germs?

THINGS TO FIND OUT

*1. Ask your doctor to tell you how the white blood-cells leave the blood-vessels.*

*2. Find out where the pulse beat is.*

*3. Does it beat at the same time as the heart?*

*4. Find out the rate of your own pulse.*

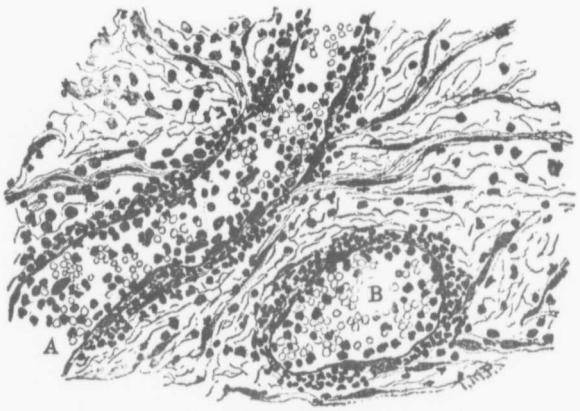
*5. Find out how rapid it is after you have been running.*

## XXVIII. THE BLOOD IN DISEASE

It is a serious thing when disease germs attack the body. Of course, we know that they are constantly taken into the system unknown to us, but are generally driven out again. When the body is attacked by disease there is a great fight between the forces of the body and the attacking microbes. Moreover, it is always a fight unto death, for either the man or the microbes must die. It is even a more deadly battle than any you have ever read about, except the one in the pass of Thermopylae, where Leonidas and his three hundred companions killed thousands of their enemies before they themselves fell. Now, it surely must be a serious fight when one side or the other must defeat his opponent by killing him. In this fight there are various soldiers at work. First we shall refer to the white blood-cells.

The white blood cells are the most extraordinary of all the cell members of the body. They are extraordinary in their appearance and also most extraordinary in their behavior. There are several sizes of them, the largest being called lymphocytes. Each particular size seems to have its own work to do in the body. Doctors have found that in certain diseases the large cells increase very rapidly, while the other cells remain almost normal in number. In other

diseases one of the small cells is the one to increase in number, while the larger ones decrease but little. These white blood-cells are the defending army of the body when it is invaded by microbes. Now, these white blood-cells, we said, behave in a most extraordinary manner. The blood is teeming with them.




WHITE BLOOD-CELLS MIGRATING FROM THE VESSELS

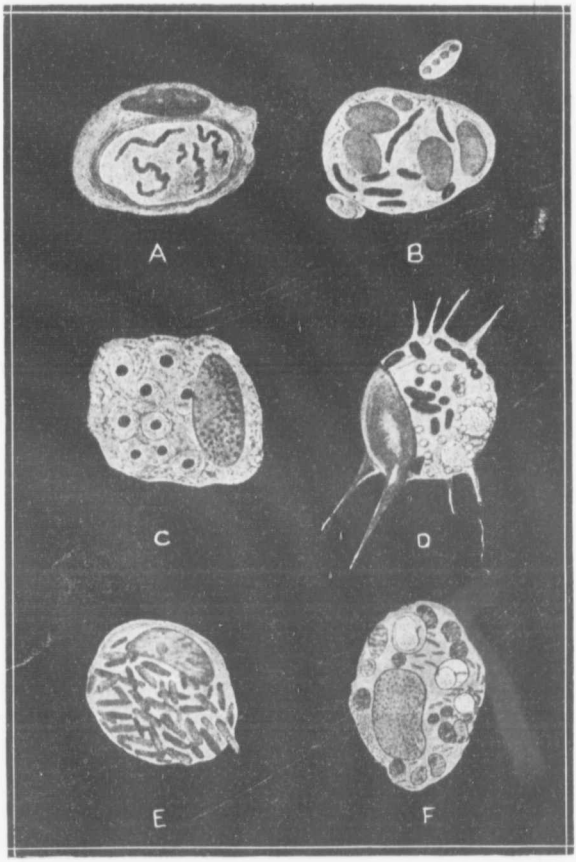
**A** Blood-vessel cut lengthwise. **B** Blood-vessel cut across. The white blood-cells are painted black to distinguish them. They leave no hole where they pass out of the vessel.

Each time the heart beats it drives millions and millions of them through the arteries and veins. Each has the power of locomotion and can breathe and digest; it has no restriction placed on its movements, and has no family ties. What is the purpose of this swarming multitude, thicker than the salmon in the Fraser River? What is their business? It has required years

of investigation on the part of scientists to find out the business of these white blood-cells.

The first thing that was learned was that these cells have the power of passing out through the walls of the blood vessels and of wandering about in the tissues. This process is called *diapodesis*, and is indeed a most remarkable thing, for in passing through the wall of the vessel they change their shape in the most wonderful manner and leave no opening to show where they had gone through.

The next important point that was learned was that the white blood-cells were found to be able to swallow up the microbes in the tissues or in the blood. During the fight, a hand-to-hand combat takes place between the white blood-cells and the microbes. The white blood-cell rushes up beside the microbe, and eats it up. If it is stronger than the microbe it completely destroys it, retaining a portion for its own use and throwing off the remainder into the blood, to be carried off with other waste material. Because of this ability to consume the invading microbes they are called *phagocytes*, cell-eaters. If the blood-cells are victorious in the combat, the development which they have got by destroying the microbes, gives them increased power of resistance over those particular germs in the future. In fact, after the recovery of the patient, if this particular germ attacks him again, the white-blood-cells will be able to destroy the germ immediately upon its entrance into the tissues. This explains why a child never gets scarlet fever a second time.




PHAGOCYTES

A. Phagocyte of a guinea-pig, containing the corkscrew-like microbe of recurrent fever. B. Phagocyte of the guinea-pig, containing large microbe known as "proteus bacilli." C. Phagocyte of a rabbit, containing microbes of spores of lock-jaw. D. Phagocyte of a guinea-pig, containing microbes known as "bacilli coli" E. Phagocyte of a guinea-pig, containing bubonic plague microbes. F. Phagocyte of guinea pig, containing the bacteria of cholera.

Reproduced by permission from "Romance of Medicine."—R. C. MacFie.

At first, the idea prevailed that the presence of the microbes in the white blood-cells was due to aggression on the part of the microbes. Gradually, however, the idea began to dawn on investigators that the bacteria were not devouring the white blood-cells, but that the white blood-cells were eating the bacteria. In 1881, Gaule made observations, under a microscope, of the blood in a frog's foot, and actually saw the white blood-cells devouring the microbes. He "happened on one occasion to observe a white blood-cell of the spleen of the frog which in a short time ingested three little worm-shaped germs. Following its movements, he was able to make out, within the contents of the blood-cell, the bodies of the three microbes; but the bodies became paler and paler, and half an hour later no trace of them was left in the white blood-cell. It had completely digested them."

Thus we see that these white blood-cells are indeed wonderful little creatures. They are the army and navy of the body—a vast multitude of free cells maintained by the State that they may repel any invasion by microbes. They float about as a rule in the blood stream, but they may also collect in large masses in the lymph glands, thus establishing a block-house or fort. There they have the power of rapidly overcoming the invaders.

But if the white blood-cells were not aided by good weather, good food, good drink and other help, they would most likely lose the battle. We told you that these phagocytes have the power to pass out

through the walls of the vessels while the fight is being carried on. Here they are bathed in serum all the while. The temperature goes up, even rising to 100 degrees or more. But other more important changes occur in this serum. As soon as there is the slightest appearance of the microbes winning the battle, the serum changes its qualities, because of the discharges given off from the phagocytes and microbes during their tremendous struggle. These substances are of two different kinds. One of them semi-digests the germ or partially cooks it, thus preparing it for the palate of the phagocyte; while the other strengthens the phagocytes and cheers them on to the fray as their appetites become more voracious.

But there is still another way in which the body protects itself. These microbes, if left unchecked, stay where they lodge. They do not spread in the blood except in a very few diseases. In diphtheria, for instance, the microbe does not itself live in the blood. It lives in the tissues of the throat, and there manufactures poisons which circulate in the blood. Just as soon as that poison is manufactured and dissolved in the blood, it is carried to all parts of the body, where it tries its best to destroy different tissues, but particularly nerve-cells. As soon as this poison commences its attack on the cells forming the different tissues of the body, these cells instantly start manufacturing an anti-toxin to counteract the toxin formed by the diphtheria microbes.

Thus we see that there are three important parts to the army fighting disease-microbes in the body; namely, the phagocytes, the serum and the cells of the tissues.

Surely, then, when so much depends on the quality of the blood in maintaining health or in fighting disease, it is of great importance that we should have the best blood possible. We should also have all our tissues as vigorous and strong as we can. You will notice that in all this chapter, we have not mentioned any of the victories as being due to medicine. The anti-toxin which is used at the present time for the treatment of diphtheria is exactly the same anti-toxin that is manufactured in the body. It is prepared from horses which have been treated with diphtheria microbes in such a way that they have manufactured an anti-toxin to cure themselves. Their serum is then drawn off and kept in sterilized tubes and sold as anti-diphtheritic serum, or anti-toxin.

By this time you will probably have concluded that it is of great importance that we should feed ourselves, house ourselves, clothe ourselves, exercise ourselves, and rest ourselves in such a way that our blood will be pure and our body strong that we may wage a good fight against the microbes about us. This is the plan of battle which will surely give us victory over the little tubercle bacillus about which so much is said to-day. It is also our strongest means of defence against diphtheria, scarlet fever, typhoid fever, pneumonia, erysipelas and many more diseases. We should pin our faith to strong, healthy bodies rather than to

drugs, especially those advertised in our papers and guaranteed to cure all diseases.

These are some of the prescriptions actually in use one hundred and fifty years ago:

To cure dropsy. "Take a good quantity of black snails, stamp them well with bay salt, and lay to the hollow of the feet, putting fresh twice a day."

"A receipt brought out of Turkey to cure a wound by anointing the weapon: Take a piece of rusty bacon, melt with a pair of tongues in a dish and anoint the weapon with it, wrap it in a woollen cloth, and set with the point upward; anoint the weapon twice a day. This will cure any wound that is curable."

The blind faith in such concoctions was no less absurd than is the present faith in patent medicines extolled so highly in the daily newspapers, and used so largely by many people.

### WHAT TO DO

*1. Draw a white blood-cell eating a microbe.*

*2. Ask the druggist to show you some diphtheria anti-toxin.*

## XXIX. INFECTIOUS DISEASES

Infectious diseases are those which are due to microbes and which one person catches from another. The commonest of these are typhoid fever, scarlet fever, measles, whooping cough, mumps and diphtheria. All of these except typhoid fever are usually considered children's diseases, and many parents take little or no trouble to prevent their children from catching them. They believe it is better for every one to have these diseases before they grow up. This attitude on the part of the parents is to be condemned. Out of every hundred cases of scarlet fever in Winnipeg in 1909 practically four died, and out of every two hundred cases of measles three died. In the latter disease nearly all of the deaths occurred in young children. Of forty-eight reported cases of whooping cough fourteen died. The death rate of this disease is always high, and it is one of the most fatal diseases of early childhood. Nearly all of the fourteen deaths took place in children under two years of age. Besides causing many deaths, these diseases are often responsible for discharging ears and sore eyes, with more or less permanent loss of hearing and sight. The deafness resulting from scarlet fever and measles alone should be a good reason why these diseases should be carefully avoided and indeed stamped out, as they can be. Think of what it means

to be deaf all through life, and think that this often results from measles and scarlet fever, both preventable diseases. Boys and girls should take all the precautions they can to prevent the spread of these diseases. More particularly should they avoid carrying them home to their little brothers and sisters.

The infection can be transmitted directly from one patient to someone else, or may be carried on the clothes of someone visiting the sick room. In this way the well children of the home may carry the disease to their playmates at school or elsewhere. During the time of an epidemic of any of these diseases the infection may be spread in school, in street cars, in stores, in fact any place where a crowd may be gathered.

Typhoid fever is infectious from the moment the disease commences till some weeks after it is spent. Scarlet fever is infectious from the first day the rash is out, and remains so until all scaling and discharges from mucous surfaces have ceased. This may take from five to seven weeks after the disease commences. Measles is very infectious during the day previous to the appearance of the rash, which is the time when there is the greatest amount of sneezing and cold in the head. At this time, therefore, if a well child is sleeping with a sick one who is developing measles, the second one is very likely to catch the disease. Whooping cough is infectious from the start to the finish, and is spread largely because of the fine spray emitted while the patient coughs. Mumps are infectious from the day the swelling commences till several days after it has

disappeared. Diphtheria is infectious from a day or two before the patient feels ill till about two to five days after he feels well. Chicken-pox is infectious all the time the rash is out. Sometimes these diseases are infectious for a much longer time than the usual period. Much depends on the care taken after the disease has gone.

Flies, food and fingers play a large part in the spread of typhoid fever. Flies have very bad habits, and after walking through the vessels in the sick room go straight to the dining room and calmly sit on the food on the table. The fingers are great offenders. The millions of germs on the soiled linen and the utensils used in the sick room cling closely to them.

Where a case of typhoid fever occurs in a family, therefore, and it is proposed to nurse it at home, the sick person should be placed in a room apart from any of the inmates of the house, and should be nursed as far as possible by one person only. This attendant should have absolutely nothing to do with the preparation of the food for the rest of the family. All bedding, dishes and other utensils should be sterilized by boiling or some other effective method. It must be remembered that sometimes a person may give out infection for a long time—even for years—after recovering from typhoid. Such people are called "typhoid carriers."

In the case of scarlet fever, measles, mumps, diphtheria, and chicken-pox, the patient should be isolated at once in a well-ventilated, well-lighted and well-aired room as much shut off from the rest of the house as

possible. Before the patient is put in, the carpets and all drapery should be removed, as well as all wearing apparel. If the patient is taken ill in the room in which he is to remain, all books and clothing should be covered up with sheets. The books should on no account be opened during his illness. The door of the room should be covered with a sheet kept damp all the time with some strong antiseptic. For this purpose, carbolic acid is one of the best. Into a dish put an ounce of pure carbolic acid, over it pour one and a half pints of boiling water and stir well. Leave an ordinary clothes whisk in the dish. With this whisk scatter the solution over the sheet until it is quite damp. Do this frequently enough to keep it damp. In warm days in the summer, especially if there is much breeze through the house, the sheet will dry out quickly and must be moistened again every hour or so. The attendant should live in the room with the patient or in an adjoining room which is also isolated from the rest of the house. All clothing coming from the room should be disinfected and all dishes should be boiled. All left-over food should be burned immediately. From this, there should be no single deviation. After the patient has recovered he should be given a carbolic bath and the room and all its contents should be disinfected.

Each of the diseases we have been speaking about has its own way of spreading, but it must be borne in mind that every one of them may be given out and taken in by means of the mouth. This may be done

by means of cups, pencils and food, and by coughing and sneezing.

In the prevention of the spread of small-pox, vaccination is of the very greatest importance. The history of the conquest of this dreaded disease by vaccination leaves no possible doubt as to the absolute necessity for every one to be vaccinated.

REMEMBER

*1. Do not put anything into your mouth that has been to the mouth of any one else*

*2. Do not put anything into the mouth except food and drink.*

## XXX. TUBERCULOSIS

You have already learned that many diseases are caused by microbes or germs. "Germ" means "seed." They are real seeds and are to the human body what weeds are in the farmers' fields. They are called *microbes* because they are very small. Indeed, the germ or seed of tuberculosis is so very small that we have to increase its size one thousand times by means of the microscope, and paint it red, before it can be seen. Yet these small seeds are the cause of the most widespread and destructive disease the human race suffers from.

Tuberculosis is so named because, when the little germs or seeds begin to grow in any part of the body, nodules or tubercles are formed. It may attack almost any part of the body, the brain lining, the eye, the ear, the larynx, kidneys, intestines, bones and joints, or even the skin. The most common form, as well as the most dangerous, is tuberculosis of the lungs, or consumption.

In most countries about one death in every eight or ten is due to this disease; but even this does not give an idea of all the havoc it works. Many people are weakened by it, and made less fit to enjoy life, though they do not die of it. Many are crippled for life by tuberculosis of the bones or joints. Indeed, apart from

injuries through accident, this one disease is responsible for three-quarters of all cripples. It may well be called the Great White Plague.

Tuberculosis is one of the oldest diseases we know about. Hippocrates, the "Father of Medicine," who lived in Greece 400 B.C., said that of the diseases he had to deal with, it was the most common, and fatal to the greatest numbers of mankind. The Jewish people and the Egyptians have left us, in their earliest records, accounts of it. It was not found in primitive people who lived in the woods or jungles, but began to be very common and fatal when men huddled together in badly-built cities. It is a house disease. The closer the crowding, the worse the housing conditions, the fewer the windows, the less fresh air—the more numerous are the people smitten. A farm-house is often more poorly ventilated than a city residence, and so the disease is found in the country as well as in the city.

This shows the reaction of the phagocytes of the pigeon against the microbes of human tuberculosis. (The shaded portion represents the phagocytes and the black markings represent the germs of tuberculosis.)

People formerly did not think that consumption

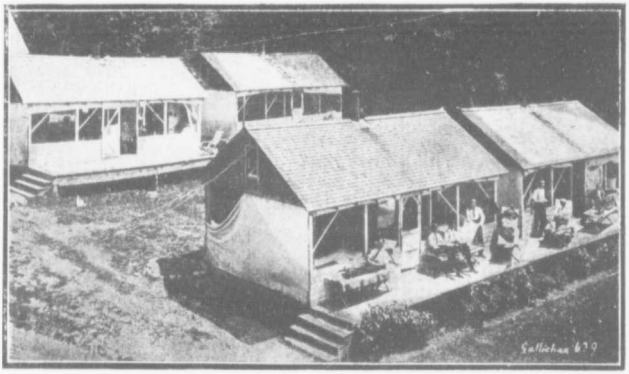
could be cured. They thought it was hereditary and always fatal. Now we know that it can both be prevented and cured. About the middle of the last century the treatment in fresh-air cure places, called sanatoria, began. In 1882 a greater step forward was taken when Dr. Koch found the germs which cause the disease and began to study their habits. He found that he could grow them and could give the disease to guinea-pigs by injecting a few of the germs. He soon saw clearly that the disease might be communicated from one person to another. Now we know without any doubt that it is *communicable*, *preventable* and *curable*.

So much is said now about fighting tuberculosis that some people think it must be increasing. This, however, is not true. Wherever the disease is being properly dealt with it is becoming less and less terrible year by year. The deaths from tuberculosis in Germany, in Massachusetts, in the city of Edinburgh and in other countries, states and cities where a good fight is being made, are just one-half what they were twenty years ago. This is but another confirmation of Pasteur's saying, which has already been quoted, "It is in the power of man to cause all germ diseases to disappear from the earth."

Almost all kinds of animals may contract tuberculosis. Much the same conditions which spread the disease among human beings spread it among cattle. It is commonly found among animals in badly-ventilated, dark, dirty, overcrowded stables. On the

other hand, cattle in well-lighted, well-aired, clean, roomy stables are usually free from it, especially if they are allowed out in the open air for a part of each day. Milk from tuberculous cows, or meat from the bodies of cattle badly affected, may give the disease to human beings.

Now, how does this disease get its start? Any farmer or gardener will tell you that, in order to have a



SHACKS AT MUSKOKA COTTAGE SANATORIUM

crop, you must have first the seed, and, second, the soil in which to sow it. We have already said something about the little germs or seeds of tuberculosis. These are widely scattered about, especially in places where crowds of people meet. It is impossible to avoid them altogether, but more could be done than is being done to destroy them. A person who is far advanced in consumption may cough up millions of them in a day. These should all be entirely destroyed.

It is not dangerous to sit in the same room with a person who has consumption and talk with him, if he is exceedingly careful. If he is careless there is very great danger. A careful consumptive destroys, by burning, every particle of material coughed up and spat out. He also covers his mouth when coughing or sneezing, and the cloth used for this purpose is burned. Dishes used by a consumptive person should be washed in very hot water. The hands and face, particularly the mouth, of a sick person should be kept as clean as possible. If all people who are sick with consumption were as careful as they might be, the disease would soon be checked throughout the world.

When germs are not carefully destroyed they are scattered about and taken into the bodies of other people. This may be brought about in a number of ways, but we need consider only two, namely, in the air we breathe and in the food we eat. When the germs are in a dry state, they float in the air. When they rest on the ground they become attached to particles of dust. These, when stirred up as in sweeping, fill the air. To see how much dust floats in the air watch a ray of sunlight which has passed through a chink into a darkened room. Such dust—possibly carrying some disease germs—may be breathed into the lungs, or may lodge in the throat and be swallowed. Children creeping about the floor may get it on their fingers, or toys, and so carry it to their mouths. For this reason it is always wrong to sweep a floor with a dry broom or dust with a dry cloth.

The germs of tuberculosis are not easy to kill. Cold, even the extreme cold of winter, does not affect them. Heat, to destroy them, must be almost equal to boiling water, and kept up for some time. One of the best means of killing germs is by exposing them to direct sunlight, which destroys them in a few hours. This is one reason why it is very healthy to have plenty of sunshine in our homes. The sun is the best of all germ-killers.


This shows a gelatine plate which has been planted with the germs of typhus fever. A piece of paper with the cut-out letters forming the word "typhus" was laid over the plate and exposed to direct sunshine for one hour. Observe that no microbes are present where the sun was let to shine on the plate.

Having learned something about the seeds, we should now consider the soil. In the "Parable of the Sower," some seed fell by the wayside where the fowls of the air devoured it; some fell among thorns which sprang up and choked it; some fell on stony ground and sprang up, but because it had not suitable soil it soon withered away. Some fell in suitable soil and brought forth a large harvest. In the same way some of the seeds of tuberculosis fall upon the tissues of healthy people and are easily thrown off. Some manage to take root, but a good general condition, or "taking the cure" early, checks the disease. But some seeds

of tuberculosis unfortunately fall into the tissues of people who are so run down through bad living of one sort or another that the disease has little to check it. This is good soil for the germs.

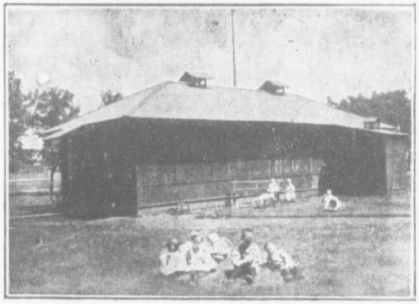
Since the tuberculosis crop, like the weed crop, is a very bad one, anything which gives it suitable

PATIENTS ON RECLINING CHAIRS
In front the windows have all been removed.

soil to grow in should be avoided. Tuberculosis is like a fungus; it grows among conditions in which other plants would die. It hates sunlight and likes dark, damp places. It should not find soil in the human body. It is an intruder, a foreigner, a weed, and the healthy human body gives it little chance to grow. But when our habits of living are bad

we are making a soil in which the germs will grow easily.

Sleeping or working in crowded or dusty or dirty rooms, sleeping in rooms with windows closed, getting insufficient food, or food not properly cooked, going without enough rest or sleep, intemperance of almost any sort, will make a soil very suitable for tuberculosis to grow in. And when the body is weakened by la grippe, pneumonia, typhoid fever or other diseases, the soil is also prepared for the seed.



THIS IS AN IDEAL PLACE TO SLEEP IN THE SUMMER

Now you can see the means by which this disease may be avoided. Take plenty of rest. Work and live in well-aired, sunny rooms. Sleep always in a room which has the window and storm window well opened. Give your lungs clean, fresh air. Get plenty of good food. Avoid overstrain, and take plenty of time to recover well from any illness you may have had, before beginning work again. Do not sleep in the same room with a person who has tuberculosis. Do not be afraid to visit or associate with a careful consumptive; but shun the consumptive who is careless. Do not put to your mouth anything

which has been near the mouth of any other person. *Be clean.*

The first symptoms of consumption may be loss of appetite, loss of weight, fatigue on slight exertion, a general feeling of weakness, lack of energy and ambition, rapid pulse, fever in the afternoon and evening, and a cough which is usually most noticeable in the morning. The disease sometimes begins with pleurisy. The spitting up of any fairly large quantity of blood is almost a certain sign. Cough which continues for more than a month, especially if it follows pneumonia, or la grippe, should mean a visit to the doctor.

The symptoms are often so slight that they are not noticed at first. Indeed, the onset is so slow that the disease is often firmly established before the suspicions of the patient, or his friends, have been aroused as to the nature of the trouble.

Unfortunately, many consumptives fail to heed the advice given them. This is especially true of those in the earlier stages of the disease, and it is unfortunate, not only for the consumptive, but for others.

Consumption is one of the most curable of diseases when proper treatment is begun early, but one of the most difficult to deal with in its later stages. Treatment should be begun at the earliest possible moment and persevered in long after the person feels almost perfectly well. The three most important elements in "taking the cure" are as follows:—

1st. *Rest.* In the beginning, and for quite a time, rest may mean rest in bed. This is the most important

element of all, and the one most often disregarded. Later on, careful exercise under constant medical guidance is important.

2nd. *Fresh Air.* Spend all the time possible day and night in the open air. It is quite possible to sleep very comfortably out-of-doors even in the winter time. There is scarcely any ordinary room which gives enough fresh air for a consumptive patient, even when several windows are open.

3rd. *Good Food.* Eat plenty of good plain food.

Consumption is not cured by drugs, nor is it cured by any particular climate. The important matter is not "where to go," but "what to do" and "what not to do." Possibly the best climate to get well in is the one you wish to live and work in afterwards. It is not necessary to go to a warm climate. There is no need for despair, therefore, on the part of those who who cannot afford to "go South."

Remember that the disease is cured slowly, not by any big dose of anything, but by so planning your life as to give yourself every advantage possible, and to avoid all possible disadvantages.

The following is a catechism written by Dr. Grenfell for use in schools in Newfoundland and Labrador:

THE AIR

1. Is fresh air good for me? I cannot live without it.

2. Is air ever bad? It gets very poisonous.

3. What makes it poisonous? Every time any one breathes he throws poison into the air.

4. What are those poisons like? Some are poisonous gases, some like tiny poison seeds.

5. Will they hurt me? Yes, they will kill me in time.

6. How can I avoid these poisons? By always keeping in fresh air.

THE SUNSHINE

1. Must I let in sunshine? Yes, every bit I can let in.

2. Why must I let in sunshine? Because nothing else cleans the room so well.

3. How does sunshine clean a room? It kills all the poison germs it falls on.

4. Ought I to sit in the sunshine? Yes, I must always keep in it when I can.

5. Why must I do this? Because it will kill the poison germs in my blood.

THE WINDOW

1. Must I open the window? Yes.

2. When must I open the window? All day and all night.

3. Will not the cold hurt me? Cold does not hurt anybody.

4. Why must I open the window? Because I cannot grow strong unless I do.

5. Will not the draft hurt me? I must arrange to avoid drafts as far as possible.

6. What good is it to open the window? It lets in pure air to clean my blood.

### HOW TO AVOID TUBERCULOSIS

1. Do not let yourself get "run down" in health.

2. Always sleep with your window and storm window open, and in summer, if possible, sleep on an open balcony.

3. Avoid late hours and dissipation, overheated, unventilated and dusty houses.

4. Eat wholesome food.

5. Take a proper amount of rest.

6. Avoid the careless consumptive.

7. Never put to your mouth what has been in or near the mouth of another person.

### IF YOU HAVE TUBERCULOSIS

1. Spend as much time as possible, day and night, summer and winter, in the open air.

2. Eat plenty of plain, wholesome food.

3. Never allow yourself to become fatigued. Rest as much as you can. If you have any fever, rest in bed absolutely.

4. Get the best advice you can, and follow it.

5. Keep cheerful, be careful, stay careful.

REMEMBER

*1. That consumption can be communicated. It is spread by the careless habits of those who have the disease.*

*2. That consumption can be prevented by healthy, clean, right living.*

*3. That consumption can be cured.*

*4. That it can be stamped out of any country if the right measures are taken.*

## XXXI. DISINFECTION

After an illness due to any infectious disease it is wise to so clean the room and the furnishings that no one else may get it. This means that all the microbes, which were about the room while the patient was ill, must be killed. These steps are necessary, because the microbes may live for a long time in clothing, mattresses, books, wall-paper and other places. Careful disinfection should be carried out after the following diseases: Scarlet fever, diphtheria, measles, chicken-pox, typhoid fever, consumption, erysipelas, whooping cough, mumps and "la grippe."

### METHODS

1. *Fire.* Where things are of little value after the patient has recovered, the best thing to do is to burn the clothing and bedding. This is not necessary, however, if the articles are at all valuable.

2. *Steam.* Steam, under pressure raised to the temperature of 221 degrees F., will kill practically all germs in ten minutes. In cities special plants are provided for this purpose. In the country or in towns where such plants are not available, a good method for small articles is to place them in a steamer with a close lid. Here the temperature will rise to somewhat above

the ordinary boiling point because of the increased pressure.

3. *Boiling in water.* Articles that can be boiled will be freed from germs in one half hour. Some articles, of course, cannot be disinfected in this way.

4. *Carbolic Acid.* Dissolve one part of carbolic in twenty parts of boiling water and soak articles for two hours. This is a good method for articles of clothing which can be thus treated.

5. *Corrosive Sublimate.* Let a druggist make up corrosive sublimate in the proportion of one part to five hundred of water; this makes a good solution for scrubbing walls, floors and wooden furniture, etc. It must not be used on any kind of metal. Color with methylene blue to avoid mistakes.

6. *Formalin.* This is one of the best disinfectants we have if carefully used. All of the articles to be disinfected should be hung up about the room so that they remain quite open. Sheets, quilts or blankets must not be piled up, but each one must hang by itself. This applies equally to every article in the room, including all bedding, wearing apparel, books, boxes and bureau drawers, which have been opened during the illness of the patient. For a room ten feet square, one-half pint of formalin is required. The room should be made air tight except the door. The formalin is then sprinkled over sheets hung on a line and the door quickly closed and all crevices pasted up. The room must be kept at a temperature of 65 to 70 degrees F., and should remain closed for twelve hours. To open

the room it is better, if possible, to raise a window from the outside. The reason for this is that the formalin causes an irritation of the nasal passages if one enters the room to raise the windows. In order to hasten the clearing out of the formalin, ammonia may be sprinkled on blotting paper and placed about the room. The room should be kept as warm as possible after the window is open. This will cause a rapid interchange of air, and will soon clear out the odor of the drug.

### SPECIAL ARTICLES

*Clothing.* All clothing, bedding and linen which are of little value are best burned. Those that are too valuable to destroy should be sterilized by boiling for at least one-half an hour. This method, of course, can only be used for such articles as will stand boiling.

*Woollen and Silk Goods.* These are best disinfected by heating them to 250 degrees F. in an oven for two hours. A higher temperature than this is likely to destroy the texture of the goods.

*Mattresses.* If they are of little value, it is better to burn them. If they are too valuable to be destroyed the best method of disinfection is by steam under pressure. This is possible only where some such apparatus is available for the purpose.

*Furniture.* All furniture made of wood should be disinfected in the room with formalin. After this it should be scrubbed with a carbolic solution, one part to fifty of water.

*Dishes.* All dishes of various kinds used in the sick

room should be boiled for half an hour. This includes knives, forks, spoons, table dishes, bed pans, etc.

*People.* The best method is to take a bath in a solution of carbolic, one part to sixty of water. This bath should be thorough, including a careful wash of the head.

*Excreta.* All excreta should be disinfected by covering them with a solution of formalin, one part to fifty of water. The whole should stand for one-half hour before being thrown out.

*Food.* Food or drink, which has been in the sick room should be given to no one else. It should be burned or otherwise destroyed.

Articles which have been disinfected in any of these ways should, where possible, be left out of doors for some time in the bright sunlight.

## XXXII. HOME NURSING

Often in the home some slight illness occurs. It is well for us, therefore, to know something of how to care for one another. Many times it is unnecessary to have a nurse to care for the sick one. In some homes, indeed, it is too great a financial burden to engage a qualified nurse. It thus happens that the nursing requires to be done by one of the family.

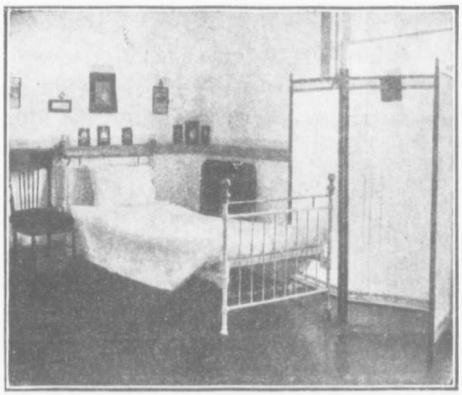
One of the first things to learn in caring for the sick is that the doctor's orders must be implicitly obeyed. It is not at all in the interests of the patient to have friends and relatives advising as to the treatment. Furthermore, when the doctor gives definite instructions, particularly regarding diet, these instructions must be observed.

Where possible the patient should be placed in a fairly large room with two or three windows, one of which is preferably on the south side. Loose rugs and heavy draperies about the room are better removed. The bed should not be placed in a dark corner of the room, for there the air is not so good as it is in other parts of the room. Better place it by a window or in the centre of the room.

When convenient it is better to provide a single bed about two feet high. This makes it much easier to care for the patient. The bed should have a fairly

stiff spring and a good firm mattress. Never under any conditions put a feather tick on the bed for one who is sick.

Fresh air is even more necessary during illness than it is at ordinary times; therefore, the sick room should be ventilated continuously, day and night. To prevent the patient becoming chilled or suffering from a direct draft, a screen may be placed between the windows and the bed in such a way as to protect the patient. In the absence of a regular screen, one may readily be improvised by pinning a sheet or quilt over an ordinary clothes-horse.

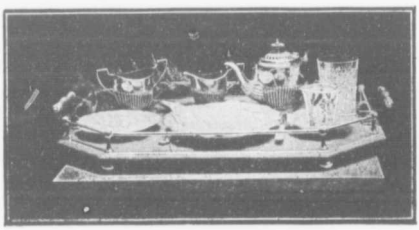


Sunlight adds to the cheerfulness of the sick-room and is also valuable as a remedial agent. The Italians' appreciation of the value of sunlight is shown by their proverb: "Where the sun does not enter the doctor does."

In the care of the sick-room it is more important to be careful about sweeping and dusting than it is in the rest of the home or in the school-room. If a corn broom

is used, the brush should be wrapped with a damp cloth which will prevent the dust rising. Carpets should be swept only with a carpet sweeper. They should never be swept with a corn broom. Loose rugs should never be swept in the room; they should be taken outside and cleaned there. The dusting in the room should be done with a damp cloth. When it is practicable it is better to have a bare floor which can be washed off frequently enough to eliminate sweeping altogether. Small rugs can be used to deaden the sound of footsteps on the bare floor, and these can be cleaned and aired outside each day.

The furniture should be as simple and plain as possible. Curtains and all unnecessary articles should be removed from the room. Such things hold the dust and make it difficult to maintain the perfect order and cleanliness necessary to the comfort and well-being of the patient. Dishes, medicine glasses and, in fact, everything used for the patient, must be kept scrupulously clean. It is well to keep a nice clean towel over the medicine bottles or any appliances used for treatment. Thus these unpleasant reminders of illness are kept out of the patient's sight.



DAINTY TRAY FOR SICK ROOM

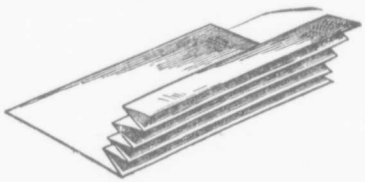
Meals, even if they consist of only a glass of milk or a bowl of beef-tea, should be served as daintily as possible. Here, as elsewhere, the most important thing is cleanliness, and that is within the reach of all. A snowy tray-cover and sparkling dishes and cutlery make the simplest meal tempting.

A great deal of the comfort of the patient depends on the bed and the care with which it is managed. We have already referred to the kind of bed best suited to the care of the sick. The proper making of the bed is of the first importance. The lower sheet should be put on perfectly smooth and tucked in so firmly all around that there is no possibility of it forming wrinkles. The upper sheet should be tucked in well at the bottom and should be high enough at the top to fold back over all the other covers, and so be comfortable about the patient's face. The upper clothing should be just sufficient for warmth. Too much heat is weakening. Blankets make the best covering, as they are both light and warm. It is necessary to take great care to keep the lower sheet clean and smooth and free from moisture or crumbs. It is well to have the bed away from the wall, thus making it accessible from both sides. It is pleasanter for the patient if it is so placed that its occupant can look out of the window.

To change the bed while the patient is in it, first loosen the clothes all around the bed, then move the patient carefully to one side of the bed and begin work at the other side. Fold the lower soiled sheet lengthwise backwards and forwards in folds about eight

inches wide until it reaches the patient. Fold a clean sheet in a similar manner and lay it beside the folded part of the soiled one. Then draw back enough of the clean sheet to cover the space from which the soiled one was taken, and tuck it in well. The patient may then be lifted or turned on to the clean sheet. The soiled one can then be removed and the clean one drawn tightly and tucked in neatly all around.

The changing of the upper sheet is a simpler matter. Have all the upper covers free from the foot of the bed, and over them lay a clean sheet and a blanket. Tuck the clean ones in securely at one side and then draw the other set from underneath. Change the pillow-slips often enough to keep them fresh and clean, and in moving or changing the pillows lift the patient's head carefully and rest it on one arm while you adjust the pillow with the other hand.



How to Fold the Sheet

There is a popular idea that one must eat solid food three times a day or the health will suffer seriously. One of the great difficulties doctors have in treating some cases is that the relatives fear that the patient will starve on the diet prescribed by the doctor. Now you will readily understand that when one lies in bed it does not require nearly as much food to replenish the wear and tear of the system as when one is working.

Furthermore, in every one there is more or less fat under the skin; this fat is greatly made use of by the system when one is unable to take large quantities of food by the mouth. In some cases of illness the patient is better not to take anything by the mouth, not even a drop of water. This is true in a very acute attack of appendicitis. In other conditions, such as dysentery, water may be allowed but nothing else. Do not worry, therefore, over the welfare of your brother or sister if the doctor allows them nothing but water.

Do not always be anxious to have the sick one out of bed quickly. It is a mistake to think that the patient necessarily gets weak rapidly by staying in bed. If the doctor's instructions are carefully followed out, the patient will gain a great deal more strength by staying in bed. In some conditions it is necessary to keep the sick one in bed possibly for two or three months.

In sickness and in health, sleep is of the very greatest importance. Generally speaking, a patient should never be wakened for medicine, diet or other treatment. If sleep is unbroken, allow the patient to slumber until morning. If sleep is broken during the night efforts should be made to get the patient to drop off to sleep. One serious mistake is made in some cases; namely, a light is kept burning all night. Even in health the presence of a light in a room would disturb some of us more or less, and sleep is more easily broken while one is ill than during health. Therefore, as a rule, the light should be put out. In

homes where coal-oil lamps are used, a frequent custom is to turn the lamp very low. Now the light produced from a coal-oil lamp is due to a mixed gas being formed. This gas burns and forms the light. If the wick is turned low, the gas is not completely burned. Part of it escapes into the air. Some of this is poisonous and spoils the atmosphere of the room. Under no conditions, therefore, allow a coal-oil lamp to burn low in the sick room.

In some cases of illness it is in the interest of the patient to exclude visitors. It should be a rule that none be allowed after 8.30 in the evening. This is necessary, to allow the patient to become quiet before it is time to go to sleep. In all cases of serious illness, no visitors should be admitted to the room. It is well to remember that it is the patient that the doctor and nurse are treating, and we should consider only the good of the patient when thinking of visitors. Whether friends are lonesome without the patient or anxious to see the patient for any reason, has nothing to do with the welfare of the sick one. Again, the patient has to stay in bed all the time during the day; you go outside and play and in other ways spend your time getting fresh air. It is clear, then, that the sick one does not get as much oxygen during the twenty-four hours as well people do. Then why should three or four friends congregate in the room of the sick relative and sit for an hour or two taking up the oxygen from the air, which is so necessary for the patient?

When two people do happen to be in the sick-room, never carry on conversation in whispers. It is just as serious a breach of nice custom to whisper in a sick-room as it is to whisper in the parlor in the presence of company. It is even more serious, because the sick one, frequently hearing whispers in the room, has a suspicion that all is not well. When conversing in the sick-room, therefore, always speak in an audible tone, though, of course, not too loudly.

It is not at all necessary for a family to keep a thermometer for taking the temperature of the sick ones. It is better in the majority of cases not to have one, for in the absence of a nurse or doctor, the family become unduly excited. The normal temperature of the body is 98⅜ degrees F. During most diseases it rises above this, even to 104 and 105 degrees. The rise in temperature is not always a bad thing in itself, and very rarely is it necessary to give any drugs to reduce it. In fact, it is frequently a serious mistake to attempt it. Do not be over anxious, therefore, about a rise in temperature. In fact, it is better for you to judge of the serious nature of illness, not by the temperature, but by the general appearance, pain or other symptoms.

It would be a wise and an economic rule in every household if drugs were never purchased except on the advice of the physician. This would at once banish practically all patent medicines. In the purchase of these medicines large sums of money are wasted. Many of them have little or no medicinal value. In

fact, some of them are largely composed of cheap forms of wine.

Some people have too much faith in what drugs can do. Some diseases, such as appendicitis, are probably better treated without drugs at all. One rule is safe for you, however: leave it entirely with your doctor whether the sick one is to take any medicines. There are other ways of treating the sick of greater value in some cases.

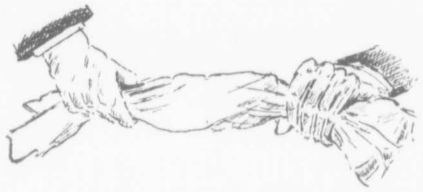
We have already said that, as well as being a protective covering for the body, the skin is an excretory organ. Now, unless the skin is kept perfectly clean perspiration is impeded and the health is to a certain extent impaired. For this reason, daily baths are at all times desirable. During illness bathing is more necessary than it is at ordinary times. Occasionally this very necessary treatment is omitted because of fear that the patient may take cold. There is no danger of that, however, if you have the room warm and do not needlessly expose the patient. The bath also adds very greatly to the comfort of the patient.

Preparing a Fomentation

Before beginning to give the bath, get everything ready. Thus there will be no interruptions. You will need a basin, a pitcher of cold water, soap, a wash cloth, two towels and whatever clean clothing the

patient requires. Cover the patient with a nice warm blanket and then remove the gown. Uncover only a small part of the body at a time, and, after washing and drying it, cover it up before proceeding to the next part. Place one of the towels in such a way that it will protect the bed from becoming damp.

Heat in various ways is used a great deal, both to relieve pain and as a remedial agent. When dry heat is to be applied, a rubber hot-water bottle is most commonly used. If there is not one at hand, bags of bran, hops or salt, or heated plates may be substituted. In the use of dry heat, great care must be taken to avoid burning the patient, especially in the case of children or those who are unconscious. A hot-water bottle should never be used without a flannel cover.



Wringing the Fomentation Dry

Moist heat may be applied in the form of poultices as fomentations. Fomentations are more easily prepared than poultices and are light and clean, but they require changing very frequently. Two pieces of flannel will be needed, each large enough to be the required size when folded double. These are called stupes, and it is necessary to have two, because one must always be ready to apply as soon as the other is removed. You will also need a stupe-wringer, which is a strong

piece of toweling or other stout material. Place the folded flannel or stupe in the middle of the wringer and place both in a basin, allowing the ends of the wringer to fall over the edge of the basin. Saturate the stupe with boiling water and wring as dry as possible by twisting the dry ends of the wringer in opposite directions. Apply the fomentation as hot as possible without danger of burning the skin. Then cover with a piece of oiled silk or rubber to keep in the moisture. Over this place two or three thicknesses of flannel or a layer of cotton-wool. When the fomentation is discontinued, a dry warm flannel should be applied and kept on for a day or two.

Poultices may be made of various materials, but linseed meal is usually used. To make a linseed poultice, bring a pan of water to boiling point and without removing it from the stove, gradually stir the meal into it until thick enough. Let it boil for a few minutes, stirring all the while. It should be perfectly smooth and free from lumps. Have a piece of muslin or thin cotton large enough to spread the poultice on and fold back over it, leaving a margin of about two inches free to fold over the edge. A layer of cotton wool should be applied outside and the whole secured with a binder, a bandage or a jacket according to the part to which it is to be applied.

A mustard poultice is made by adding a prescribed amount of mustard to an ordinary linseed poultice. The amount of mustard prescribed is usually from one-eighth to one-fourth.

Cold applications are sometimes ordered and an ice-cap is used if ice and ice-cap are available. If not, ice cold water may be put in an ordinary water bottle. In the absence of all these things, pieces of linen may be wrung out of ice cold water and changed very frequently. If ice can be secured it may be crushed fine and folded in a linen or cotton cloth, another being arranged to absorb the moisture as the ice melts. The bed should always be protected from moisture of any kind.

Mustard plasters are often used and are usually applied over the seat of the disorder. They are made by mixing one part of mustard with from two to three parts flour; then adding tepid water and mixing to a smooth paste. This paste is spread evenly between two pieces of muslin and applied. The length of time a mustard plaster is left on varies from ten minutes to half an hour, according to its strength.

## XXXIII. SKIN

The skin is the principal seat of the sense of touch. It also acts as a covering for the protection of the deeper tissues. In addition, it is also an important excretory and absorbing organ. It consists chiefly of a deep layer of connective tissue well supplied with blood vessels and named the *derma*, and the external covering of flat cells having no blood supply, termed the *epidermis*. On the surface of the derma are numerous little sensitive organs with special functions, namely, *sweat glands*, *hair follicles* and *sebaceous glands*.

The epidermis or scarf-skin is composed of flat cells piled in layers on top of one another. These you can demonstrate by soaking your hands for a time, then scratching the back of the hand gently with a knife or your thumb nail. You will find many little flat scales easily raised from the surface of the skin. You will notice that a number of these scales can be removed without causing any bleeding; and you will observe, in addition, that it gives you no pain unless you continue to scrape until bleeding is produced. This does not occur until the epidermis has all been removed and you have reached the derma.

The epidermis is molded over the derma. It not only forms a defensive covering to the surface of the derma, but also limits the evaporation

of moisture from its free surface. It varies in thickness in different parts. In some places, as on the palms of the hands and the soles of the feet, it is thick and hard. By looking closely at the back of your hand you will notice that the free surface of the epidermis is marked by a network of linear furrows of variable size, marking out the surface into a number of lozenge-shaped forms. Some of these furrows are large, as on the palm of the hand, particularly opposite the flexures of the joints. In other situations, as on the back of the hands, the arms and body, they are exceedingly fine and intersect one another at various angles. On the palms of the hands and the soles of the feet, these lines are very distinct and arranged in grooves which form a pattern. A very curious thing about these patterns is, that in no two persons, not even twins, are they identical in all details. If you would like to study a print of the pattern formed by the ridges of your own hand, just rub a little moist blacking with a rag over a piece of smooth cardboard or glass. Then gently press the ends of your fingers on the blackened surface. Remove your fingers and press them on a sheet of clean white paper. Lift them off this without smudging, and you will see the pattern on the paper.

The derma or true skin is tough, flexible and highly elastic, in order to defend the parts beneath from violence. It varies in thickness from one-fiftieth to one-tenth of an inch in different parts of the body. Like the epidermis it is thick on the palms of the hands

and the soles of the feet, and thicker on the outer than on the inner sides of the arms.

The papillae, of which we spoke, rise perpendicularly from the surface. They are conical in shape. Their average height is about one one-hundredth of an inch, and they measure at their base one two-hundred-and-fiftieth of an inch in diameter. On the general surface of the body, more especially in those parts which are only slightly sensitive, they are few in number, short, extremely minute and irregularly scattered over the surface. In some situations, however, as on the palms of the hands, and more particularly the fingers, they are long, of large size, closely aggregated together and arranged in parallel grooves, forming the elevated ridges seen on the free surface of the epidermis. At the bottom of the little furrows separating these rows of papillae are the minute orifices of the sweat glands. No papillae exist in the grooves between the ridges. Some of these papillae are provided with blood vessels and some are not. Those without blood vessels are the papillae by means of which we get the sensation of touch.

We perspire from one to five pints every twenty-four hours. The perspiration varies considerably in quality at different times. If one is perspiring very freely, as on a hot summer day, the major part is water. At other times when perspiration is taking place very slowly, its bulk is largely made up of various salts and acids. Thus it will be seen that consider-

able quantities of impurities find their way out from the body through the skin.

Another purpose of perspiration is to regulate the temperature of the body. The evaporation of moisture from the skin cools it. Thus the greater the amount of evaporation, the more the body is cooled. Exercise during the hot summer would be quite impossible were it not for this fact. Exercise causes rapid oxidation in the tissues with the production of heat. Were it not for the cooling of the body by evaporation of moisture from its surface, the temperature would rise in proportion to the vigor of one's exercise. Thus the more active one is, though heat is produced by activity, perspiration is proportionately increased, so that the temperature of the body is maintained at normal. All this goes to show why it is necessary for us to care well for the skin in order that we may be healthy.

It is because of the fatty substances in the perspiration that the free use of soap in the bath is necessary. To be healthy, one should have a thorough scrub bath at least once a week with warm water and soap. The parts of the body exposed to the dusty winds will of necessity be washed more frequently. The hands, which are soiled so often in our occupations, should be carefully washed with soap and water immediately before each meal and as frequently as may be necessary.


YOU CANNOT BE CLEAN WITHOUT SOAP

Besides a bath with soap and hot water to thoroughly cleanse the body, a cold plunge bath, taken each morning on rising, has a very stimulating effect. This bath should not last more than one or two minutes and should be followed by a brisk rubbing with a coarse towel. People with poor circulation are not benefited by a cold bath, and indeed in some instances are decidedly injured. It cannot be laid down as a rule, therefore, that every one should take such a bath in the morning.

You all know very well how one perspires on a hot day. The clothes will even become quite damp with perspiration and in some instances the water may be wrung from the underclothing. After vigorous exercise one must take precautions to avoid catching cold. The rapid evaporation of moisture from the skin gives a chilly sensation. This you all have discovered when, if the body is not dried at once after taking a bath, the skin begins to feel quite cold. Therefore after vigorous exercise, it is well to rub the body with a rough towel and put on dry clothing. If this is not convenient, one should take the precaution to avoid sitting in drafts where evaporation will take place too quickly. After a swim in the lake it is not wise to sit about on the shore in a damp bathing suit. As soon as the bath is over it is much better to remove the bathing suit at once.

For a regular bath, probably the best time is on rising in the morning. The body is rested. Reaction of the skin occurs readily, for the circulation is at its

best. One should never bathe in cool water when greatly fatigued nor while still perspiring. Neither should a bath be taken soon after a meal. A warm bath followed by a very quick cold sponge after cooling off from vigorous exercise, is healthful. It removes all fatty parts of the perspiration which are left upon the skin when the water evaporates. A slightly cool bath is also an excellent thing on retiring when one is nervously tired and unable to sleep. It must be brief, however, and followed by brisk rubbing.

### WHAT TO DO

*1. Make an imprint of your thumb and fingers on a piece of cardboard or glass.*

*2. Compare these with those of other children.*

### HOW TO BE HEALTHY

*1. Keep the pores of the skin open by bathing with soap and warm water.*

*2. Never stay in a draft after perspiring freely.*

## XXXIV. THE NAILS

It is well known that the nails continue to grow throughout life, even after the body has reached maturity. One purpose of the nails is to protect the fingers. They are also useful in picking up small objects, such as pins, needles or small coins. If you watch the nails on the hand for a few days without doing any trimming at them, you will see that they project farther and farther over the ends of the fingers. Little ledges of tissue also grow forward over the root. This really gives the nail the appearance of growing at the upper end, just under the edge of the flesh, and thus being pushed forward over the end of the fingers. The root of the nail underneath the flesh of the finger grows from a part called the matrix. Thus you see that the nail really grows at this point, and is merely pushed forward. There is no growth whatever at the tip of the nail. This provides for its steady growth in order to make up for its wearing away at the tip.

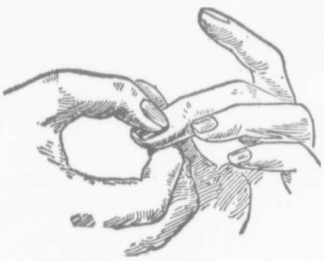
*A Finger Nail that is a Credit

Every one is quite familiar with the difficulty there is in keeping the finger nails clean, particularly during

* Reproduced from "Good Health."—Gulick. By permission of Messrs. Ginn & Co.

hot, dusty summer weather. It is desirable to have the finger nails nicely cleaned and neatly trimmed for the sake of appearance. It is also necessary to keep them clean because of the ever present danger there is of having microbes lodged there in the dirt. You will appreciate the importance of this at once when you recollect how many, many times during the day your hands touch your lips and nose, either directly or through the medium of your handkerchief. In addition to this, many articles of food are held in the fingers while being eaten. Thus it is clear that many times during the day the busy microbes, which are given a hiding place under the nails, are brought close to the portals of entrance to our body; namely, the mouth or the nostrils. Surely, then, it is of great importance, as well for our appearance as for our health, that we should look well to the nails.

*A Finger Nail that Tells Tales



Making the Crescent Show

In caring for the nails you will have been impressed with the need for keeping the soft part pushed back at the root. And it should be emphasized that pushing back this part

* Reproduced from "Good Health."—Gulick. By permission of Messrs. Ginn & Co.

is the proper method of caring for it, rather than cutting it off. At the side where the edge of the nail first appears, there is a great tendency for little tags to hang from the skin. These can be largely avoided by attention to the point we have just mentioned.

In caring for the tips of the nails, some people have acquired the habit of biting the end off. This is not the proper thing to do, because it leaves the nails rough and uneven on the end. In addition to this it is not a nice habit. A file with a blunt tip, a tiny pair of scissors, and a nail brush are the proper instruments to use. The brush should be used with soap and water until the nails are left clean looking. The file should then be used to run round the ends of the nails, as well as to remove any accumulation of spongy skin underneath the tips. The blunt tip of the file may be used to push back the soft part of the finger at the root. The scissors may be used as occasion requires to trim off the little tags which occasionally appear.

REMEMBER

*Keep the nails clean for health sake as well as for appearance sake.*

## XXXV. CARE OF THE MOUTH

The care of the mouth has much to do with good health. When the subject is raised, the first thought that comes to mind is the teeth. It is quite evident that if they are always kept clean and white the rest of the mouth will be clean. The importance attached to this subject will be appreciated when some of the things about microbes and how they cause disease are brought to mind. In addition to this, it is well to recollect that the food eaten all passes through the mouth. If the latter is not as clean as possible, neither will the food be clean, and if unclean food reaches the stomach, digestion will be very materially interfered with.

In giving attention to the teeth the chief point to emphasize is their preservation. Around the question of prevention of the decay of teeth, called *caries*, centres the whole problem. The cause which produces caries of the teeth is the same as that which spoils good food after it is taken into the mouth. This in each case is the collection of bacteria in the food hidden between the teeth.

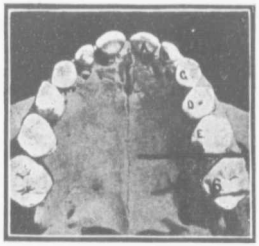
It may be laid down as an almost invariable rule that a clean tooth never decays. Since this is true it will be well to know a little about the cause of decay.

The mouth cannot be kept absolutely free of microbes. With care, however, the bacteria can be prevented from doing any serious harm. When food is allowed to remain about the teeth from one meal to another the bacteria then find just the home they like. These bacteria, when left undisturbed for several days, manufacture an acid. This acid dissolves out the lime salts of the tooth, thus leaving a soft spot, then the germs can enter the tooth. They go deeper and deeper, and soon there is a cavity leading to the very centre of the tooth, and it begins to ache. An examination by the dentist reveals the fact that nothing is left but a shell, and a great deal of expense will be entailed to preserve it. This emphasizes the fact that the teeth should be examined by a dentist twice a year.

Infectious diseases are very frequently spread through the medium of unclean mouths. The germs of tuberculosis have actually been found in carious teeth. There is good reason also to believe that the infection in scarlet fever, diphtheria and such diseases is frequently retained in decaying teeth long after the child has recovered. In this way diseases may be carried to others.

USE A BRUSH THE SIZE AND SHAPE OF THIS

Furthermore, carious teeth are very frequently the place of entrance of infection into the system. Quite a percentage of cases of enlarged lymphatic glands in the neck are caused by infection entering through a decaying tooth. Thus both for the community and the individual, carious teeth are a great menace.



THE TEMPORARY TEETH

A. Central } INCISORS D. 1st } MOLARS
B. Lateral } INCISORS E. 2nd } MOLARS
C. CANINE

THE PERMANENT TEETH

6. 1st PERMANENT MOLAR commonly called the 6 YEAR MOLAR

A moment's consideration will also convince all that one cannot masticate well with aching, diseased teeth. The food cannot be properly ground up. To make up for this defect large quantities of fluids are used, during meal time, to wash the unground lumps of food down. The work of the stomach is thus very greatly increased, because the food has not been properly minced. It has been proven that large pieces of meat take much longer to digest than does well minced meat.

In addition to caries of the teeth a second disease deserves mention. It is called Pyorrhœa, and consists of an inflammation of the gums just at the margin along the teeth. This inflammation is due to an irritation of the gum tissue, usually due to the presence on the teeth of hard scales known as tartar. This forms on and around the roots and necks of the teeth, and when scaled off looks like pieces of limestone. These

roughened surfaces help to gather small particles of food. All this, in the presence of the ever-present microbe, leads to the formation of tiny drops of pus. In two schools examined in a large city in Ontario, 30.5 per cent. of the pupils had pus exuding into the mouth. During each meal some of this oozes out and is swallowed with the food. This can result in nothing but ill health.

A temporary set of teeth comes in during childhood. These fall out later, to be replaced by a permanent set. Eruption occurs at the following periods:

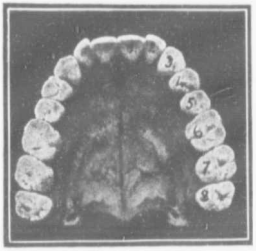
TEMPORARY TEETH

6th to 8th month—2 Lower Central Incisors
7th to 8th month—2 Upper Central Incisors
7th to 9th month—2 Lower Lateral Incisors
8th to 9th month—2 Upper Lateral Incisors
17th to 18th month—4 Cuspids
14th to 18th month—4 1st Temporary Molars
18th to 24th month—4 2nd Temporary Molars

PERMANENT TEETH

6th to 7th year—1st Molars
6th to 8th year—Lower Central Incisors
7th to 8th year—Upper Central Incisors
7th to 8th year—Lateral Incisors
9th to 10th year—1st Bicuspids
10th to 11th year—2nd Bicuspids
11th to 12th year—Cuspids
12th to 14th year—2nd Molars
17th to 23rd year—3rd Molars

It will be observed that the first permanent teeth to appear are the first molars; or first double teeth as they are sometimes called. Mothers very often mistake these for temporary teeth and for this reason do not value them. They are, therefore, allowed to decay without any attempt being made to preserve them until beyond repair. Moreover, the too early loss of the temporary set, or their delayed retention, is responsible for many of the irregularities of the permanent teeth. In order to get the best results, the temporary set should be kept in the best possible condition until they are forced out by their successors; then they should be extracted if necessary.




THE PERMANENT TEETH

1. Central, 2. Lateral, 3. Canine } INCISORS
4. 1st, 5. 2nd } PREMOLARS
6. 1st or 6 Year
7. 2nd or 12 Year } MOLAR
8. 3rd MOLAR or WISDOM TOOTH

Since health depends so much on the condition of the teeth, their care becomes at once a vital question. This is particularly important, since caries can be practically prevented simply by keeping the teeth clean.

In the care of the teeth the kind of food eaten has considerable importance attached to it. It is quite a common custom to eat some kind of soft, more or less sticky food, such as steamed puddings, for dessert. This kind of food lodges between the teeth very readily. A good way to finish a meal would be to take something like a raw apple, which would require careful

mastication before it could be swallowed. It will help dislodge other kinds of food because of its firm consistency.

The habit of eating candies and other sweets between meals is a very bad one, unless the teeth can be brushed. This is often impossible. The consequence is that some form of food remains about the teeth most of the time. When sweets are eaten they should be taken only with meals.

The best known means of cleansing the mouth and teeth other than by mastication, is by the intelligent use of a good tooth brush along with plenty of cold water. The brush must be small enough to pass readily between the cheek and the posterior teeth. The wisdom teeth are frequently the first to decay, because the large brush used will not reach them.

The head of an ideal brush for an adult should not be over one and one-half inches in length and one-third of an inch wide. The bristles should be arranged in two or three rows, each of about seven or eight tufts. They should be not longer than half an inch and of moderate stiffness. If the gums are inflamed, softer bristles should be used for a time.

In using the brush, the method of brushing across the teeth is not a good one. The correct way is to brush from the gums toward the end of the teeth. This can be done very easily on the surface next the cheek. For the inner surface, place the ends of the bristles directly against the teeth, just at the gums, and by twisting the handle the bristles pass length-

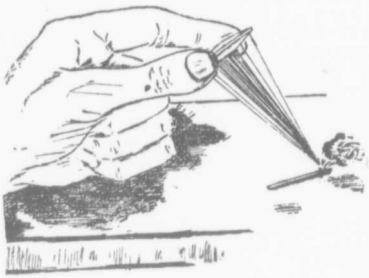
wise over the teeth, thus removing whatever may be between them.

Whatever kind of powder or paste is used should be rinsed off carefully with abundance of *cold water*. It is possible by the action of the tongue and cheek to force water back and forth between the teeth with considerable pressure. When food cannot be dislodged by this method it should be removed by a quill toothpick, or dental floss-silk.

To cleanse the mouth and teeth should be the first duty each morning. They should be cleaned also after each meal. The most important time of all is after the last meal of the day. During sleeping hours saliva is not flowing freely; neither is the tongue brushing the surfaces of the teeth. Germs lodged under particles of food would thus have the whole night in which to work. Is it any wonder that they destroy the teeth? Persons in delicate health, or those who have decaying teeth, should cleanse the mouth carefully before each meal. This will prevent the entrance into the stomach of the many germs lodging in the mouth.

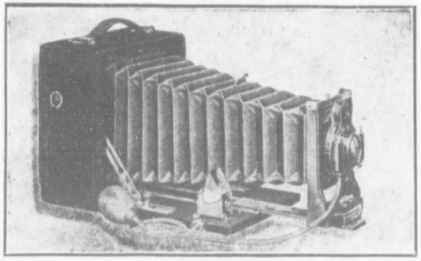
## XXXVI. THE EYES

If one of the boys will provide a burning glass or lens, it will be very useful in helping us to understand something about the wonderful structure of the eye. With it concentrate the rays from the sun on the point of a match. It will take fire. There is one point only at which it will burn. If you hold a piece of paper behind the lens, and parallel with it, you will observe that the rays are concentrated directly opposite the middle of the lens. This is the burning place, and is called the focal point. With a ruler you will be able to measure exactly the distance between the lens and this focal point. Now if you are fortunate enough to have several such lenses having different degrees of convexity, you will find the focal point different in each case. Thus, you will observe that for each different shaped lens there is only one point at which the light rays are concentrated. Beyond that point the rays commence to diverge again.



BURNING GLASS

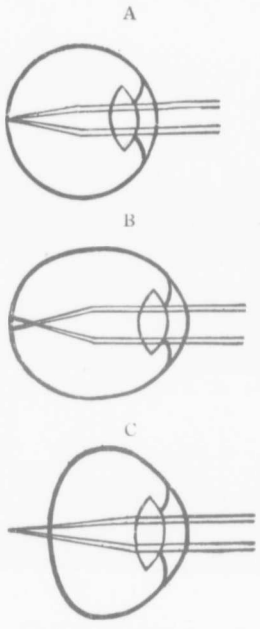
If you study a camera, you will find a lens in the front of it. If the lens is stationary, the focal point for near objects is not the same as for those at a distance. The focal point must fall on the plate or film at the back of the camera. Thus the lens is so arranged that it can be moved backward and forward. The rays are made to strike on the sensitized plate or film in order to produce the likeness.



CAMERA

The rays of light between the eye and any objects are made to converge at the back of the eye, and there they produce an exact likeness of the object. This likeness is just as definite as your likeness is when you stand before a mirror. The point at the back of the eye where the rays come together to form this likeness, is called the retina. From this point the nerves connecting the retina with the brain carry the images to the nerve cells, and thus the mind reads what is pictured on the retina. Without the connection made by these nerves the image might be framed on the retina, and yet the mind would not see anything. You could no more see without these connecting nerves than you could hear over the telephone if the wires were cut.

What is the provision made in the construction of the eye to insure the image being formed at the right point? If the rays meet at a point either in front of the retina or back of it, no image will be formed. How, then, does the eye see to it that the image is always formed at the retina? Can the eye move the lens backward and forward to suit distant or near objects? What other means can the eye use? You will recollect from your experiment with the lens that the distance of the focal point from the lens depends on the convexity of the latter. In other words, you notice that the more convex the lens is, the nearer is its focal point. This means that by changing the convexity of the lens for near and far objects the focal point is always in the same place. This is what actually occurs in the eye. Thus the shape of the lens is varied to suit the distance of the object from the eye. This means that the farther away the object is from the eye the flatter the lens requires to




Diagrams illustrating the path of the light rays entering A, a normal eye, B, a far-sighted eye, and C, a short-sighted eye. Notice how in the normal eye, A, the light focusses on the retina, and so the image resulting is a true image.

be, and the nearer the object is to the eye the more convex the lens must become. The muscles of the eye see to it that the lens changes its shape for distant and for near objects. Thus the normal eye adjusts itself so that the image is always formed on the retina.

LIGHT OVER THE LEFT SHOULDER. CORRECT POSITION

The eye forms habits just as children and animals do. If it is used for looking at near objects a great deal of the time, it forms the habit of keeping the lens somewhat convex. In this case the rays of light from distant objects would meet at a point in front of the retina, and the person would not be able to see properly. This is what actually happens in a great many children attending school. The eye is naturally at rest when viewing objects ten or twelve feet away. When the eye is focused on close objects, such as a book, the lens has to be held more convexly to insure proper vision. And this long continued reading is one of the chief factors in producing short-sighted children.

Now that you have learned a little of the mechanism of the eye, you will appreciate the importance of not straining it unduly while at work. For instance, the boy or girl who holds the book closer to the eye than is necessary is gradually causing the eye to become short-sighted. This condition is also produced by reading in a bad light or reading with the book held in some awkward position, such as while lying in bed or on a couch, or sitting all crouched up at a table. These positions all tend to make it difficult for the lens of the eye to produce the image on the retina. Regarding position, then, the book should always be held fairly in front of the eyes and at a distance of about fourteen inches. The light should always be clear and bright, and always come from behind and to the left. It is unwise to read books with very fine print or having the lines close together. Either is very hard on the sight and tends to strain the eyes. It is just as important not to read in a very strong light as

PAPER IN THE SHADE. INCORRECT POSITION

it is to avoid a very poor light. The strong light, indeed, is injurious to the eyes, even though you are not reading at all. Therefore it is wise to shade the eyes when in the strong sunlight, particularly in the spring of the year. You should always remember to see that the baby's eyes are shaded during the summer while in its carriage.

A very common form of amusement which is at the same time injurious to the sight, is a moving picture show. Here, owing to the rapid change of near and far appearances on the screen, there is a rapid effort at accommodation. This causes very serious eye strain. During convalescence after long illness the muscles and nerves of the eyes are easily tired, and care must be taken not to require too much work of them. Where work demands accurate and continued vision, frequent intermissions should be given in order to relax the muscles which change the shape of the lens.

LIGHT IN THE EYES. INCORRECT POSITION

# E Z L P C F D T

This is the size and shape of letters used by practically all oculists in testing the vision. They should be read at 19½ feet when held in a clear light.

In the home treatment of eyes it is a common custom, if inflammation is present, to cover the eye with a cloth or shield of some kind. By doing this all secretions from the inflamed eye are retained in contact with it. This secretion will remain at body temperature. This, you know, is the temperature at which microbes develop. Therefore covering the eye in this way does the very thing that will encourage the rapid growth of the microbes and the rapid increase of inflammation. The eye should be bathed with boiled water or boracic solution frequently enough to keep it clean, but it should never be covered in the way just mentioned. Another common practice is to apply poultices made with linseed, tea leaves or other home remedies. These are bad forms of treatment.

When dust or a cinder gets into the eye and causes pain, do not rub the eye. Get some one to remove the speck with the corner of a clean cloth. If this cannot be done the eye should be bathed with boracic solution. Do not allow fingers or towels, or anything else, when dirty, to come near your eyes.

### WHAT TO DO

*1. Set a match on fire with a lens.*

*2. Measure the distance the focal point is away from several lenses.*

*3. Make a drawing to illustrate your results.*

*4. If you know a photographer, ask him to let you focus the camera.*

### HOW TO PRESERVE YOUR EYESIGHT

*1. Let the light fall from behind and to the left.*

*2. Protect the eyes from a bright light.*

*3. Never read in the twilight.*

*4. Hold the book squarely before the eyes and not too close.*

*5. Never read fine print nor a book in which the lines are too close together.*

*6. Never read lying down.*

## XXXVII. EARS, NOSE AND THROAT

In referring to respiration, the importance of breathing through the nostrils and not through the mouth was pointed out. Very frequently those who breathe in the latter way are also slightly deaf. Thus, it is seen that the hearing is sometimes affected by the condition of the nose and throat. For this reason these three are considered together.

The part of the ear which is seen is not the whole of this organ. In fact, the important part of the hearing apparatus is situated deeply in the bone just back of the ear. The little passage from the outside leads only as far as the ear drum. Beyond this is the really essential part. The ear drum receives the impression of the little waves of air. These are transmitted through three bones to the nerve leading to the brain. The little chamber in the inner ear is connected with the back of the nose by a small passage called the Eustachian tube. The purpose of this tube is to equalize the air pressure inside and outside the drum of the ear. If it should become closed from any cause the hearing is interfered with. Owing to the position of its opening at the upper part of the throat or the back of the nose, the little growths, which are called adenoids, more or less close it off. Thus the hearing is interfered with.

It is quite evident also that the hearing is interfered with if the passage outside the ear drum is blocked. This may occur because of the presence of a large plug of wax or from inflammation. Thus the hearing depends on a healthy nose and throat as well as a healthy ear. The care of each, therefore, is necessary, not only to protect the hearing, but also to insure good respiration.

In the care of the ear it is unwise to do anything more than wash with soap and water in order to clean it. This means that it is not safe to clean the ear with the head of a pin or any other such instrument. If the external canal is closed to such an extent that you cannot hear, it is better not to attempt to treat it yourself, but go at once to your physician. In cases of earache it is not safe for you to put anything into the ear. Frequently oil of some kind is so used. This is not wise. The application over the ear of a hot-water bottle or hot fomentations is safe, however. Any further treatment should not be attempted except on the advice of the doctor.

In the care of the nose and throat it is worth while again to emphasize the evil effects arising from the presence of enlarged tonsils and adenoids. It has already been pointed out that adenoids at the upper part of the throat are responsible, not only for mouth breathing, but also for a certain amount of defective hearing. When the tonsils are large and adenoids are present, the only treatment of any use is to have them removed. Do not fear that the removal of enlarged tonsils will

interfere with the voice in speaking or singing. In fact, the presence of these enlarged glands gives the voice an unnatural sound. Their removal, therefore, aids instead of spoils the voice.

A frequent ailment of the nose and throat is the ordinary "cold." This consists of an acute inflammation of the mucous membrane of this whole region, including the Eustachian tube. As a rule a cold in the head is not benefited by taking medicine internally; neither is it helped by strong sprays or snuffs. If the cold is very severe the best plan is to stay in bed one whole day. During this time spray the nostrils frequently to remove the irritating secretions. This allays the inflammation. For this purpose use a warm solution made by putting a teaspoonful of sodium bicarbonate and a teaspoonful of ordinary salt into a glass of warm water. This solution is to be preferred to the majority of patent mixtures available. The throat can also be gently gargled with the same mixture.

# XXXVIII. EMERGENCIES

## DROWNING

There is a case reported where a drowning boy was under water twenty minutes after sinking the third time, and yet he was brought to life by faithful efforts at artificial respiration. It is rare, however, for recovery to occur after being under the water for longer than four or five minutes.

REMOVING WATER FROM THE LUNGS

As soon as a drowning person is taken from the water, the clothing about the neck should be loosened and the body held up, as shown in illustration. This will allow the water and mucous to run out of the mouth and trachea.

If breathing has stopped, artificial respiration should be commenced at once. This is best done according to the method of Professor Schaffer of Edinburgh University. This is as follows:

"Place the patient face downward on the ground with a folded coat under the lower part of the chest.

"To effect artificial respiration, put yourself on one side of the patient's body or a stride of it, supporting yourself on one knee upon one side, and on one foot on the other.

ARTIFICIAL RESPIRATION. FIRST POSITION

"Place your hands flat over the lower part of the back (on the lowest ribs), one on each side, and gradually throw the weight of your body forward on to them so as to produce firm pressure (which must not be violent) upon the patient's chest.

"By this means air (and water if there is any) is driven out of the patient's lungs. Immediately thereafter raise your body so as to remove the pressure, but having your hands in position.

"Repeat this forward and backward movement (pressure and relaxation of pressure) every four or five seconds. In other words, sway your body forwards and backwards upon your arms fifteen or twenty times a minute without any marked pause between the movements. This course must be pursued for at least half an hour, or until the natural respirations are resumed.

ARTIFICIAL RESPIRATION. SECOND POSITION

"Whilst one person is carrying out artificial respiration in this way, others may, if there be opportunity, busy themselves with applying hot flannels to the body and limbs, and hot bottles to the feet. The bystanders should assist in keeping the body warm, contributing some of their own garments, if necessary, for this purpose."

### BLEEDING

If a leg or an arm has been nearly severed by accident and bleeding is going on from the stump, tie a strong handkerchief loosely about the limb just above the injury. Run a stick through this and twist the handkerchief till the bleeding stops. In case profuse bleeding takes place from a cut on any part of the body, place a clean handkerchief or piece of clean cloth right over the cut. Bind it firmly with a second handkerchief or a strip of cotton.

A TOURNIQUET USED TO STOP BLEEDING

### FRACTURES

In any city or town where doctors are close by, the best thing the bystanders can do when a man breaks his leg is to get him lying down and leave him there till the doctor comes. Any handling you might do would only tend to make the jagged parts of the bone stick into the muscles or blood vessels and do additional injury. In places where a doctor cannot be got soon, secure a thin board and cut a piece off as long as the broken limb. Then bind the fracture up

so that the fragments cannot become further displaced. Leave it thus till the doctor comes.

### FROST-BITES

There is an absurd idea prevalent that the best way to treat a frost-bite is by rubbing it with snow. On a cold winter day the snow is necessarily frosty. To rub the part with it is to freeze it harder.

If you are outside when you find that your nose is frozen, rub it with a fur mitten or your bare hand. If you discover the white spot after you get into the house, go at once to a dish of cold water and bathe it with this till the color returns. If the frost-bite is extensive and involves several fingers or part of the foot, bathe the part in alcohol.

### BURNS AND SCALDS

Accidents frequently occur where people use coal-oil in lighting the fire in the stove. This is a dangerous practice. When put on before the fire is lighted an explosion may occur as soon as the match is put to it. If there is a little fire already in the stove it is even more dangerous.

One day a doctor was called to see a poor woman whose clothes took fire. She had been working in the house and ran wildly out into the yard. The flames were fanned by the breeze and rose up about her head, consequently her hair took fire. When the doctor arrived two-thirds of the surface of her body had

been burned. Had she seized the cloth off the table and lain down on the floor and rolled herself up in it, the fire would have been quickly extinguished. As it was she died.

When a child falls into a pail of boiling water, however, the all important thing to do is to tear the clothing off as quickly as possible, unless the child can be held in cold water. The clothing is saturated with the scalding hot water, and as long as it is left in contact with the body, it will continue to do harm.

After a burn, either by fire, hot water or gunpowder, the best thing you can do is to wrap a clean sheet about the patient till the doctor arrives.

### FAINTING

The usual custom when some one faints is to rush off madly for a bottle of brandy or whiskey. Some of it is put into a glass with a smaller quantity of water. Then the patient's teeth are pried apart and the mixture is poured into the mouth till it runs out.

This is the worst thing that can possibly be done, because the fluid is likely to go down the wrong way and choke the patient. Those of the class who have ever seen any one faint will have noticed that the face becomes very pale. The blood has almost ceased to flow through the parts. This is all that is wrong. To set it right, lay the person down with the head lower than the rest of the body.

### FITS

As in fainting, so in fits, the popular method of treatment is to pour whiskey or brandy down the throat. This is wrong. Do not do it. Nothing you can do will shorten the duration of the fit. One thing you can do, however, that is, to place a small stick between the patient's teeth to prevent biting of the tongue.

### STREET CAR ACCIDENTS

During every year, street car companies have to investigate a large number of accidents to people, the majority of which fall in four classes:

Accidents to persons boarding or alighting from street cars; accidents to pedestrians, on the street; collisions with vehicles; accidents to bicyclists.

Accidents to persons boarding cars are usually caused by the person arriving at the corner just as the car is pulling out and attempting to board while it is in motion. Alighting accidents are caused in the majority of instances by passengers getting off before the cars come to a full stop.

Accidents to pedestrians are caused in the majority of cases by children (and grown persons too) attempting to cross the street in front of an approaching car, or by passing behind a standing car without looking to see if another is coming in the opposite direction. Motormen are instructed to run very carefully near schools, yet school children are not careful, and frequently try to cross in front of cars.

Collisions with vehicles are usually caused by

drivers attempting to cross the track in the face of an approaching car or by passing behind a standing car without looking to see if one is coming in the opposite direction. Accidents to bicyclists are caused by boys riding beside the car and hanging on some portion of it. Although this is an easy way of travelling, it is, nevertheless, very dangerous.

Rules for prevention of these accidents would be:

Do not cross the track in front of an approaching car. Wait till it passes. Do not cross immediately behind a passing car. Wait till it moves on. Another car, an automobile, or a bicycle might come along the other side of the car and strike you. Do not play on, or near, the street car track, or in the road where street cars operate. Do not jump on a car that is moving, and do not run to catch one that is pulling out. Never get off a car while it is in motion, and when you step off always keep to the right and face the front of the car, that is, the way the car is travelling. If girls would carry all their bundles, purses and parcels in the right hand in getting off the car, they would then naturally take hold of the grab-handles with the left hand, and face the front. To walk off straight is almost as bad as walking off with the back to the motorman. Never ride on the platform, where a sudden lurch of the car may throw you out. Never put your head or hands out of the window, as passing wagons or vans might strike you. Before crossing double street car tracks, always look both up and down the track to see whether cars are near by.