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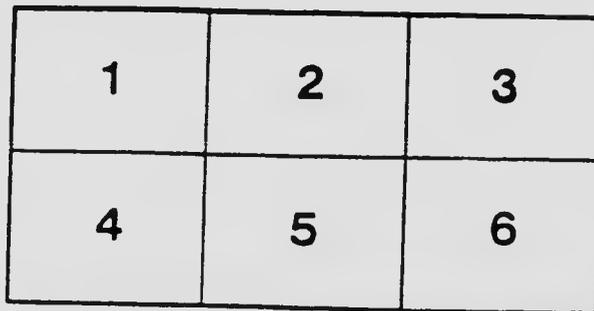
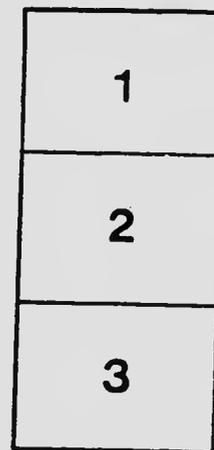
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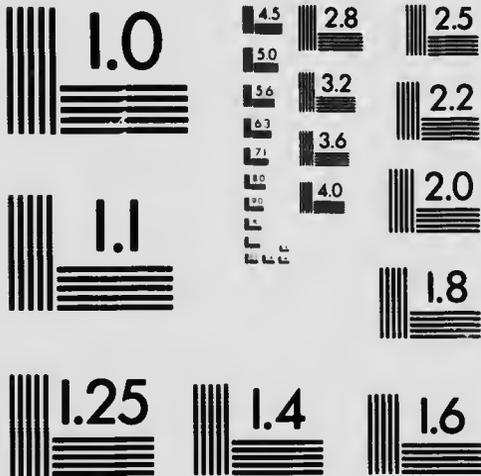
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THE EDUCATIONAL PUBLISHING COMPANY  
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## PREFACE.

No more important advice was ever given to man than "know thyself," and no more pleasing or more profitable subject could be considered in school than the obeying of this command.

It will lead us to consider the relation of the body to the soul ; the purpose of the body and the destiny of the soul ; the beauty of the soul as expressed in the body ; and the dependence of the soul upon the body. It will lead us to see that the achievements of the soul are limited by the power of the body.

It will lead us to consider the beauty of the human form ; to know the different systems of which the body is composed ; the organs of each system and the structure and definite function of each organ. We shall see the dependence of each organ upon all the other organs, and the wonderful harmony in which they all act when in health.

It will lead us to know what care must be taken to keep all these delicate organs in proper condition, so that each may perform its function perfectly. It will point out to us what will interfere with the perfect development and perfect action of these organs, and will particularly warn against alcohol and tobacco, because these two evils are abroad in the land and are daily claiming their victims from the ranks of the boys and girls who are growing up around us.

THE AUTHORS.



CEREBRO-SPINAL AXIS.

## THE HOUSE WE LIVE IN.

However strange it may seem to you, no one has, at any time, seen even his dearest friend. All that is visible to the mortal eye is the wonderful house in which the real person lives.

And wonderful it truly is—wonderful in the beauty of its outline—wonderful in the framework upon which this outline depends—wonderful in the parts which clothe the framework and enable the person to move about so gracefully. It is wonderful in the provision that is made to supply the waste which is constantly going on, in the manner in which a nourishing material is prepared and the way in which this nourishing fluid is constantly being purified to keep the parts of this wonderful house in proper condition. *It is the crown jewel of the creat.*



The mind is the "man of the house." In what part of the house it dwells we do not know; but we know that it controls the body through the brain. The brain is situated in the skull and is connected with all parts of the body by the myriads of little nerves which form a telegraphic system, conveying information to the brain and carrying orders from the brain to all

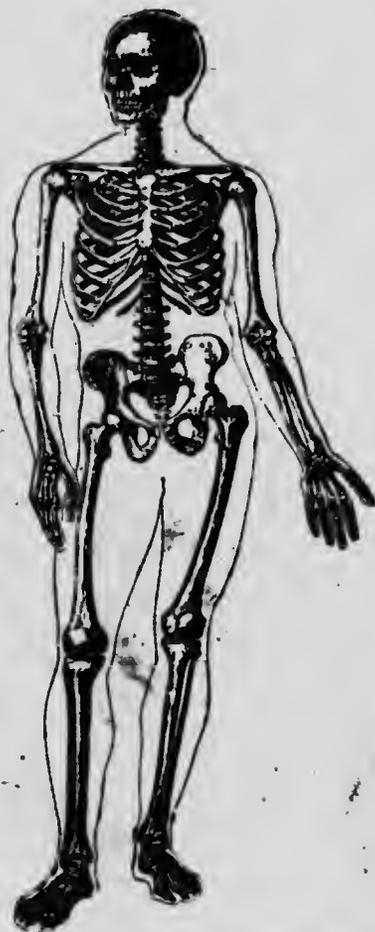


parts of the body. No act is performed, no word is spoken, nor is even the slightest movement made by any part of the body without an order from the brain. Thus the expression of the face and the little acts and words which ornament or mar the moments as they speed along, indicate the nature of the "man of the house" and we learn to love him or we wish to shun his company.

The bones so wonderfully joined together, supply the framework of the house and give it

its general outline. Some of the bones are to protect the most delicate vital organs, while others are so hinged together that they are used in performing the wishes of the "man of the house." Being composed of many parts, the skeleton is stronger than if it were composed of one bone, or even of a few bones, and at the same time the body is able to assume many graceful positions and to perform the most delicate acts.

Every movement of the body is produced by the action of some part of the great muscular system, which clothes the framework of the house. This system is composed of bands of minute strands or fibres, which contract or relax in obedience to the brain, and being attached to the bones by tendons, they produce motion or action. The health, the strength and the growth of each part of the body depend on its being exercised or used. Each act, therefore, tends to strengthen and develop the muscles; but, strange as it may seem, it does this by wearing them away and having them renewed.



This work of renewing the house is constantly being carried on by means of a wonderful network of passages which carry nutriment to every part of the body. This network is so dense that we cannot pierce any part of our body, even with the finest needle, without coming in contact with a branch of the system and letting out some of its fluid nutriment, which is called blood. This blood is sent out from the heart and contains all the ingredients necessary to build up every part of the body. It comes back to the heart laden with waste matter and other impurities. It is then sent to the lungs where it gives up its impurities to the air and, taking in a fresh supply of oxygen from the air, it returns to the heart to be sent again throughout the system,





while the air, now impure, is breathed out of the body.

This process of renewing the tissues of the parts of the body is a chemical change, and, like all chemical actions, it produces heat. This animal heat is constantly being produced, distributed, and regulated, so that a person in health has the same temperature day and night, summer and winter, and in all climates. As soon as this temperature rises we know there is disease in some part of the system, and that "the man of the house" is making extra efforts to protect his home, and needs outside help.

Whether we sleep or wake, the work of purifying the blood should be going on in the lungs. The air, so pure, and sweet when it is inhaled, is foul and deadly when it is exhaled. It is then carrying the impurities it has received out of the system. It has lost its purifying power. If re-breathed it does not cleanse the blood and if continued to be breathed serious results follow. Every effort should therefore be made to ventilate our rooms, furnishing a good

supply of pure, life-giving air which the Creator has supplied so abundantly and so freely.

As the blood is constantly being used to renew the parts of the body, the supply of blood must be replenished constantly. For this purpose, the food we eat is mysteriously digested as it passes through our system, and the nourishing part is absorbed and changed into blood. Any substance which we take into our system and which can be digested and changed into blood, is food. Alcoholic drinks, however, are not food, as they cannot be digested; and besides, when the alcohol gets into the blood it does great injury.

Thus we see :—

1. That the purpose of the body is to act.
2. That the actions are performed by the muscles.
3. That the muscles are renewed by the blood.
4. That the blood is purified in the lungs (and other parts).
5. That the blood is replenished from the food.
6. Lastly, that all is controlled by the brain.

As we study the parts of this wonderful house, learn of its various organs and the functions of each, see the delicateness and importance of each organ and the care that must be taken to keep each in perfect health, and lastly, when we see the beautiful unity and harmony of the whole, we must needs wonder at the wisdom, and power, and goodness, of God. We shall surely resolve never to defile this wonderful temple in which the soul dwells, by wrong or careless acts, or by taking into it, anything which would injure it or would interfere with the perfect development and perfect action of each of the parts of so wonderful a structure.

# THE CIRCULATORY SYSTEM.

1. **Circulation :—**
  - a. Long, or Body Circulation.
  - b. Short, or Pulmonary Circulation.
2. **The Blood :—**
  - a. Constituents—plasma, corpuscles.
  - b. Kinds—arterial, venous.
  - c. Coagulation—purpose.
3. **The Organs of Circulation :—**
  - a. The Heart.
  - b. The Arteries.
  - c. The Veins.
  - d. The Capillaries.
4. **The Heart :—**
  - a. Shape, size, position.
  - b. Parts—right and left.
  - c. Chambers—functions.
  - d. Walls—muscular.
  - e. Actions and valves.
  - f. Lining and covering.
5. **The Blood-vessels :—**
  - a. **Arteries :—**
    1. Purpose, kind of blood.
    2. Position, strength, pulse.
    3. The Aorta—divided and sub-divided.
    4. Pulmonary artery.
  - b. **Veins :—**
    1. Purpose, kind of blood.
    2. Position, movement, strength, valves.
    3. The Venæ Cavæ.
      - (1) Ascending or inferior.
      - (2) Descending or superior.
    4. Pulmonary vein.
6. **The Course of the Blood :—**
  - a. Through the Body Circulation.
  - b. Through the Pulmonary Circulation.
7. **Heat—produced, distributed, regulated.**
8. **Blood Cleansed—by lungs, kidneys, and skin.**

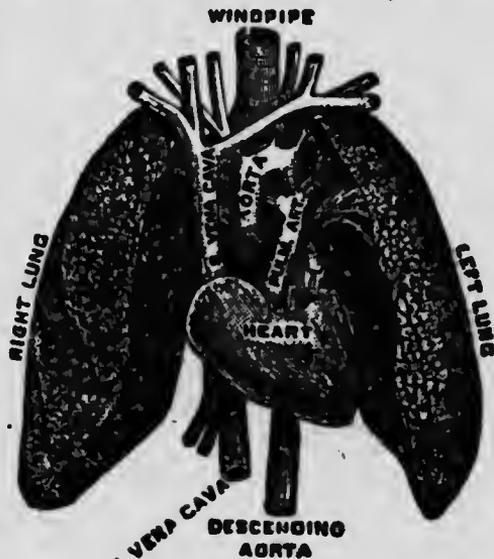
# CIRCULATORY SYSTEM.

## I. CIRCULATION.

**Circulation** is the regular flow of the blood to all parts of the body. It consists of two parts :—

**a. The Long, or Body Circulation,** which carries the bright, pure (arterial) blood, from the heart, to all parts of the body, to renew the worn-out tissue and to carry the refuse or worn-out matter back to the heart.

**b. The Short, or Pulmonary Circulation,** which carries the impure, waste-laden (venous) blood, from the heart to the lungs, to be purified, and then carries it back to the heart.



Position of the Heart.

## 2. BLOOD.

**a. Blood** is the fluid which circulates through the body, renewing the tissues, and carrying away the waste matter. It is composed of a colorless fluid called plasma, and numberless little discs called corpuscles.

**The Plasma** contains fibrin and albumen, and many kinds of minerals, such as lime and phosphorus, all of which go to renew the various parts of the body.

**The Corpuscles** are (1) red, (2) white. The red corpuscles are so numerous that they give the color to the blood. These corpuscles also carry oxygen from the lungs to the parts of the body which are to be renewed, and then carry the waste matter from these parts back to the heart and lungs to exchange the impurities for loads of oxygen.

**b. The pure blood**, charged with oxygen, is of a bright red color, and is called **arterial blood**.

**The impure, or venous blood**, which is returning from the body, is of a dark color, and is charged with carbonic acid gas and worn-out tissue.

**c. Coagulation** is the clotting of the blood when it is exposed to the air. This clot is composed of the fibrin of the plasma, and the corpuscles which have been caught in these fine threads. This clotting checks and stops the flow of blood, in cases of accident, and is one of the kind provisions of the Creator. If the blood is too thin it will not clot, and then a slight wound becomes dangerous.

### 3 THE ORGANS OF CIRCULATION.

**a. The Heart**—the centre of the system.

**b. The Arteries**—the vessels which carry the blood from the heart.

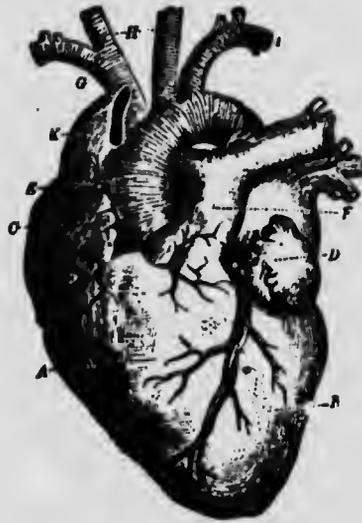
**c. The Veins**—the vessels which carry the blood to the heart.

**d. The Capillaries**—arterial and venous—the minute hair-like blood-vessels which connect the arteries with the veins, and complete the circuit.

The system is really a closed sac in which the blood may circulate freely and do its work ; but at no point can the blood escape unless some vessel be pierced or cut.

#### 4. THE HEART.

**The Heart**, the chief organ of circulation, is a cone-shaped, muscular organ about the size of the person's fist, and is situated between the lungs. It consists of **two parts**—the right heart and the left heart, separated by a partition of flesh. Each has a distinct, yet similar, function to perform.

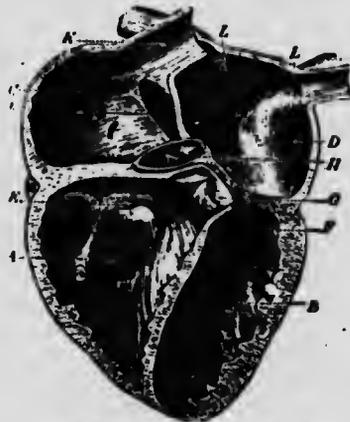


The Heart.

**The right heart** receives the impure or venous blood as it returns from the system and sends it to the lungs to be purified. **The left heart** receives the pure or

arterial blood, as it returns from the lungs, and sends it to all parts of the system to renew the tissue.

The **walls of the heart** are composed of involuntary muscles, and so act independently of the will. Each side has two **chambers**—the auricle and the ventricle. The **auricles** receive the blood; the **ventricles** force it out. As it requires more power to force the blood out than merely to receive it, the walls of the ventricles are thicker and stronger than the walls of the auricles; and as the left ventricle has the heavier



The Walls and Chambers of the Heart.

work to perform, its walls are thicker and stronger than those of the right ventricle. The chambers of the heart are lined with a delicate membrane called **endocardium**, and the whole heart is enclosed in a smooth covering called **pericardium**, which prevents friction when the heart is acting.

The heart has two actions:—(1) the **diastole**—the heart opening to receive the blood; and (2) the **systole**—the heart contracting to force the blood to the lungs and to all parts of the body. These movements are regular and are called the beating of the heart. It beats about seventy times a minute. The movement of the blood is felt in the arteries and is called the **pulse**.

The blood is allowed to flow but one way. The **Tricuspid Valve** opens to allow the blood to pass from the right auricle to the right ventricle, and the **Bicuspid, or Mitral Valve**, opens to allow the blood to pass from the left auricle to the left ventricle. But each closes, when the ventricles contract to force the blood out, and this prevents the blood from returning to the auricles. Thus, also, the **semi-lunar** valves allow the blood to pass out of the ventricles, but prevent it from returning to the heart without going its circuit. Night and day, summer and winter, this wonderful action continues, convincing us of the constant Care that is watching over us.

## 5. THE BLOOD-VESSELS.

a. **The Blood-vessels** are of two kinds—the arteries and the veins. The **Arteries** lead from the heart; the **Veins** lead to the heart. Both are composed of **muscular tissue**, which will expand when an extra flow of blood passes through them. The movement of the blood through the arteries is called

the beating of the **pulse**. It there flows with greater force than in the veins, where the blood merely ebbs back to the heart. For this reason, the **walls** of the arteries are thicker and stronger than the walls of the veins; and as it is more dangerous to cut an artery than a vein, the arteries are placed farther from the surface. The **valves** throughout the veins allow the blood to pass onward only. All the arteries but one—the pulmonary artery—carry **pure blood**, and all the veins but one—the pulmonary vein—carry **im-pure blood**.

b. **The Capillaries** are the minute hair-like blood-vessels forming a network in all parts of the tissues of the body. Some of them are so fine that only one corpuscle of blood can pass at a time, and the walls are so thin that the oxygen and carbonic acid gas and other impurities can pass through. It is here that the work of renewing the tissues goes on. The little corpuscles giving up their supply of oxygen and taking in a load of impurities, start back to the heart and the lungs. The capillaries are arterial or venous, according as they are conveying blood *from* or *to* the heart. The arteries separate into *capillaries*. The capillaries unite into veins.

## 6. THE COURSE OF THE BLOOD.

a. **The Long or Body Circulation**:—When the pure blood returns from the lungs it enters the **left auricle**, passes through the **bicuspid** or **mitral valve** into the **left ventricle** and is forced, by the **systole**, through the **semi-lunar** valve into the aorta the largest artery in the body. The blood passes through the **aorta**, its two branches, and the divisions and sub-divisions of each, until it reaches the **capillaries**, where the work of renewing

the body takes place. The little corpuscles are dancing with delight.

Their loads of oxygen seem to be a delight to them. But, here, the load of oxygen is exchanged for a load of carbonic acid and waste matter, and the blood starts back for the heart. The blood is now venous and the little corpuscles are apparently burdened with their load, for they move along much more slowly. The **valves**, however, prevent their going backward. The



Circulation of the Blood.

little capillaries unite to form the veins, the veins unite to form larger veins—all leading towards the heart.

At last all unite into the **venæ cavæ** and the impure blood enters the **right auricle**.

**b. The Short or Pulmonary Circulation :—**

When the impure blood enters the **right auricle** of the heart, it passes through the **tricuspid valve** into the **right**



The Short Circulation.

**ventricle** and, by the **systole**, is forced through the **semi-lunar valves** into the **pulmonary artery**, which, branching off, divides into the **capillaries** which form the network in the walls of the lungs. Here the little corpuscles give off, to the air, their burden of impurities, and taking in a new supply of oxygen, their color brightens up. As happy as ever, they start back for the heart, and passing through the **pulmonary veins**, the stream of life again enters the **left auricle of the heart**.

## 7. HEAT.

When the oxygen of the capillaries assists to renew the tissues of the body, a chemical change takes place and heat is **produced**. There is "fire" but no flame. As the blood circulates to all parts of the body, this heat is **distributed**; and the amount of heat in the system is **regulated** by the skin. The normal temperature of a person is a little over 98° Fahrenheit.

We can assist nature in regulating the heat and maintaining a proper temperature by:—

- (1) Regular baths to keep the pores of the skin open.
- (2) Selecting clothing according to the climate—linens and cottons in warm climates; woollens and furs in cold climates.
- (3) The selection of our diet—fats in cold climates; fruits in warm climates; grains and a mixed diet in temperate climates.

## THE RESPIRATORY SYSTEM

1. **Respiration :—**
  - a. Inspiration.
  - b. Expiration.
  - c. Purpose of each.
2. **The Organs of Respiration :—**
  - a. **The Lungs :—**
    1. Position, parts, sub-divisions.
    2. Cells, number, arrangement, walls.
    3. Passages--flexible tissue.
    4. Capacity and action.
    5. Lining--mucous membrane.
    6. Covering (pleura)--serous membrane.
  - b. **The Air Passages:—**
    1. Glottis, larynx, trachea, bronchi.
    2. Composed of tissue and cartilage.
    3. Lining--cilia, mucous membrane
3. **Organs connected with Respiration :--**
  - a. Mouth and nose.
  - b. Muscles of chest and diaphragm.
  - c. Pulmonary blood-vessels.
  - d. The vocal organs.
4. **Air :—**
  - a. Pure air.
  - b. Exhaled air.
  - c. Effects of re-breathing air.
  - d. Ventilation--essentials.
  - e. Instances of lack of ventilation.
  - f. Nature's provisions to purify the air.
5. **Diseases of the Respiratory Organs.**
6. **Hygiene and Respiration :—**
  - a. General.
  - b. Alcohol—See Chapter VI.
  - c. Tobacco--See Chapter VII.

# THE RESPIRATORY SYSTEM.

## I. RESPIRATION.

**Respiration** is the process of inhaling and exhaling air, to purify the venous blood and give it a constant supply of oxygen. It consists of two parts :

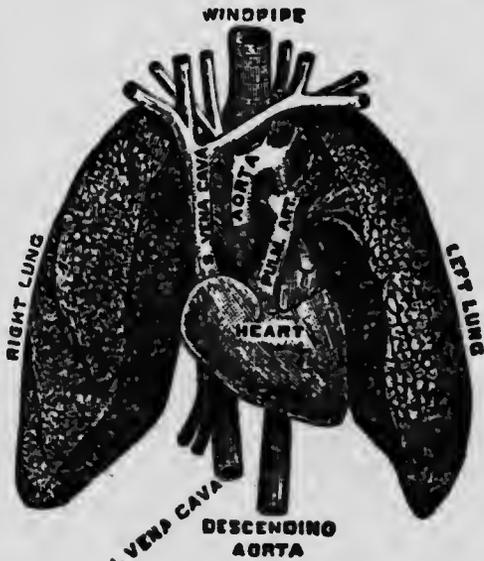
a. **Inspiration**, which consists of expanding the chest, lowering the diaphragm and allowing the air to rush in and fill the myriads of cells in the lungs.

b. **Expiration**, which consists of contracting the chest, raising the diaphragm and expelling the air.

c. The first carries oxygen to the blood ; and the second carries out of the system, the impurities received from the blood.

## 2. THE ORGANS OF RESPIRATION.

a. **The lungs** are two light, spongy, elastic organs, situated in the chest and separated from each other by the heart and the larger blood-vessels. They are composed of a multitude of **lobules** each surrounding an air passage and its cluster of many hundreds of **air-cells**, which are separated from each other by very thin walls of tissue. These walls or partitions, although exceedingly thin, contain a dense **net-work of capillaries**. Some of



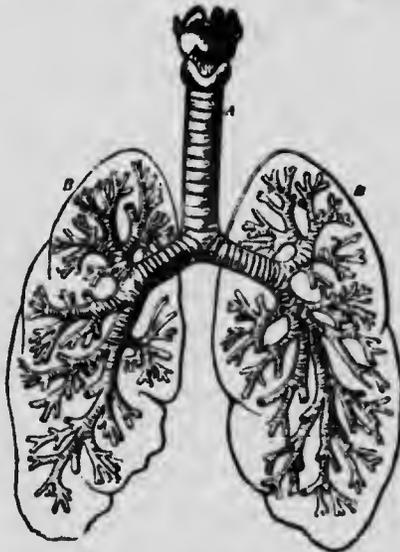
The Position of the Lungs.

these are to carry nutriment to the lungs, but the most of them carry **venous blood** to the lungs to be purified, revived with oxygen, and then sent back to the heart.

The cavities of the lungs and the passages leading to them are lined with a most delicate and sensitive **mucous membrane** which detects impurities; and the passages leading to the lungs are coated with **cilia**—very fine filaments which catch the dust and prevent it from entering the lungs.

We breathe about seventeen or eighteen times a minute. The ordinary work of respiration is carried on by involuntary muscles and so does not require an effort of the will. In an **ordinary breath**, we inhale and exhale 20—30 cubic inches of air; but when an average-sized man takes in a deep, **full breath** and then breathes out as much as he can, he exhales about 230 cubic inches. This amount is called the **breathing capacity** of the lungs and depends on the size of the person. About 100 cubic inches of air still remains in the lungs. We cannot possibly empty them of all air, for the interchange between the air and the blood must never cease, or we would die.

b. **The Air Passages** leading to the lungs are composed of tissue and cartilage. The cartilage strengthens the



The Lungs and the Air-passages.

passages and keeps them always open. The **glottis**, the opening to these passages, is at the base of the tongue and is protected by a little lid—the **epiglottis**—which closes when we swallow and so excludes all but air from the passage. The air passes through the **larynx** which contains the vocal chords, down the **trachea** or windpipe, through the two **bronchi** which lead to the two lungs, and then dividing into the **bronchial tubes**, passes to the myriads of air-cells which fill the lungs.

c. **The Covering.** The lungs are enclosed in the **pleura**—a closed sac composed of two layers. The outer layer is attached to the chest, while the inner layer is attached to the lungs. These secrete a lubricating fluid which **prevents friction** in the constant movement of the lungs.

### 3. ORGANS CONNECTED WITH RESPIRATION.

a. **The Mouth and Nose** through which the air enters the system.

b. **The Muscles of the Chest and diaphragm** which expand, or contract, when we inhale and exhale air.

c. **The Pulmonary Blood-vessels** which convey the blood to the lungs.

d. **The Vocal Organs** which are situated in the larynx.

### 4. AIR.

a. **Pure Air** is composed of about one-fifth of oxygen and four-fifths of nitrogen. The nitrogen is

merely to dilute the oxygen, which though stimulating and life-giving must not be taken pure.

**b. Exhaled Air.** When the **air that is inhaled** enters the myriads of air cells it comes very close to the blood in the capillaries which form a complete network in the thin partitions separating the cells. The blood cannot pass through, but it gives off the impurities which the little corpuscles have collected from all parts of the body, and at the same time, it takes in oxygen to carry to the heart, and then, to all parts of the body, to assist in building up tissue. The air that is then expelled from the lungs is quite different from the air that was inhaled. It is **warmer** and quite **moist**. It is not only **deprived of its oxygen** but is **charged with carbonic acid gas** and other impurities. It is loaded with **worn out tissue** and sometimes it **contains germs of disease**. Instead of it being stimulating and life-giving **it is depressing and poisonous**.

**c. Effects of re-breathing Air.** If the air be re-breathed it will not purify the blood, and if this continue :—

1. The blood stagnates.
2. The muscles become less active.
3. The heart acts slowly and feebly.
4. The brain clogs, and one becomes drowsy.
5. The head aches.
6. Consciousness is lost ; one goes to sleep.
7. The vital organs cease to act.
8. Death takes place.

**d. Ventilation.** The persons, the lights, and the fires in a room, are constantly consuming the oxygen and poisoning the air. The room, therefore needs to be ventilated. **Ventilation** is the process by which

the impure air is taken from a room and a constant current of fresh air supplied. A good system of ventilation will provide a constant supply of pure warm air, while it expels the impure air without producing a perceptible draft. About six hundred cubic feet of air should be allowed for each person, and many times that much for each fire and each light.

**e. Instances of Lack of Ventilation.** Many stories are on record, to show the horrors of lack of ventilation. We shall merely refer to:—

1. The Black Hole of Calcutta.
2. The "Londonderry" in a Storm.
3. Russian Prisoners at Austerlitz.
4. The Scottish Dancing-party.

The air has always some impurities, but in towns and cities, and around uncleanly homes, the air is often very impure and loaded with germs of disease. The impurities in the air are scattered by the winds or washed down by the rains, while the carbonic acid gas is utilized by the plants.

## 5. DISEASES OF THE RESPIRATORY ORGANS.

**a. Colds**—Caused by stoppage of perspiration.

**b. Inflammation**—Redness, heat, pain and swelling of any part of the body, and from many causes.

**c. Croup**—Inflammation of the mucous membrane of the larynx and trachea.

**d. Bronchitis**—Inflammation of the mucous membrane of the bronchial tubes.

**e. Pneumonia**—Inflammation of the lungs affecting chiefly the air cells.

- f. **Pleurisy**—Inflammation of the pleura.
- g. **Consumption**—A disease which destroys the substance of the lungs.
- h. **Asphyxia**—Death by drowning, strangling or choking.
- i. **Diphtheria**—
- j. **Stammering**—A hesitancy in speech.

### 6. HYGIENE—General Rules.

- a. Stand or sit in such a position as to give the lungs a chance to act freely.
- b. Do not wear tight clothing, and adapt the quality and quantity to the climate.
- c. Breathe through the nose.
- d. Use good wholesome food.
- e. Keep the home clean, dry, well lighted and well ventilated.

## THE DIGESTIVE SYSTEM.

### 1. Food :—

- a.* What?—Why required?
- b.* Foods—solids and liquids.  
—nitrogenous, carbonaceous, minerals.
- c.* Diet.
- d.* Beverages—natural and artificial.

### 2. Digestion :—

- a.* The Process of Digestion—steps.
- b.* The Alimentary Canal—parts.

### 3. The Organs of Digestion :—

- a.* Mouth—containing the tongue and the teeth.
- b.* Teeth—sets, kinds, parts, material, function.
- c.* Tongue—muscular, functions.
- d.* Salivary glands—function, position, names.
- e.* Palate—hard and soft.
- f.* Pharynx—position, openings.
- g.* Oesophagus—coats, function.
- h.* Stomach—position, size, coats, openings.  
—lining, color, glands, muscles, chyme.
- i.* Intestines—parts, coats, glands, juices, chyle.  
—lining, villi, lacteals, absorption.
- j.* Synopsis.

### 4. Diseases of the Organs of Digestion :—

### 5. Hygiene :—

- a.* Food, meals, stomach, teeth.
- b.* Alcohol and Digestion—See Chapter VI.
- c.* Tobacco and Digestion—See Chapter VII.

# THE DIGESTIVE SYSTEM.

## I. FOOD.

**a. Food** is any substance which can be taken into the system, then digested, and the nutriment changed into blood. This is required to replenish the supply of blood, which is constantly being used to build up the parts of the body, and keep the person alive.

**b. Foods** are solids or liquids, and may be grouped into three classes :—

(1) **Nitrogenous**, or tissue-forming foods—*white of eggs, lean meat, casein and gluten.*

(2) **Carbonaceous**, or heat-producing foods—*sugar, starch, fats.*

(3) **Minerals**, or inorganic foods—*water, lime, salt, iron, phosphorus.*

**c. Diet** :—All of these three classes of foods are necessary to build up the various parts of the body—bone, tissue, and brain. If one class be lacking, some part of the system must suffer. Our diet, therefore, should consist of a **variety of foods**, but the amount of each kind will depend on the climate, and the condition of the person. **Milk** is the only food which contains all that is necessary to support life

**d. Drinks** are natural, or artificial :—

**Natural Drinks** are those found in nature, and like water and milk, are necessary to life. Water forms the greater part of our bodies. It helps to dis-

solve our food, holds it in solution, and gives our bodies size, form and flexibility.

**Artificial Drinks** are those which are prepared by man. They are not necessary to life, and some of them are injurious and even fatal. They may be divided into two classes :—

- (1) **Household drinks**—Tea, coffee, cocoa.
- (2) **Spirituous beverages**—All containing alcohol
  - (a) **Malt liquors**—Ale, beer, stout, porter.
  - (b) **Spirits**—Gin, rum, whisky, brandy
  - (c) **Wines**—All made from fruits.

Most of these are nauseous, and make the person sick the first time they are taken; but an appetite for them may be formed which becomes uncontrollable and ruinous to the individual, the family, and the state.

## 2. DIGESTION.

**a. Digestion** is the process by which the nutriment of the food we eat, is changed into blood. This process takes place in the alimentary canal and consists of six steps :—

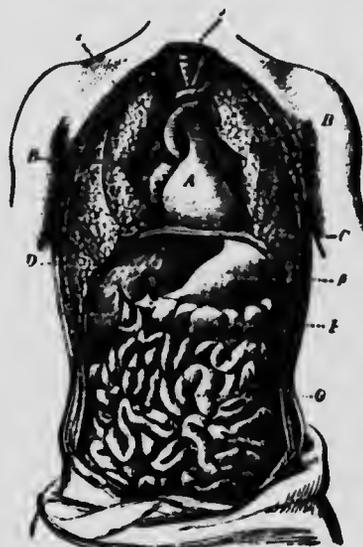
1. Mastication—by the teeth.
2. Insalivation—with saliva.
3. Swallowing—voluntary and involuntary.
4. Gastric digestion—to chyme.
5. Intestinal digestion—to chyle.
6. Absorption—by veins and lacteals.

**b. The Alimentary Canal** is the tube leading through the body, in which the food is received, the nutriment absorbed and passed over to renew the supply of blood (assimilated). It consists of :—

The mouth, pharynx, œsophagus, stomach, duodenum, small intestine and large intestine. Its **lining** is a delicate, mucous membrane, which is a continuation of the skin. On the outside of this membrane, is a coat of connective tissue and also a coat of two layers of muscular fibres.

Connected with the alimentary canal, there are **glands** which secrete certain **fluids** that assist in digestion. These glands are: — (1) the salivary glands; (2) the gastric glands; (3) the liver; (4) the pancreas, and (5) the intestinal glands. Some of these are situated in the mucous membrane of the canal, but all are connected with the canal by little ducts.

Chest and Abdomen.



A. Heart.	E. Gall sac.
B. Lungs.	F. Stomach.
C. Diaphragm.	G. Small intestines.
D. Liver.	H. Large intestines.

### 3. THE ORGANS OF DIGESTION.

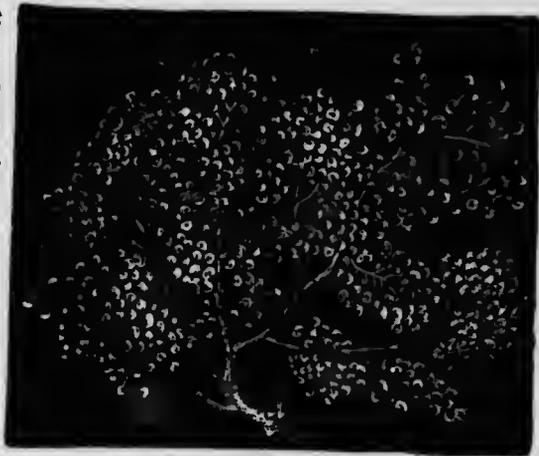
**a. The Mouth** is the opening into the alimentary canal. It contains the tongue and the teeth, and receives the saliva from the salivary glands.

**b. The Teeth**—upper and lower—are two rows of bone-like organs. They are situated in the mouth and are used to bite and chew the food. We receive two sets of teeth:—(1) the **temporary set**, of twenty teeth, which grow in childhood, and which soon

decay ; and (2) the **permanent set** which we receive later and which, if properly cared for, will remain during life. This latter set consists of thirty-two teeth :—incisors (8), canines (4), bicuspid (8) and molars (12). The crown of the tooth is the part we can see ; the root is the part hidden beneath the gums. Each tooth is composed of a very fine kind of bone, called dentine ; the crown is covered with enamel ; and the pulp in the centre contains blood vessels and nerves.

**c. The Tongue** is a muscular organ in the mouth. It contains the nerves of taste, is covered with papillæ and always indicates the condition of the stomach. Its function is to assist in chewing and in speaking.

**d. The Salivary Glands** are six in number :—  
 (1) the **parotid glands**, a little below and in front of each ear ; (2) the **sub-maxillary glands**, under the lower jaw ; (3) the **sub-lingual glands**, under the tongue. Each is composed of a multitude of little cells which secrete an alkaline fluid called **saliva**. It enters the mouth through little ducts, moistens the food, and changes the starch to sugar.



The Parotid Gland.

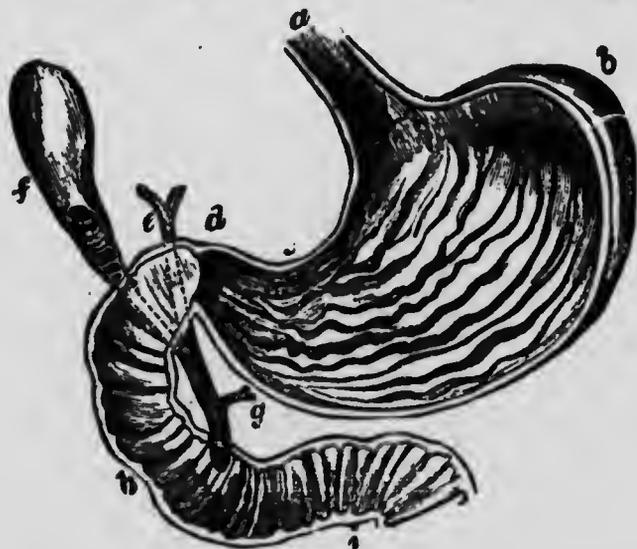
**e. The Palate** is the roof of the mouth The

front part is called the hard palate ; the back part is the soft palate.

**f. The Pharynx** is the cavity behind the mouth. Openings connect it with the mouth, the nose, the two ears, the lungs and the stomach. The **epiglottis**, the little lid covering the glottis, prevents the food from getting into the wind-pipe and going "the wrong way."

**g. The Œsophagus**, or gullet, is the passage leading from the pharynx to the stomach. It is composed of three coats:—(1) mucous membrane, (2) connective tissue, and (3) muscular tissue. The muscles are involuntary, and lie both lengthwise and around the gullet. By their contracting, the food is forced into the stomach.

**h. The Stomach**, the chief organ of digestion,



The Stomach—laid open.

is a pear-shaped expansion of the alimentary canal, situated at the upper part of the abdomen. It can

contain about three or four pints. The food enters it through the **cardiac opening** and passes out through the **pylorus**. It has four coats:—(1) mucous membrane, (2) connective tissue, (3) muscular fibre, and (4) a smooth, serous membrane which covers the stomach, holds it in its place, and prevents friction from the movements of the the stomach.

**The Mucous Membrane** is rich in blood-vessels. When the stomach is at rest, very little blood flows through these arteries, and the lining is of a delicate, pink color. But when the food enters the stomach, the blood flows quite freely through the arteries, and the lining becomes a deep red. The mucous membrane contains numberless little **gastric cells**, which secrete a slightly acid fluid, called **gastric juice**. It contains pepsin and assists in digesting nitrogenous foods. The flow of this fluid is increased by warm food and by mirth. It is unduly excited by mustard, pepper, or alcohol, while it is stopped by cold water, iced food, fear, anger, or fatigue.

**The Muscles** of the stomach run in different directions, and, by contracting, they give the food a peculiar, churning (peristaltic) motion, which thoroughly mixes the food to a soupy substance called **chyme**. **The veins** in the lining of the stomach, absorb some of the water, the sugar, and other easily digested material, and these at once enter the circulation. In time, the remainder passes through the pylorus and enters the duodenum.

i. **The Intestines** include the duodenum, the small intestines, and the large intestines (the colon). These, like the stomach, have four coats. The duodenum receives the bile and the pancreatic juice. **The bile** is a bitter, greenish-yellow fluid,

which is secreted by the liver, and stored in the gall sac. By it, the globules of fat, in the chyme, are broken up into minute particles.

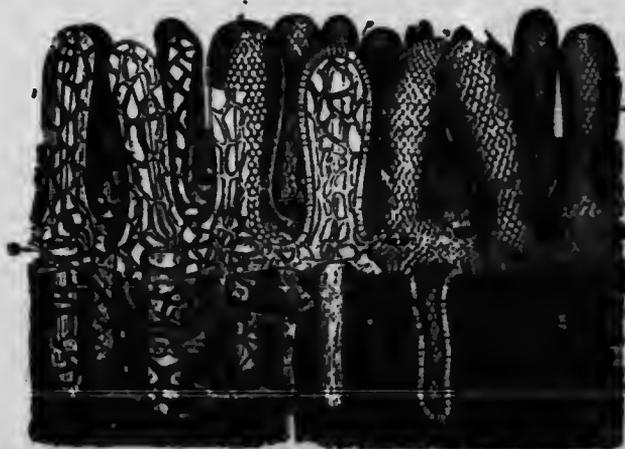
**The pancreatic juice** is a colorless, alkaline fluid, which is secreted by the pancreas, during digestion. It contains certain ferments which act on all kinds of foods, changing the starch to sugar, emulsifying the fats, and digesting nitrogenous food. A third fluid, called **intestinal juice**, which is secreted by numberless little glands in the mucous membrane of the small intestine acts upon

the chyme, and the whole is changed to a milky substance called **chyle**.

The mucous membrane of the small intestine, is covered with a multitude of small projections called



Stomach and Intestines.



The Mucous Membrane of the Intestines magnified to show the Villi and the Lacteals.

**villi.** There are about seven thousand of them to a square inch, and each is called a villus. Although so small, each is supplied with **blood vessels** and a **lacteal**. The little villi **absorb** nutriment from the chyle. This is collected by the **lacteals** and carried by the **lymphatics** to the neck, where it enters the circulation, through the thoracic duct.

**j. Synopsis** :—Thus the food is masticated, and moistened with the saliva in the mouth, and the starch is partly changed to sugar. It is then swallowed, and passing down the œsophagus, it enters the stomach through the cardiac opening. Here, the gastric juice, secreted by the gastric cells, helps to digest albumens, tissues, casein and gluten, and all is thoroughly mixed to a soupy substance called chyme. The veins in the mucous membrane absorb part of the food which is digested, and, in time, the remainder passes through the pylorus into the duodenum. Here, the bile, from the liver, breaks up the fats; the pancreatic juice, from the pancreas, acts on all the foods, and the intestinal juice affects the casein. The chyme is thus changed to chyle. The little villi of the small intestines, absorb the nutriment from the chyle; the lacteals collect it and the lymphatics convey it to the thoracic duct where it enters the circulation of the blood.

## The Digestive Fluids.

Name.	Nature.	From:—	Affects:—	Where.
Saliva.	Alkaline, colorless	Salivary glands.	Starches.	In mouth.
Gastric Juice.	Acid, pepsin.	Gastric cells.	Nitrogenous foods.	In stomach.
Bile.	Bitter, yellow.	Liver.	Fats.	In duodenum.
Pancreatic Juice.	Alkaline, colorless	Pancreas.	All foods	In duodenum.
Intestinal Juice.	Curdling ferment.	Intestinal glands.	Casein of milk.	In intestines.

## DISEASES OF THE ORGANS OF DIGESTION.

- a. **Mumps**—Inflammation and swelling of the parotid glands.
- b. **Diphtheria**—Often begins on the tonsils.
- c. **Quinsy**—Inflammation and bealing of the tonsils.
- d. **Indigestion**—Difficulty, or failure to digest some of the food we eat.
- e. **Dyspepsia**—Chronic indigestion.
- f. **The Stomach** may become **irritated, inflamed, ulcerated** and **cancerous**.

## HYGIENE

- a.—**Food**—(1) Choose good, well-cooked, plain, wholesome food.
  - (2) Avoid those foods which do not agree with *you*.
  - (3) Chew your food well, and do not drink while the food is in the mouth.
  - (4) Avoid alcoholic drinks. They are no food.
- b. **Meals**—(1) Have regular meal times, and a mixed diet.
  - (2) Do not eat when fatigued, angry, or worried.
  - (3) Encourage pleasantries during meal time.
- c. **Stomach**—Remember warm foods stimulate the gastric glands, cold foods stop their action, but alcohol, pepper, and mustard unduly excite them.
- d. **The Teeth**—(1) Clean them regularly.
  - (2) Avoid food too hot, too cold, too hard.
  - (3) Have the teeth regularly examined by a dentist.

# THE NERVOUS SYSTEM.

*The Manager of the Systems of the Body.*

1. **The Organs of the Nervous System:—**
  - a. The Brain
  - b. The Spinal Cord. } Cerebro-Spina Axis.
  - c. The Nerves.
  - d. The Ganglia.
2. **The Brain:—**
  - a. Position.
  - b. Parts—cerebrum, cerebellum.—functions.
  - c. Form—convoluted hemispheres—right, left.  
—cerebrum—irregular convolutions.  
—cerebellum—parallel convolutions.
  - d. Material—white and gray matter ;  
—position, structure, and function of each.
  - e. Weight—40—53 oz. ; heaviest in males.
  - f. The power of the brain depends on .—  
—size, shape, and amount of gray matter.
  - g. Protection—position, skull, coverings, water-bed.
3. **The Spinal Cord:—**
  - a. Position.
  - b. Parts—spinal cord and medulla oblongata.
  - c. Form—a double cylindrical cord.
  - d. Material—white and gray matter—arrangement.
  - e. Function—to conduct messages —spinal nerves.
  - f. Protection—spine, coverings, attachment, water-bed.
4. **The Nerves:—**
  - a. Appearance.
  - b. Kinds—(1) according to origin, (2) according to function.  
(1) spinal, cranial, sympathetic.  
(2) sensory and motor.
5. **Diseases of the Organs of the Nervous System.**
6. **Hygiene:—**
  - a. Development and rest.
  - b. Narcotics—use and abuse.
  - c. Alcohol and the Nervous System—See Chapter VI.
  - d. Tobacco and the Nervous System—See Chapter VII.

# THE NERVOUS SYSTEM.

## I. ORGANS OF NERVOUS SYSTEM.

- a. **The Brain**—the centre of the nervous system and the seat of the will. It is situated in the skull and controls every part of the body.
- b. **The Spinal Cord**—that part of the nervous system which is in the cavity of the back bone.
- c. **The Nerves**—glistening, milk-white threads which connect the brain with all parts of the body.
- d. **The Ganglia**—nerve centres of gray matter which are subject to the brain.

## 2. THE BRAIN.

a. **The Brain**, the centre of the nervous system, is the most important organ of the body. It is enclosed in the skull, the strong, bony box which forms the top of the head.

b. The brain is composed of two parts—the cerebrum and the cerebellum.

**The cerebrum**, the top and front part of the brain, is the centre of intelligence and thought, and is about seven times as heavy as

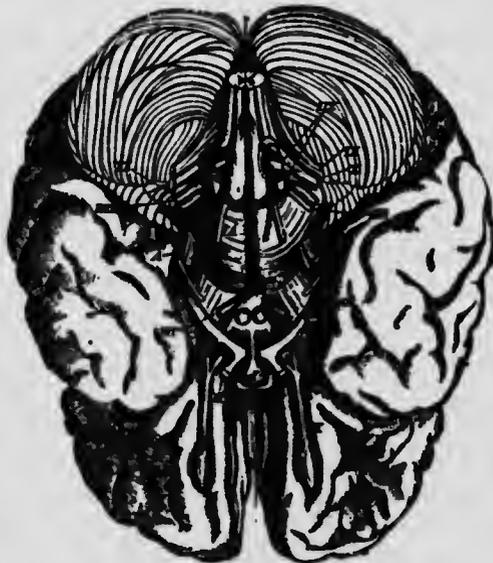
**the cerebellum**, the lower and back part of the brain, which has control of the voluntary muscles of locomotion.



Vertical Section of the Brain

c. The cerebrum and the cerebellum are each composed of **two hemispheres**, the right and the left, separated by a deep fissure. Each pair of hemispheres have the same structure and material, and also a similar function to perform, but each hemisphere of the cerebellum is subordinate to the opposite hemisphere of the cerebrum. **The surface** of each lies in deep folds, and is said to be **convoluted**. On the cerebellum, the folds are parallel; but on the cerebrum, they are irregular, the surface having much the appearance of the kernel of an English walnut. The number and depth of the convolutions indicate the development of the brain.

d. The brain is composed of white and gray matter, and is richly supplied with blood vessels. **The white matter**, which is in the centre, is composed of minute, white fibres. These also form the nerves and carry the orders and messages of the brain. The number of these fibres is not increased during life. **The gray matter** forms a layer about a quarter of an inch thick on the surface of the brain, and consists of myriads of little cells. The number of these may be increased by mental activity. During childhood they increase very



Base of the Brain.

rapidly but more slowly as the years go by. This is the part of the brain which receives the messages from all parts of the body, the part which does the thinking and gives the orders. It is **the executive** of the body, and the amount of gray matter indicates the development of the brain.

**e. The weight** of the brain varies in different persons, and ranges from 40—53 oz. In a few cases it has reached 64 oz. It is heavier in the male.

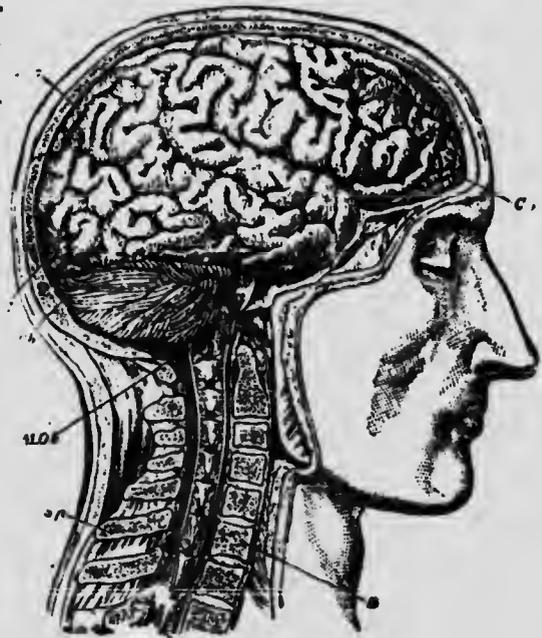
**f. The power** of the brain depends on:—

(1) The absolute size of the brain.

(2) The relative size of the cerebrum.

(3) The amount of gray matter, and this depends on the number and depth of the folds. The more numerous the convolutions, and the deeper the folds, the greater will be the surface, and therefore the greater will be the amount of gray matter.

**g. Protection:**—The importance and delicateness of the brain is shown by the care that is taken to protect it. **The skull**, which encloses it, is composed of nearly flat, arched bones which are joined together so as to resist any ordinary blow. It is placed **at the top of the**



Side View of the Brain.

**head**, where it is least liable to jars, and besides, it is surrounded by a **water-bed** of cerebro-spinal fluid. This fluid can readily pass into the spinal canal when there is an extra flow of blood to the brain.

The brain is enclosed in three coverings :—

(1) **The pia mater**—the inner covering—a covering of fine tissues, rich in blood vessels and receiving about one-fifth of the whole circulation of the blood.

(2) **The arachnoid**—a double membrane, as delicate as a spider's web. It contains a fluid like water, and forms a closed sac about the brain.

(3) **The dura mater**—the outer covering—a tough membrane which lines the skull and separates and supports the hemispheres of the brain.

### 3. The Spinal Cord.

**The Spinal Cord** is that portion of the nervous matter which is in the spinal canal—the cavity in the back bone. It consists of two parts—the **spinal cord**, and the **medulla oblongata**, which is the enlarged top part of the cord which enters the skull. Like

the brain, the whole cord is divided into a right side and a left side, by two deep **fissures**. It is composed of white matter on the surface and gray matter in the inside. Its principal function is to conduct messages *to* and *from*



S. Spinal nerve  
 A. Anterior root  
 P. Posterior root  
 G. Ganglion. } White—fibres.  
 Gray—cells.

the brain. From each side of the spinal cord, thirty-one nerves pass off through little apertures in the spinal col.

umn. Each spinal nerve has two roots. The **posterior root** is composed of sensory nerve-fibres. The **anterior root** is composed of motor nerve-fibres. The two roots unite in one sheath and form a **plexus**, from which single nerves branch out and control the movements of the body and the limbs.

The spinal cord is as carefully **protected** as the brain. It is securely **lodged in the canal** in the centre of the spine, is also surrounded by three **coverings**, is richly supplied with blood-vessels and is suspended in the **cerebro-spinal fluid**. The middle covering is a sheath, attached at the top and at certain other parts and this admits of the bending of the spine without injuring the cord.

#### 4. The Nerves.

a. The **nerves** are milk-white fibres which connect every part of the body with the brain, enabling it to receive impressions from exterior objects, and also to control all the parts of the body.

b. According to their **origin**, the nerves are divided into three classes:—

(1) **Spinal nerves**—thirty-one pairs—those passing out through the spine.

(2) **Cranial nerves**—twelve pairs—those passing out through the skull.

(3) **Sympathetic nerves**—those passing out from the ganglia.

According to their **function**, the nerves are divided into two classes:—

(1) **Sensory nerves**—those which carry sensations and messages to the brain, the nerves which give us sensations of pleasure or of pain. They are the sentinels of the body. If these would be destroyed or cut, all power of feeling would be lost.

(2) **Motor nerves**—Those which carry orders from the brain to produce motion. If these were destroyed or cut, all power of motion would be lost.

Pain is not an unmixed evil. It warns us of danger and enables us to take steps to protect or relieve the part. The skin is richly supplied with sensory nerves; the muscles are richly supplied with motor nerves, the bones have few of either, while the brain itself has none.

**The Cranial Nerves** are in pairs, like all the other nerves and parts of the nervous system. Each pair has a similar function to perform. Each pair is named according to the part they control and the duties they perform.



Nerves from the Medulla Oblongata.

(1) *Olfactory* — the nerves of smell.

(2) *Optic*—the nerves of vision.

(3, 4, 6) *Motores oculi*—to move the eye-balls.

(5) *Trifacial*—to control the face, teeth, and mouth

(7) *Facial*—to control the expression of the face

(8) *Auditory*—the nerves of hearing.

(9) *Glosso-pharyngeal*—Controlling the mucous membrane of the pharynx, etc.

(10) *Pneumo-gastric*—controlling the heart, lungs, stomach, etc.

(11) *Accessory*—to control the organs of voice.

(12) *Hypo-glossal*—to control movements of the tongue. All but one pair branch out from the medulla oblongata.

## 6 HYGIENE.

The brain is the most important part of the human system, and if we would have it perform its functions well we must carefully attend to the following rules :—

- (1) Have pure thoughts, and ennobling ideals.
- (2) Have regular systematic work.
- (3) Have regular change of occupation. Younger children should change at shorter intervals.
- (4) Have a sound mind in a sound body.
- (5) Avoid long hours, over-work, and worry.
- (6) Avoid late hours. Have enough sleep. Children require more sleep than adults. Girls require more sleep than boys. Brain workers more than manual laborers.
- (7) Choose those subjects which are best adapted to brain development and take the work up in logical order. Information is not everything.
- (8) Lack of mental exercise causes the brain to become weak and worthless.
- (9) Do not habitually use narcotics to deaden pain. Seek the cause and apply the remedy.
- (10) Avoid all alcoholic beverages and tobacco.
- (11) Have plenty of good sunlight, and reflect the light in pleasant looks and pleasant words.

## ALCOHOL.

1. **Alcohol :—**
  - a. Nature, preparation, fermentation, distillation.
  - b. Kinds, uses—in the arts and in manufacturing.
2. **Alcoholic Beverages :—**
  - a. Malt Liquors—ale, beer, stout, porter.
  - b. Spirits—gin, rum, whiskey—by distillation.
  - c. Wines—from fruits—by fermentation.
3. **Reasons for Total Abstinence from Alcohol :—**
  - a. It is not necessary.
  - b. It is not a food.
  - c. It is a waste of money.
  - d. It is a poison to the system.
  - e. Disgrace and ruin follow in its train.
4. **Alcohol and the Human System :—**
  - a. Alcohol and the Digestive System.
  - b. Alcohol and the Circulatory System.
  - c. Alcohol and the Respiratory System.
  - d. Alcohol and the Nervous System.
  - e. Alcohol and the Liver, Kidneys, Skin and Muscles.
5. **Effects of Alcohol :—**
  - a. On the Man.
  - b. On the Family.
  - c. On the Community.
  - d. On Posterity.

# ALCOHOL.

## I. ALCOHOL.

**a. Alcohol** is an intoxicating substance obtained from fruits, grains, and wood, by a process of fermentation and distillation.

**Fermentation** is the change that occurs in certain liquids, caused by living organisms called ferments. The sugar and the oxygen are changed, and carbonic acid and alcohol are formed.

**Distillation** is the process by which the alcohol is separated from a fermented liquid. The liquid is heated, the vapor is collected and cooled, forming a liquid containing a greater per cent. of alcohol.

**b. Kinds** :—There are two principal kinds of alcohol :

**Methyl Alcohol** is produced from wood, and is used to produce a smokeless flame.

**Ethyl Alcohol** is produced from fruits and grains, and has many valuable uses :—

- (1) To produce a very hot, smokeless flame,
- (2) To dissolve gums and fats, in manufacturing.
- (3) To preserve animal specimens in museums.
- (4) To prepare certain medicines.
- (5) To use in a few conditions in sickness.
- (6) To fill thermometers for very cold climates.

## 2. ALCOHOLIC BEVERAGES.

From a very early period, to the present time, men have made beverages which contain alcohol; and their record since the days of Noah is one of disgrace and

ruin. These beverages may be grouped into three classes :—

**a. Malt Liquors**, like beer and ale, which are prepared from malt-sprouted grain.

**b. Spirits**, like gin, rum, and whiskey, which are prepared from grain, and the refuse of molasses, by fermentation and distillation.

**c. Wines** of various kinds, which are prepared from all kinds of fruits.

These are different in appearance, taste, and strength, but they are alike in being prepared from decomposed substances, and in containing alcohol with its evil influences. The danger is increased by the drugs which often are added to hide adulteration.

### 3. REASONS FOR TOTAL ABSTINENCE.

**a. It is not necessary** to life, growth, or strength, as is shown by the life of other animals.

**b. It is not a food** like milk and water, as it cannot be digested and changed into blood. It enters the blood and mixes with it, but they never unite. While it remains in the system it is alcohol, and it is alcohol when it is expelled from the system.

**c. It is a poison**, nauseous to the taste, destructive to the tissues of the body, and ruinous to all the organs. It particularly affects the stomach, the heart, the brain, the nerves, the liver and the kidneys; and all the organs of the body unite to expel it as quickly as possible.

**d. It is a waste of money** to give the vast amount which is spent annually for what is not neces-

sary, is no good, and is dangerous. More money is spent in Great Britain, Canada, and United States for alcoholic beverages than is spent for clothing.

**e. It creates an appetite** which disgraces the person, destroys the soul, robs the family, and curses the community and succeeding generations.

#### 4. ALCOHOL AND THE HUMAN SYSTEM.

The effects of alcohol on the human system are appalling. At every step of its course through the body, its terrible affinity for water is shown, neutralizing the work of each organ of the body, and destroying the organ, or rendering it unable to perform its function properly. The man who named it "*aqua vita*" and died of its effects, made a sad mistake. Instead of maintaining eternal youth it produces premature old age. And countless thousands are today making the same sad mistake, as if the past held up no "night-mare" warnings, or the ravages of alcohol were not visible on every side.

It is difficult to discuss the influence of alcohol on one system of the body, without at the same time considering its effects on the other systems, for all the systems of the body form one unit, and, at all parts, they are acting in harmony, under the control of the wonderful nervous system. But as we have already taken up the systems of the body and seen the particular functions of each organ, we are prepared to understand the points which we shall now take up, following, as nearly as possible, the order of occurrence and showing the immediate, and then the permanent affects of this monster of death.

### a. Alcohol and Digestion.

When alcoholic drinks are taken into the system, its influence is instantaneous, and the digestive system sets to work at once to dilute the poison. The alcohol absorbs the moisture from the delicate parts of the alimentary canal, destroys the digestive fluids and the glands which secrete them, hinders digestion and weakens and destroys the organs which absorb the nutriment from the food. It really cuts off the supply of fuel which feeds the fire of life.

(1) **It inflames the Mucous Membrane** and absorbs its moisture. The delicate pink becomes a deep red, and tipping makes this redness permanent. In the drunkard the lining of the stomach and intestines becomes a purplish black and is covered with ulcers.

(2) **The Capillaries become swollen**, and in time, their walls become thick and tough. Thus the nutriment of the blood is unable to pass through to renew the stomach, and the capillaries are unable to absorb the nutriment from the food to replenish the blood.

(3) **It hinders digestion** by preventing the decomposition of the food, and by separating the pepsin from the gastric juice.

(4) **It weakens the Gastric Glands** by overwork, exciting them to too active secretion to dilute the alcohol. Afterwards they are not able to secrete enough to digest the food.

(5) **The drinker suffers** from indigestion, dyspepsia, ulcers of the stomach, nausea, vomiting and loss of appetite.

### b. Alcohol and the Circulation.

The alcohol passes directly into the circulation through the capillaries of the mucous membrane of the stomach. Here it attacks the very fire of life, overcoming the nerves, which regulate the flow of the blood, weakening the corpuscles, destroying the nutriment in the blood, overworking the heart, and preventing the renewing of the system. The circulatory system at once makes a violent effort to expel the poison.

(1) **It paralyzes the nerves** which control the capillaries and regulate the flow of blood. These at once dilate and the blood flows too freely.

(2) **It weakens the corpuscles** by absorbing their moisture. They shrink and harden and are not able to carry their loads of oxygen or of waste matter. Sometimes they adhere to one another and block the circulation at some part.

(3) **It weakens the blood** and renders it impure and unfit to nourish the tissues of the body. The alcohol mixes with the blood, which then becomes an irritating narcotic poison, instead of being a soothing, nourishing liquid for all the tissues of the body. If too much liquid is taken, as with beer-drinkers, the blood becomes thin. When spirits are taken, it destroys the albumen which goes to nourish the muscles, and the blood becomes thick and coagulated. The blood loses its healing powers and the whole muscular system is starved and weakened.

(4) **It weakens the heart** by over-work trying to expel the poison and to make up for what the other organs fail to do. Two ounces of alcohol—a small amount for even a moderate drinker—will cause 6,000 extra beats in twenty-four hours. This is a loss of enough

energy to raise seven tons of coal one foot. This extra effort is followed by a period of depression. The heart flags; the brain and muscles are exhausted; then comes the temptation to take another glass.

(5) **It weakens the capillaries.** Day after day the capillaries are dilated, till they lose their elasticity, like the elastic of an old gaiter, and remain permanently dilated. This is seen in the nose, eyes, and cheeks of the drinker. The walls of the capillaries grow thick and hard, and this hinders the work of renewing the tissues, which should be going on constantly.

(6) **It undermines the whole system.** Overwork and lack of nourishment causes the heart to become fat and weak, and the beat to be irregular. The work of circulation is not properly performed. Weak fat forms where strong muscle should be, and this deceives those who think size indicates strength and health. The endurance of the whole system is undermined, and the person is liable to fall a prey to any epidemic which may occur.

### c. Alcohol and Respiration.

The circulation of the blood quickly carries the alcohol to the lungs, and the respiratory organs unite to expel the intruder from the system. Here, it irritates the lungs and air passages, blunts the nerves, increases the respirations, overworks the organs, hinders the work of purifying the blood and so undermines the whole system.

(1) **The alcohol dilates the capillaries** and too much blood flows to the lungs.

(2) **The capillaries become tough and permanently dilated,** and the walls of the air-cells become thicker.

(3) **The blood is not purified**, as the free exchange of the poisons in the blood for the oxygen of the air is prevented by these thickened walls.

(4) **This injures the power of the muscles** of respiration as well as of the other muscles of the body.

(5) The heart and lungs are urged to **increased action** to make up for the imperfect work.

(6) **The breathing** becomes labored, frequent and wheezy.

(7) **The endurance** of the whole system is lessened; the poorly clad drunkard is apt to be chilled, and pleurisy and inflammation follow.

#### d. Alcohol and the Nervous System.

Alcohol quickly reaches the brain through the circulation, and on account of the delicateness of the brain matter, and the large amount of blood which flows to it, the effect is most disastrous to the organ itself, and to all the organs which the brain controls. If the person continues to take the alcohol the stage of excitement is followed by a stage of muscular weakness, then by a stage of mental weakness, and lastly, by a stage of unconsciousness, and possibly by death. The person becomes dead drunk, and a brain once thoroughly intoxicated will never regain its proper condition.

Drunkenness diseases the brain, weakens the will, banishes ambition and destroys self-respect. The finer feelings of the father, the husband, and the friend are displaced by feelings which would disgrace the most brutal of the lower animals, and the happy, useful man becomes a curse to the community.

**(1) The Stage of Excitement**—when alcohol is taken into the system :—

(a) The nerves controlling the capillaries are paralyzed.

(b) The blood-vessels are dilated and circulation quickens.

(c) The brain becomes congested with blood which is impure with alcohol and carbonic acid.

(d) The whole system is excited and inflamed without being supplied with extra strength.

(e) The temperature rises, the circulation rushes to the surface, the skin is flushed, and the heat escapes through the pores. This is very dangerous in cold climates.

(f) The mental activity is not safe.

**(2) The Stage of Muscular Weakness**—when more alcohol is taken :—

(a) The spinal cord becomes affected.

(b) The control of the muscles is lost.

(c) The staggering step and unsteady hand show how the muscles are weakened.

(d) Then the temperature begins to fall and chill follows.

**(3) The Stage of Mental Weakness**—when more alcohol is taken :—

(a) The cerebrum is now affected.

(b) The emotions are quickened; the will weakened.

(c) The mind becomes a chaos.

(d) The person becomes garrulous, but afterwards remembers nothing of what he has said.

(e) The judgment is gone, and educational polish loses its controlling influence.

(f) The animal instincts gain the mastery. Cowardly, boastful, daring, and brutal acts blacken this stage of drunkenness. The person may commit the worst crimes.

**(4) The Stage of Unconsciousness :—**

(a) The mad revel ends in unconsciousness.

(b) The person is senseless—"dead drunk."

(c) Brain and spinal cord are benumbed.

(d) The weak breathing and feeble action of the heart are the only signs of life.

(e) Only that brain-centre in the medulla oblongata, which controls the circulation and the respiration, continues to act.

(f) The person is liable to die at any moment.

**Alcoholism and the Nervous System.**

There are three classes of drinkers—those who take a moderate amount of alcoholic beverages, those who get on periodic sprees, and those who have a constant craving for alcohol. Alcoholism is a disease of the brain, which shows itself by a constant desire for alcohol. Dipsomania is a disease of the brain, which shows itself by periodic craving for strong drinks. These terrible diseases may be inherited or be created and developed by tipping, and only moral and spiritual change and nerve tonics can cure them.

(a) The brain once intoxicated never regains its proper condition.

(b) The membrane enveloping the nervous matter becomes thickened.

(c) The blood-vessels of the brain lose their elasticity.

(*d*) The nerves are deadened and do not warn of danger. The fineness of touch is lost.

(*e*) The process of nourishment is hindered.

(*f*) The mind and the will become weakened.

(*g*) Headache, red eyes, bloated face, coated tongue, frequent and weak pulse and fever are followed by epilepsy, paralysis, and insanity, and often these are inherited by children.

(*h*) Delirium tremens occur.

### **Alcohol and the Liver.**

The portal vein carries the alcohol direct from the digestive organs to the liver, and, as a large share of the blood goes to this organ, the influence is easily seen.

(1) It changes the color of the bile, and destroys its power to assist in digestion.

(2) It inflames the tissues of the liver.

(3) In time the liver shrinks and hardens, forming "hob-nailed" liver.

(4) Sometimes the liver becomes fatty and enlarged.

(5) The liver cannot perform its function, and disease follows.

### **Alcohol and the Kidneys.**

The function of the kidneys is to strain the blood and excrete the impurities. Alcohol changes the tissues to waxy fat, and the kidneys are not able to do their duty, but allow the albumen of the blood to pass out of the system.

### Alcohol and the Skin.

The skin is to protect the body and assist in purifying the blood and regulating the heat of the body. It is richly supplied with sensory nerves to warn the brain of danger and enable the person to perform the most delicate operations.

- (1) Alcohol deadens the nerves, so that they do not warn the brain of danger, or carry wrong messages
- (2) It opens the pores and robs the body of its heat.
- (3) The skin becomes blood-shot and blue-veined.

### Alcohol and the Muscles.

The muscles are the workers of the body.

- (1) Alcohol paralyzes the nerves which control them.
- (2) Impoverishes the blood which should nourish them.
- (3) Changes them to fat and makes them weak and useless.

### Diseases Caused by Alcohol.

- a. Of the Brain and Nervous System:—Apoplexy, epilepsy, paralysis, vertigo, softening of brain, delirium tremens, dipsomania, alcoholism, loss of memory, dementia.
- b. Of the Lungs:—Congestion, bronchitis, consumption.
- c. Of the Heart:—Irregular beat, feebleness of the walls, dilation, disease of the valves.
- d. Of the Blood:—Scurvy, dropsy, separation of fibrin.
- e. Of the Stomach:—Feebleness, indigestion, irritation, inflammation.
- f. Of the Bowels:—Purging, irritation.
- g. Of the Liver:—Congestion, hardening and shrinking, cirrhosis.
- h. Of the Kidneys:—Fatty or waxy degeneration leading to dropsy.
- i. Of the Muscles:—Fatty change, weakening.
- j. Of the Membranes:—Thickening and loss of elasticity.

### Effects of Alcohol on the Nervous System.

Stage	On Brain, Etc.	Talking, Actions.	On Heart.	On Blood-Vessels.	On Heat of Body.	On Muscles.
I.	A feeling of excitement. The whole system seems to feel better.	Seemingly no difference.	Beats faster.	Capillaries dilate. Increased circulation. Skin becomes redder, temperature rises.	Surface is warmer.	Seemingly no difference.
II.	Person feels jolly.	Says and does ridiculous things.	Beats faster.	Same as in first stage.	Warmer for a time, then a chill follows.	Voluntary muscles affected. Step and hand unsteady.
III.	Mind a chaos. Memory gone.	Silly talk, cruel quarrels, some acts.	Action feeble and unsteady.	Organs of the body are congested. Chill has set in.	Surface colder.	Staggers and falls.
IV.	Seems quite dead. Only one centre acting.	Unable to talk.	Very feeble and unsteady. Respiration very feeble too.	Blood scarcely moves.	Body cold as death.	Voluntary muscles are powerless. Only heart and lungs moving.

## TOBACCO.

### 1. Tobacco :—

- a.* Tobacco, nature, origin.
- b.* History—in England.
- c.* Tobacco using—smoking, chewing, snuffing.
- d.* Forms—leaves, cigars, cigarettes, plugs.
- e.* Tobacco is a poison.
- f.* Constituents of tobacco smoke.

### 2. Reasons for Avoiding Tobacco :—

- a.* It is not a food.
- b.* It creates a habit that enslaves.
- c.* It is an injury to the user.
- d.* It is a habit which is offensive to others.
- e.* It is a bad example to the boys.
- f.* It is unclean to the person and his surroundings.
- g.* It is a great waste of money.
- h.* Is it manly to do what would be impure for a lady?

### 3. Tobacco and the Human System :—

- a.* Mouth—inflamed, causes smoker's sore throat, lost saliva, spongy gums, cancer on the lips.
- b.* Stomach—nausea, vomiting, loss of appetite, dyspepsia.
- c.* Blood—watery, corpuscles changed, poisonous.  
Eels have been killed by sucking a smoker's blood.
- d.* Heart—weak and irregular, poor circulation, person pale.
- e.* Lungs—irritated, producing cough.
- f.* Brain—less active, memory impaired, paralysis of the motor and sympathetic nerves.
- g.* Nerves—blunted, and all the special senses impaired—paralysis of the motor and the sympathetic nerves.
- h.* Sight—confused, color-blindness produced.
- i.* Hearing—ringing sounds, deadened sense.
- j.* Muscles—tremulous.
- k.* Stature—stunted if tobacco is used in youth.

### 4. Effects of Tobacco :—

- a.* On the Boy.
- b.* On the Man.
- c.* On the Home.
- d.* On the Street.
- e.* On the Pocket-book.
- f.* On the Manners.
- g.* Tobacco and Posterity.

## TOBACCO.

*Vice is a monster of such frightful mien,  
As, to be hated, needs but to be seen ;  
Yet seen too oft, familiar with her face,  
We first endure, then pity, then embrace.*

### I. TOBACCO.

a. **Tobacco** of commerce is the leaves of a poisonous, tropical plant which was grown and used by the Indians when Columbus discovered America.

b. **History.** Tobacco was not known to the white man before his visit to America. It was soon taken to Europe and was one of the two plants which Sir Walter Raleigh brought to England. The other was the potato. They are of the same family, but their effects are very different. The one has proved itself to be a terrible curse, while the other is a blessing to mankind. Tobacco was reputed to possess almost miraculous healing powers, but its effects show this to be entirely wrong.

c. **Tobacco using.**—Smoking, chewing, snuffing—are filthy habits which the civilized (?) white man has copied from the barbarian Indians. All these habits are dangerous. Each has its own peculiar dangers, but there are some dangers common to all. The effect they produce will depend on the constitution of the person, and on his occupation.

All “poison-taking” habits create an unnatural appetite, which enslaves the person. In this they are unlike taking any food. We may like the food, but the system does not cry out for it as it does for the poison, to which it has become accustomed.

**d. Forms** :—Tobacco is placed on the market in five forms :

- (1). In bales of leaves to be manufactured.
- (2). As cigars—made of the finest leaves.
- (3). As cigarettes—with refuse tobacco and opiates.
- (4). In plugs—for chewing and smoking.
- (5). In a powder—for snuffing.

The cigarettes are the most dangerous. They are reputed harmless, and are often the stepping-stone to the "tobacco habit." They are usually made of tobacco refuse, drugged so as to hide the adulteration, and they usually contain opiates, which lull the nerves to sleep, so that they are unable to do their duty.

**e. Tobacco is a poison**, as is shown by the effects on one who uses it for the first time. The stomach tries to throw off the poison ; the brain becomes inflamed ; the head aches and the person becomes giddy and deathly pale. By repeated trial, the nerves, the faithful guardians of the body, become so benumbed that they do not protest against the habit. The person thinks he has gained a victory over the tobacco, when he is merely the victim of it.

**f. Constituents of Tobacco Smoke** :—Among the principal constituents of tobacco smoke are :

- (1). **Nicotine**—a powerful poison.
- (2). **Carbonic acid**—produces headache and sleepiness.
- (3). **Carbonic oxide**—produces a tremulous movement of the muscles and so of the heart.
- (4). **Ammonia**—Bites the tongue and excites the mucous membrane, and the salivary glands.

## 2. REASONS FOR AVOIDING TOBACCO.

a. **It is not a food** as it does not contain one ingredient which could go to nourish the body.

b. **It creates a habit** and an appetite which enslaves the victim, and from which it is most difficult to break.

c. **It is an injury to the user**, at first interfering with the functions of the organs and then producing chronic derangement of the system.

d. **It is a habit which is very offensive and sickening** to those who do not use tobacco; and the smoker is so ungentlemanly as to disregard the rights of others. This is seen in the home, on the public streets and in the crowded cars.

e. **It is a bad example to the boys** who are told that only men should use tobacco. This, to the boy, means that it is a manly habit, and the repeated trials behind the barn, under the shed and out of sight, in spite of the nausea and vomiting, tell him strongly the boys desire to be "manly."

f. **It is unclean** to the person, and his surrounding, discoloring the teeth, tainting the breath and giving the clothes a disagreeable odor. Those who chew tobacco, leave pools of filth on the floor, in the corner, and on the street.

g. **It is a great waste of money** for what creates only injury. In the United States twice as much is spent annually for tobacco as for boots and shoes and five times as much as for public education.

h. **Are there two standards of morals?** We would be horrified to see a lady (?) swagger down the street puffing a cigar or a vulgar pipe. Why? Many reasons would be given for avoiding her company.

Is it better for men and boys? A good rule is "*be as pure in thought, word and deed as is the queen who sits opposite your father at the dear old family board.*"

#### 4. EFFECTS OF TOBACCO.

##### a. On the Boy.

The effects of tobacco on a boy are bad. It is while he is growing and the tobacco interferes with the function of the organs which should build up his body, and should make him a strong, healthy, well-developed man. It stunts his growth, it weakens his memory, and he is not so good a scholar. It weakens his heart, and the other muscles of the body, and he does not become so strong a man. It deadens his nerves and injures him for a skilled workman. It weakens the brain and the will, and he becomes irritable and nervous. It is also noticed that boys who smoke tobacco are not so polite; but on the contrary they are disrespectful to elders and those in authority over them.

##### b. On the Man.

Tobacco gains a power over a man which renders him a slave to habit and at the same time undermines his health, deranges his organs, and makes his happiness (?) depend on a filthy practice. His mouth becomes parched, and his lungs irritated with the smoke which is inhaled. His heart becomes weak and irregular; his memory is impaired and his will is so weakened that he finds himself unable to quit the habit, although he knows it is doing him great injury. His nervousness is shown by his irritableness in the home and excitableness on the street or in the place of work. His skill as a workman is impaired, as his fineness of touch is gone and his eyesight is affected.

Sometimes he loses the power to distinguish colors, a disease hardly known in women.

### c. In the Home.

Here money is wasted which should be used for other purposes. The air is poisoned and the health of the other members of the family is affected. A certain lady whose husband was a heavy smoker, was constantly delicate. On the doctor's advice, the husband ceased to smoke in the home, and his wife began to improve and was soon quite well. Many, however, do not see the necessity of such nonsense as giving up their "pleasure" for the "whim" of another, and so they continue to poison the little children who play about their knee, and render them less clear in intellect and weaker in body than they would otherwise be.

Many of them boast of being able to give up the habit when they wish to. In fact this boast is a part of the smoking habit. They assume great wisdom and say that when they see it does any harm they will quit smoking at once; but they little know their weakness; they little know the power of habit. A certain Irishman wrote to his uncle advising him to give up a certain habit, and expressed the belief that it would lengthen his days. The uncle took the advice kindly, and at the end of the first day, wrote to his nephew thanking him for the interest he had shown, and stating he was quite correct in thinking it would lengthen his days, as the one he had just spent had been the longest day of his life. That is when the weakness of the will and the power of the tobacco appetite are shown.

#### **d. On the Street.**

The air is vitiated with poisonous smoke. The streets are discolored with tobacco spit and strewn with "chews" of tobacco and stubs of cigars.

#### **e. On the Pocket-book.**

The amount of money (\$625,000,000) spent annually in United States is amazing—as much as for bread; twice as much as for boots and shoes; twice as much as for cotton goods; three times as much as for woollen goods; four times as much as for public education; forty times as much as for ministers' salaries, and one hundred and twenty times as much as for Home and Foreign Missions. Great Britain and Canada spend a similar proportion for tobacco. In all, alcoholic liquors come first and tobacco second.

We know a person who has a lovely library, bought with the money others waste in tobacco. It contains scores of volumes by the best authors, and is a delight to the person and to the members of his family.

#### **f. On the Manners.**

The tobacco habit is unmannerly, to say the least. The way men will blow their smoke into the face of others is exasperating. They regard it as their right to do as they please; but we must remember that in an ideal civilization each man in stating his privileges will consider and respect the rights of others. But in the crowd, on the cars, there are men who have so far lost their manliness as to pull away at their filthy pipe. He who does so has lost the finest instincts of a gentleman and is becoming a "boor."

#### **g. Tobacco and Posterity.**

One of the saddest phases of this tobacco habit is that innocent children are born into this world with a tobacco appetite and with weakened constitutions. They will have to make a superhuman effort to control the appetite, and will never have a strong will or sound mind and body with which to engage in the conflict.

Shame on the father who is so wrapped up in self! Shame on the man who will willingly continue to be the slave of such a habit! A thousand shames on a man who is the creature of such a fiendish habit, doing its bidding, defending its bad effects, and praising it for virtues which it never possessed!

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