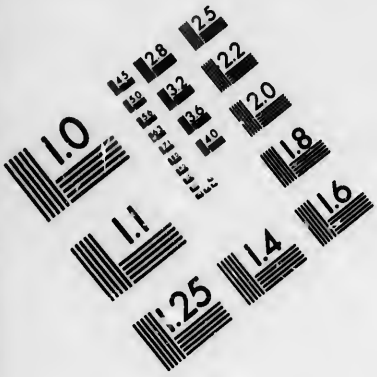
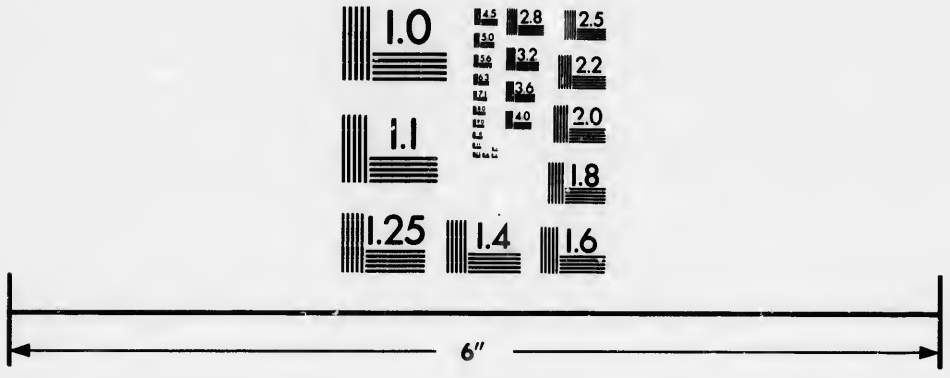
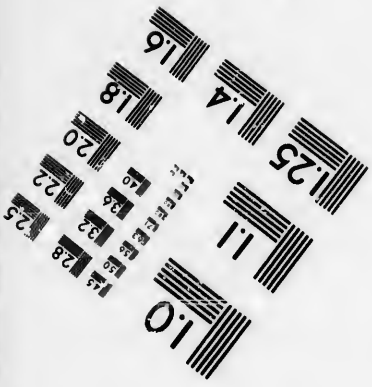
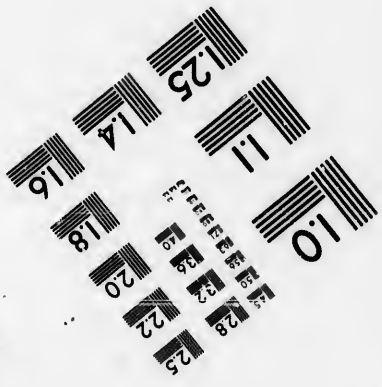


IMAGE EVALUATION TEST TARGET (MT-3)







Photographic Sciences Corporation

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

Technical and Bibliographic Notes/Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

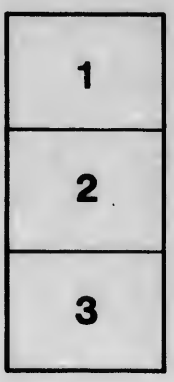
- ☐ Coloured covers/ Couverture de couleur
- ☐ Covers damaged/ Couverture endommagée
- ☐ Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- ☐ Cover title missing/ Le titre de couverture manque
- ☐ Coloured maps/ Cartes géographiques en couleur
- ☐ Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- ☐ Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- ☐ Bound with other material/ Relié avec d'autres documents
- ☐ Tight binding may cause shadows or distortion along interior margin/ La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- ☐ Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- ☐ Additional comments:/ Commentaires supplémentaires:

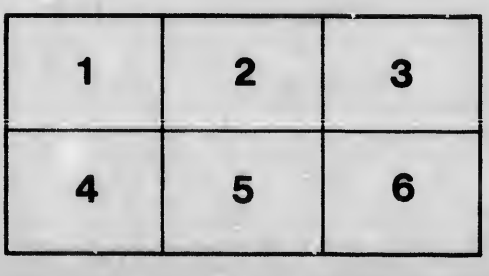
L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- ☐ Coloured pages/ Pages de couleur
- ☐ Pages damaged/ Pages endommagées
- ☐ Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- ☑ Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- ☐ Pages detached/ Pages détachées
- ☑ Showthrough/ Transparence
- ☐ Quality of print varies/ Qualité inégale de l'impression
- ☐ Includes supplementary material/ Comprend du matériel supplémentaire
- ☐ Only edition available/ Seule édition disponible
- ☐ Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image/ Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	12X	14X	16X	18X	20X	22X	24X	26X	28X	30X	32X





THE

TEMPERANCE TEACHINGS OF SCIENCE,

ADAPTED TO

THE USE OF TEACHERS AND PUPILS IN THE PUBLIC SCHOOLS

BY

A. B. PALMER, M.D., LL.D.

Professor of Pathology, Practice of Medicine, and Clinical Medicine in the College of Medicine and Surgery in the University of Michigan.

WITH AN INTRODUCTION BY

MRS. MARY A. LIVERMORE,

President of the Women's Christian Temperance Union, U. S.

ST. JOHN, N. B.
J. & A. McMILLAN, 98 PRINCE WILLIAM STREET.
1889.

[*Prescribed by the Board of Education of New Brunswick.*]

EDUCATION OFFICE,
PROVINCE OF NEW BRUNSWICK.

The Board of Education, under the authority of the Schools Act, has prescribed this edition of Dr. Palmer's *Temperance Teachings of Science*, as a Text-Book for use in the Schools of this Province.

WILLIAM CROCKET,
Chief Superintendent of Education.

NOTE.

THROUGHOUT this volume no opinions have been expressed as to the particular methods of what is called "Temperance Work." Nothing has been said as to the propriety or efficacy of pledges, moral suasion, political agitation, or legislative enactments. Important questions are connected with these subjects, but the sole object has been to bring all, and especially young people, who may honor this little book with a perusal, to the rational conclusion and firm resolve that in whatever form, as an article of "diet," of luxury, or as a beverage, *alcohol is harmful; is useless; we will not take it.*

CONTENTS.

PAGE.

INTRODUCTION. The Need of Knowing the Facts, .. vii

I. Half a Century's Study of the Question, ... 1

II. The Production of Alcohol and the Composition of Alcoholic Liquors, ... 7

III. The Parts and Qualities of the Human System,... 18

IV. The Effects of Alcohol upon the Stomach, ... 28

V. The Action of Alcoholics upon the Liver, ... 37

VI. The Action of Alcohol upon the Lungs, ... 48

VII. The Action of Alcoholics upon the Heart, ... 59

VIII. The Effects of Alcohol upon the Kidneys, ... 72

IX. The Nervous System and Narcotics, ... 80

X. The Action of Alcohol upon the Brain, Spinal Cord, and Nerves, ... 90

PAGE.

XI. The Action of Alcohol upon the Brain and Nervous System (*Continued*), ... 102

XII. Further Influence of Alcoholics upon the Brain, ... 115

INTRODUCTION.

The Need of Knowing the Facts.

LESS than a quarter of a century ago, the United States was in the agony of a protracted sanguinary conflict. To-day that conflict is called "The War of the Rebellion." For four years the people of the North and South were arrayed against each other in deadly hostilities, and not until hundreds of thousands had been slain on battle-fields, or had died in hospitals, was peace declared. During this war "recruiting offices" were opened in all the large towns and cities of the country, where men were enlisted as soldiers; for soldiers were in continual demand, not only to augment the army, but to make up for the losses incurred on battle-fields and in hospitals.

Not only did the country need a large army, it needed an army of strong, sound, healthy men. So when a man had "enlisted," he was sent from the recruiting office to the "examining surgeon" to undergo rigid bodily inspection. If the surgeon found disease in the heart, or lungs, or brain, or in any part of the body; if the enlisted man had defects of vision or hearing; if he had lost a front tooth, and could not bite off the end of a cartridge, or a right thumb, and could not cover the vent-hole of a cannon; if he was maimed, deformed, defective, or unsound in body, the Government refused to accept him as a soldier. He could not be "mustered in." For the business of war requires the highest bodily efficiency, and feeble or crippled men are not equal to its tremendous demands.

Every young man and maiden of our country is on the verge of a longer and more important conflict than were the soldiers of the War of the Rebellion. For the world is a vast encampment, and every human being is a soldier, drafted for service. No substitute can take another's place, nor can a discharge be obtained from the battle of life till

God grants it at death. "War a good warfare!" is the order that rings down the ranks from the great Captain who commands these hosts.

Even more important to success are bodily strength and efficiency in the battle of life, where all do service, than they were in the War of the Rebellion, where only a million were mustered in. For a good physical condition is one of the great pre-requisites to successful living. To live worthily or happily, to accomplish much for one's self or others, when suffering from disease and pain, is attended with great difficulty. The very morals suffer from disease of the body. "Every sick man is a rascal," said the great Doctor Johnson.

The importance of physical education to the young cannot be unduly emphasized. For out of the schoolroom of to-day are to come the skilled workmen and women of the next generation — the physicians, clergy, lawyers, judges, legislators, merchants, manufacturers, and navigators — all who are to carry on the work of the world.

Civilization has already outrun the bodies of men and women. Its complicated work taxes body and

brain almost beyond endurance. In addition, the self-indulgence of the age is so general and wasteful that it creates physical degeneracy and mental imbecility. It crowds the hospitals, peoples the asylums, increases the tenants of almshouses, fills the prisons, empties the churches, dethrones manhood, and brutalizes alike the rich and poor. I allude to the indulgence in intoxicating drinks. All the while the severity of the struggle for life increases, and the difficulties of earning a livelihood grow intenser with every generation. What is to be done?

The young must be taught the hygiene of intoxicating drinks. It must enter into their school education. They must be carefully instructed in the damaging physiological results of indulgence in the cider, beer, and wine so largely used as beverages, and which, in the main, become as destructive as the stronger alcoholic liquors. They must be trained to maintain serene dominion over appetite —to lead lives of wholesomeness—to practice rigid total abstinence from all that can intoxicate. Plato laid down the rule that boys must not taste

wine until they were eighteen years old. The early Romans forbade its use till a man had reached the age of thirty. The Spartans denied intoxicating drinks to their sons, and compelled their slaves—the Helots—to get drunk in presence of their young men, that they might witness the degradation of drunkenness. Their great aim was to develop a superb physical manhood.

Science to-day teaches that alcohol is not only not a food, but a poison. When we say a man is "intoxicated," we simply say that he is poisoned. For our word "intoxicate" comes from the Latin word "toxicum," which means poison. From this we have the word "toxicology," which is the science that treats of poisons. If one takes into the stomach meat, bread, potatoes, or other food, it is digested, and converted into muscle, brain, bone, or some other part of the body. Thus by food the waste of the human system is repaired, which is occasioned by the work of life. But when alcohol is taken into the stomach, that organ resents its intrusion, and drives it into the liver, which, in turn, forces it to the heart, and that throws it into

the lungs—and so it goes on, in its unwelcome and compulsory tour through the body. Every organ rejects and expels it, the liver, bowels, kidneys, lungs, and skin all throwing out a portion of it, until the system is rid of it. In this process of expulsion, every organ, by and by, becomes seriously damaged.

At last, both body and mind are ruined. The perceptions are bewildered, the memory weakened, the reasoning power clouded, the moral sense benumbed, the will dethroned, the self-respect dead, and there is no vice or crime to which the victim is not liable. A terrible [1] dipsomania is established, when there is only an insatiate craving for alcohol, that knows no bounds, and for which there is rarely any cure.

When to the wreck of the individual are added the appalling facts that four-fifths of all the criminals in the prisons, four-fifths of all the paupers in the almshouses, three-fifths of the insane in asylums, and one-half of the idiots are the direct products of strong drink, how ghastly is the re-

1 A thirst for stimulants.

cord! Ought not these facts to constitute a powerful array of reasons why the youth of to-day should vow in high honor absolute and life-long aloofness from all that can intoxicate?

THE TEMPERANCE TEACHINGS OF SCIENCE.

THE

TEMPERANCE TEACHINGS OF SCIENCE.

CHAPTER I.

Half a Century's Study of the Question.

I HAVE been requested to state to young people some things that I know, and that many of them may not, respecting the drinks called spirituous and fermented liquors, that many people use. It is thought by good and wise men and women, that young persons should be instructed about these liquors, because, through ignorance of their nature and effects, multitudes begin to drink them, and acquire a love for them, which goes on increasing the more they are used, until very great injury is done to the bodies, minds, and character of those who take them; a great deal of poverty, distress, and misery is produced in families, neighborhoods, and towns; many crimes are committed; and a vast

amount of evil of different kinds is spread over the whole country, and a large part of the world.

It is important that young persons should have correct views of all matters pertaining to their welfare, their happiness, and usefulness in after life. In my own case, strong impressions were made upon my mind respecting these drinks when I was a small boy, and these impressions have had an influence upon my whole long life. In the first years of my going to school in the country town where I was born, now a favorite summer resort in the interior of New York, I passed by a house where a man lived who was frequently drunk. When so, he was apt to be boisterous, staggering about, and abusing his poor heart-broken wife. Whenever I saw him, or heard him, in that condition, I was terribly frightened, and hurried past the place as fast as I could. In a few years after my first remembrance of these frights, the poor wife died, when her husband gave himself entirely up to drinking. In a dark, rainy night, after drinking freely at one country tavern, he was sent out, and was going to another. On his way he fell down by

the side of a little ditch, and apparently, in his attempt to get up, he fell over upon his back in the narrow ditch, in which, from the rain, water was running. Owing to the weakness produced by intoxication, he was unable to rise; and his body damming up the stream, the water ran over his head, and he was drowned. The next day his body was found, and as there was no *morgue*[1] in the country — no place such as there is in many cities, where friendless or unknown bodies are taken, when found, the body was brought to my mother's house, which was near. A coroner's court was there held to determine the cause of death. The jury said it was accidental drowning. No one was blamed. The sad funeral occurred, and nothing was said at that funeral of the evils of drink, or the blame of drinking or selling it, though the young man that sold this drunkard the liquor and sent him out in the night, saw clearly afterwards how wrong it was; and for many years, though he repented and trusted God had forgiven him, he wore on his conscience a burden of "bloodguiltiness" for having a part in that terrible death.

1 Pronounce — *Morg*.

The horror of that whole affair haunted me like an evil spirit for many months after. But one day an old friend of my father's, a member of the same church, called on a friendly visit at my mother's house. My oldest brother, who was then the head of the family, brought out, as was the general custom, a decanter of liquor and offered the visitor. He politely said, "I thank you for what you intend as a kindness, but I have concluded to drink no more liquor." In reply to the surprise which all countenances expressed, he said, "I *know* this liquor does an immense amount of harm, I *believe*, as a beverage, it does no good, and therefore I shall take it no more."

I saw at once, boy as I was, that if his premises were correct, his conclusion was logical, and the only one to which a good man could consistently come. This was the first temperance argument I had ever heard. I was most painfully sensible of the *harm* that liquor had done, though I had but the dimmest conception of its extent; and if it really did no good—if it did not help the harvest men to do their work better, if the "bitters" taken

in the morning and "toddy" at night, did not improve the health and strength—if liquor did not warm the body when it was cold, nor protect it from the effects of heat—if it was really useless as a beverage, it seemed to me the argument was conclusive, overwhelmingly so, in favor of abstaining from it.

I soon began to inquire, to observe, and to think about these propositions: Is it useless? In what manner and to what extent is it harmful? What is it in the liquor that does the harm, or does not do the good? How are its evils to be prevented?

These are not trivial questions. They are worthy of the most careful and protracted consideration of any mind. They have received no inconsiderable portion of my attention for more than fifty years. When I was still quite young I studied chemistry, as it was then taught, and learned what the article in liquors that produces these effects was. I learned that it was called alcohol—I learned of what it was composed, and how it was produced. I afterwards studied anatomy, physiology, pathology, and therapeutics; that is, I studied

the structure of the body, what it does in health, what happens to it in disease; how and by what it is injured; how injuries are to be prevented; and how, when they occur, they are to be mitigated or removed. In other words, I studied to be a doctor; and after I had completed a certain course of study, I commenced practising as a doctor, and afterwards I tried to teach others the science and art of medicine; and all through these studies, this experience, and these teachings, I have made careful observations, have tried some experiments, and read accounts of many others, respecting alcohol; have studied the subject at home and in other countries, and I now propose to tell you some of the things that I know about it, and believe to be very important truths.

When we get through, we shall see whether we do not come to the conclusion that the statement, the belief, and the conclusion of the first temperance argument that I ever heard were correct: *Alcohol is harmful; it is useless; we will not take it.*

CHAPTER II.

The Production of Alcohol and the Composition of Alcoholic Liquors.

THE article in all intoxicating drinks that does the harm is called *Alcohol.* I propose to tell you what it is, how it is produced, where it is found, and what it does when taken into people's stomachs.

Alcohol is a thin, colorless liquid, lighter than water, more easily evaporated, and boiling, which makes it into a vapor, at a lower temperature than water. When touched with a burning match it is set on fire and burns with a blue flame, producing much heat and but a little light. You may have seen it burning in a spirit lamp. It is a very definite chemical compound, and is the same wherever found. Its character is not changed by anything with which it is mixed, and it continues the same, unless it is burned up or destroyed. Those of you who have studied chemistry, have learned that

there are a few original or simple elements which when combined together in various proportions form all the ordinary substances we see and use. There are four substances or elements which, when combined, form the chief part of all our foods, and only three of these enter into the composition of some articles which we take.

These four elements are called oxygen, carbon, hydrogen, and nitrogen. When each of these substances is alone, three of them, oxygen, hydrogen, and nitrogen are gases, without color and invisible, like the air we breathe, or the gas we burn for lights. Indeed, the air is composed of two of these, oxygen and nitrogen. Carbon, when alone, is a solid substance. It is almost pure in charcoal and in lampblack, and is quite pure in the diamond. When, however, it is combined with the other substances, its compounds take different forms—sometimes the form of gas, sometimes the form of liquids, and sometimes the form of solids. When combined with a certain proportion of oxygen it forms carbonic acid gas, which bubbles off in a glass of soda water. When united with a certain

proportion of oxygen and hydrogen it forms sugar, a solid, sweet substance, as you know; and when united with the same oxygen and hydrogen, but in different proportions, it forms alcohol — this liquid that we are to find out about.

Now, then, the different substances mentioned and many others, though formed from the same elements, but in different proportions, have, many of them, entirely different appearances, properties, and effects — are all quite different materials. These are chemical facts which many people do not understand; hence they make mistakes when they talk about alcohol. Some, in their ignorance, say it is in all our food, that it must be in grain or it could not be got out of it, that our food is changed into alcohol in our stomachs, and various other absurd things. It does not exist anywhere in *Nature*, either in grain, or fruit, or anything else.

But you are desirous of knowing from what and how alcohol is produced. It is always produced from *sugar*, by an *artificial process*.

When grape sugar — the sweet substance existing in grapes and various other fruits — is dissolved

and diluted in water, and at the ordinary temperature of the air, and has a particle of yeast added, a change goes on in it. It "works," as it is said. I have already indicated that sugar is composed of carbon, hydrogen, and oxygen in certain proportions, and have said that when the proportions of the elements in a substance were changed, the nature of the product was changed, often completely. Now, in this "working," such a change takes place in the elements of the sugar, by changes in their proportions and relations, that the sugar is destroyed, as sugar, as much as wood is destroyed when it is burned — that is, it is changed in the form and character of its substance; and instead of sugar we have two new substances produced, alcohol, a liquid, and carbonic acid, a gas. The carbonic acid passes off in the bubbles, as the liquid — cider, for instance — "works;" but the alcohol remains in the cider, having a strong affinity for the water that is present.

When common cane or maple sugar is dissolved and largely diluted with water, and yeast is added, the sugar is first slightly changed from cane to what

is called grape sugar, and then into alcohol and carbonic acid, as in the other case. Also, when pure starch is taken, or when grain, or rice, or potatoes, all of which contain starch, are ground up and mixed with water, and yeast is added, fermentation takes place; the starch is first changed to sugar, and then to alcohol and carbonic acid, as in the case of the fruit juice, and of the sugar and water.

In the yeast which produces these changes are living plants, so small they cannot be seen without a magnifying glass; these multiply rapidly, when they are in a proper vehicle, as the sugar and water, or starch and water, and cause all this "working" and change. Now these little plants do not have leaves and roots like larger plants that grow from the ground, nor do they have flowers and seeds, like many larger plants. They are more like mushrooms, but not of their shape. They are only little rod-shaped particles, linked together and sometimes branching off, something like old tree-tops.

There are many such very small, living, growing bodies, some very much smaller than the common

yeast plant, found in commom water, and floating in the air; and they produce particles much smaller than themselves, which serve a similar purpose to seeds of larger flowering plants; and these, which are called *spores*, are so very small they go into almost every place where the air goes, and they get into apple juice and grape juice, when it is exposed to the air, and grow up into the little plants, and cause fermentation; so that it is not necessary to add yeast to apple juice to produce fermentation and alcohol. In fermenting grain, to make beer or whiskey, yeast is added to cause the changes.

To make strong alcoholic cider out of apple juice, all that is necessary is to leave it in the barrels, and to give it vent by the bung when it "works."

To make wine, the grapes are crushed and left in tubs or vats, when the fermentation takes place; the skins and seeds of the grapes settle to the bottom, and are called *lees*, and the wine is drawn or dipped off and put in casks or bottles, where in time other slight changes take place, which produce particular flavors; but the alcohol produced from

the sugar remains the same, and there is more or less of it, according to the amount of sugar which is fermented and changed.

In making beer, grain is used, mostly barley. Some of the barley is moistened and kept in a warm place until it sprouts, or sends out little roots. In this process much of the starch in the grain is changed into sugar. Then the sprouted barley is dried and roasted, and this is called *Malt.* The malt is mixed with other ground grain and hops, and sometimes aloes, quassia, and other bitter things are added, the whole is heated together, and yeast is put in—brewers' yeast—the fermentation takes place, the same alcohol is formed, and the liquid is put up in casks or bottles, like the wine.

Whiskey is made by treating the grain in a similar manner, but no hops are added; and when the fermentation has taken place and the alcohol is formed, instead of leaving it in that condition, it is all put in a still, or a large boiler with a tight cover, but with a tube or pipe attached, making altogether what is called a retort. This tube extends on and is twisted round into a large coil, or "worm," which

is placed in a tub, into which cold water is constantly running — the tube passing out of this and emptying into a vessel. Heat is now applied to the retort, or boiler, and the alcohol which is in the water with the remains of the grain, being lighter and more readily formed into vapor, passes up into the tube and is cooled in the coil in the water, so as to come into the liquid form again, and runs out into the vessel to receive it. Some steam from the water passes over with the alcohol and is condensed and discharged with it, and the whole, after proper rectifying, constitutes whiskey.

To get more pure alcohol separated from the water and any remains of the grain, repeated distillations are necessary. You see by these statements, that distillation does not produce the alcohol, but merely separates it from other substances.

Genuine brandy is made by distilling wine, or the fermented products of the grape. Rum is made by the distillation of the fermented products of the sugar cane; gin, by distilling grain products like the whiskey, with the addition of juniper berries and

leaves, or the oil of turpentine, to give it a peculiar flavor.

Whiskey, gin, rum, and brandy are called *Ardent Spirits.* They all contain alcohol and water, in nearly equal proportions. What is called proof spirit contains fifty parts in a hundred of pure alcohol by measure.

Pure, or genuine wine from fermentation of grape-juice, contains from five to sixteen parts in a hundred of pure alcohol; but the wines in the market sometimes have twenty-five parts in a hundred of the alcohol, as more alcohol is added to it, after the grape juice is fermented.

Beer contains from four or five to twelve or more parts of alcohol in a hundred; and cider nearly the same, according to the amount of sugar contained in the apples of which it was made.

Currant wine, elderberry, and other wines are sometimes made and drunk even by temperance people, who do not know they contain the same alcohol as whiskey. Some juice of the berries is mixed with water and sugar and allowed to ferment, often producing a strong alcoholic liquor. This is

just as bad as any other drink which has the same amount of alcohol in it.

Alcohol readily mixes with many things besides water. It dissolves resins, making varnishes, and also essential oils, such as the oil of peppermint, cinnamon, etc., making essences. It also dissolves the active medicinal principles of many drugs, making tinctures; and it is used for making various medicines and coloring materials where the alcohol is driven off before they are finished. It is thus, like various other poisons, such as lead, arsenic, mercury, aqua fortis, etc., useful in the arts; but this does not prove that it is innocent when used in any of its mixtures as a drink.

I have taken so much space to tell about the production of alcohol, because I think it important that all should understand about it. It is particularly important to know that distilling — making the alcohol into vapor by heat, and bringing it back to the liquid form by cold — does not change its character. Water is sometimes distilled in a retort to separate it from other things, but when it comes from steam into liquid again, it is the same

water. A kind of distillation is going on around us with water all the time. It goes up in vapor from the earth and the sea, and comes down in dew and rain, the same water that rises. So the alcohol that is made into vapor and brought back to a liquid in a still is the same thing, unchanged.

I said alcohol was the same wherever it was found. It is the same in wine and beer as in whiskey and brandy; and the drunk-making quality of any liquor depends upon the amount of alcohol it contains. A glass of very strong wine will produce essentially the same effect as the same glass filled with half whiskey and half water. A glass of weaker wine, containing twelve and a half parts of alcohol in a hundred, would be equal to a glass of whiskey and water that has twice as much water in it as the last. Other things in the wine and beer make them taste differently, but the effects in the blood and upon the brain and the nerves are the same — there is no difference in drinking wine or beer, and in drinking whiskey or brandy with a certain amount of water added.

CHAPTER III.

Parts and Qualities of the Human System.

THE subject of the effects of alcohol upon the living body is one of very great interest and importance, and its importance is now recognized by very many people. That the use of alcoholic liquors as beverages is liable to do, and actually does in thousands of cases, all the harm so forcibly stated in the preface by Mrs. Livermore, no one who has common intelligence on the subject will deny. But many persons think, or at least say, and act as though they believed, that indulgence in a quantity of alcoholic liquors not "excessive," is at least innocent; and some will even say, beneficial. Those who think this true very naturally oppose restrictions upon the use of such liquors, or any rigid restrictions upon their sale. They are apt to say that they and others ought not to be prevented from the use of articles good for them, because some abuse them. I have heard men say

it would be as proper to condemn and prevent the use of water, because some drink too much of it, as to condemn and interfere with the use of alcoholic liquors, because some use too much of these. They must admit that the common practice and example of drinking lead many to excessive indulgence and ruin; and they know that St. Paul said that if eating meat should cause his brother to offend, he would abstain from eating so innocent a thing as meat while the world should stand. They must acknowledge that they have not as high a standard of moral and Christian conduct as St. Paul, but would rather ask with another character in Scripture history, "Am I my brother's keeper?"

If alcoholic liquors are good as drinks, there is at least a question as to whether they should be unsparingly denounced, and their use and sale forbidden or restricted. If, however, they are useless, and especially if they are injurious and dangerous as beverages, in whatever quantities taken, then there is every reason for denouncing them, and endeavoring to suppress their sale and use in view of the great harm they are acknowledged to do.

It is plain, then, that in this whole matter of temperance agitation as a hygienic, a social, a moral, or a legal question, much, if not everything, depends upon the question as to whether these drinks, in their habitual or even occasional use, are good or evil things. If it should be thought they were good or innocent when taken in moderation, then it would be important to determine what was moderation, and this has never been defined. A very small quantity of other poisons, of arsenic for instance, may be taken for a long time, or occasionally certainly, without doing very much harm — without doing harm that would be perceptible to all; yet, however small the quantity, some harm would be done, certainly no good, and it would be folly, on account of its slight effects when little enough was taken, to encourage or tolerate the habitual or even occasional use of it.

But coming to the inquiry as to the effects of alcoholics upon the human system, some statements seem necessary as to the parts and qualities of that system. The organs most concerned in the action of alcohol are the stomach, the liver, the heart,

the kidneys, and the brain and nervous system — though all parts of the body are effected by it.

The stomach, as all know, is the organ into which is received our food and drink, and in which the food is chiefly digested, and prepared to nourish the body. The food, thus digested, is largely absorbed, or soaked up, from this organ into the blood through the coats of the veins, and carried to the liver, where it undergoes farther changes, is converted largely into blood and mingled with it, and is then carried to the right side of the heart, which pumps it into the lungs, where it is acted upon by the oxygen in the air we breathe, changing it from the dark blood of the veins to the bright red blood of the arteries. This blood is then carried on to the left side of the heart, and from it pumped out through the arteries to all parts of the body. It goes from larger to smaller arteries, until it comes into some very small vessels called capillaries. It passes through these minute vessels slowly, and its nourishing particles are taken up into the different parts, affording them nourishment, contributing to their growth in young per-

sons, and to the maintenance of the strength and activity of all persons and all parts.

The small veins then take up the altered blood which is not appropriated by the tissues, together with the materials which result from the wearing out of particles in the acts of life, and this blood is carried from all parts of the body, from smaller to larger veins, until it comes back to the right side of the heart and is again carried to the lungs, to be restored to arterial blood by the air; and so the process goes on perpetually during our whole life.

The fluids taken into the stomach are absorbed into the veins like the foods, which are all dissolved and brought to a liquid state, and these fluids are carried in the blood to the liver, and then to the heart and lungs.

Some of the foods and fluids swallowed pass out of the stomach into the intestines, are changed and digested farther there, and are absorbed from this situation partly by the veins and partly by a special set of vessels called lacteals, and, like those substances absorbed from the stomach, are finally carried into the blood.

In the stomach the food meets with a fluid called the *gastric juice*, secreted by the coats of the stomach, and which dissolves and digests or changes the food, and fits it for absorption, and for the farther changes in the system.

Shakespeare says, "the stomach is the storehouse and workshop of the whole body;" and the office of this organ could not be more briefly and accurately expressed.

The *liver* is also an important organ. It is a large, solid body, situated to the right of the stomach under the ribs, and it performs several offices. It changes the food carried to it, and converts a part of it into blood. It produces heat, by the chemical changes effected there, and prepares waste material in the blood for being carried out of the system; and it secretes bile. This bile is carried by ducts from the liver into the intestines, and is a material that is useful in digesting food that passes from the stomach into the bowels; and it promotes proper action of those organs. When the liver is changed in its structure or its action, the whole system is deranged.

The *heart* is one of the vital organs which must be constantly in action, or life will speedily end. Its office is to circulate the blood, and if this fluid fails to be sent to any organ, even for a short time, that organ ceases its action; and when a large number of organs cease their action, death occurs. When the heart acts improperly, more or less derangement results.

The *lungs*, again, perform an office which is immediately essential to life, and are also called vital organs. In the passage of the blood through the tissues it loses its oxygen, and carbon compounds are formed, which are injurious to the tissues; or, at any rate, this venous blood is not capable of sustaining life-actions in the organs and tissues. This venous blood constantly flowing into the lungs must be as constantly changed into arterial blood by the action of the oxygen of the air upon it. The union of oxygen in the lungs with carbon and hydrogen is a kind of combustion, and by it the heat of the body is kept up, while the blood at the same time is purified. If the lungs should cease to perform their office—if we stop breathing even

for a few minutes — death will follow. Anything which interferes with the proper action of the lungs, or hinders the purification of the blood and the addition to it of the proper amount of oxygen, interferes with all the functions of the body, reduces the temperature, and in various ways does mischief to the system.

The *kidneys* perform a very important office in carrying out of the body and the blood effete or worn-out materials that result from muscular and other actions, and from the changes of the foods taken. These foreign matters, if retained for a considerable time, are certain to poison the whole system, cause stupor, and generally convulsions, and always death. Anything, again, which interferes with the proper action of the kidneys deranges the whole body.

But the *brain* and *nervous system* is, if possible, the most essential — is certainly the most central, the most characteristic, and the most important part of the human being. It not only presides over and is essential to every action of the body, but is the special organ of the mind. Its proper

conditions and actions are essential to proper thinking and proper feeling, to the existence of proper moral qualities, and to the sustaining of proper conduct and proper social relations. A bad brain makes a bad man. It hardly needs to be said that anything which acts specially and injuriously upon the brain and nervous system deranges every department of the character and of the conduct, physical and mental.

The *blood*, though not an organ like the stomach or the brain, is a vital fluid, an essential medium of communication between all parts, the carrier of the food and the oxygen to all the tissues, and is the agent of nutrition, of growth, of maintenance, and of purification of the body — and this nutrition is the ultimate and essential life-action. When this ceases, death occurs, and when this is deranged, disease is present.

The Bible says the blood is the life of the body, and certainly anything that destroys the blood destroys life; and anything that deranges or corrupts the blood deranges the actions and corrupts the very source and agent of life.

We shall endeavor to show the action of alcohol on all these parts, and upon the system at large — upon body, mind, and character.

CHAPTER IV.

Effects of Alcohol upon the Stomach.

OUR bodies are dependent for their growth, their support and activity, upon substances taken into them. The air so necessary to our life is taken into the lungs; and some other materials are taken with it in the form of gases and vapors, but these latter are not for support or growth, and many are injurious. By far the greater number of substances, whether for necessary and useful purposes, or with injurious effects, are taken into the stomach.

These ingesta,[1] as they are called, may be divided into Foods, Simple Drinks, Medicines, and Poisons; and besides these there are certain materials used as luxuries which are modifiers of action, and are regarded variously as food, medicines, or as capable of producing injurious effects. Condiments, spices, coffee, tea, and chocolate belong to this class.

1 Things taken into the Stomach.

There are also other substances taken into the stomach which are inert—incapable of solution and absorption—and which have no effect except such as is caused by their bulk or the shape of their particles. The hard fibres in fruits and vegetables, the husks of seeds and grains, and some mineral substances are examples. Doctor Martin, of Johns Hopkins University, in his work on the *Human Body*, says:

> Foods may be defined as substances which, when taken into the alimentary canal, are absorbed from it, and these serve either to supply material for the growth of the body, or for the replacement of matter which has been removed from it.

Food, in order to be such, must fulfil certain conditions. It must contain the elements which it is to replace in the body, and those necessary to build up the tissues. It must be capable of being absorbed from the stomach or intestines, and carried to the tissues; and, lastly, neither the substance itself, nor any of the products arising from its changes, or from combinations with other substances, must be injurious to the structure or activity of any organ.

If these injurious effects are produced "it is a poison, and not a food."

Water is the simple diluent[1] Drink. This liquid constitutes about two thirds of the whole weight of the body. It is contained in every tissue as well as in every fluid of the system; and its loss, which is constantly going on, must from time to time be supplied. Many drinks in use contain other ingedients, but all contain water. The other materials may be foods, as in milk; may be modifiers of actions, as in infusions of coffee and tea; or they may be medicines or poisons.

Medicines are substances which are taken for the purpose of modifying beneficially wrong actions or conditions of the system; or, in other words, for the alleviation of suffering and the removal of disease.

Poisons are substances which, either by themselves, or by the materials produced by their changes and combinations, inflict injury upon the system or some of its parts, and which are usually capable, independently of their bulk or mere physical qualities, of producing death. The same article

1 Dil-ū-ent]—that which weakens anything by mixing with it.

may be a medicine, or a poison, according to the manner and object of its use. Thus arsenic, though a poison that inflicts injury when taken by a person in health, and in any considerable quantity causes death, may yet be given in such small doses as to counteract wrong actions and aid in removing diseases. In like manner morphine, when a few grains are taken, will destroy life, and always inflicts injury in whatever quantity when taken by the well; yet in a proper dose given to the sick, it relieves pain, procures sleep, prevents suffering, and may overcome disease. Its habitual use, though in quantities which may not only be endured but may produce for the time agreeable sensations, is accompanied by consequences the most deplorable.

The statement of these facts will enable the readers who wish to know the truth the better to understand the place alcoholic drinks occupy, after we have considered their particular effects on the different organs and functions of the human body.

These drinks are taken into the stomach, and we are first to inquire as to their effects upon that organ. Although the most injurious action of alcohol

as it is commonly taken, is not upon the stomach, yet its effects on this workshop of the body are often of the most serious character; but as with all other substances, poisonous or otherwise, its particular action and results depend much upon the quantity taken, the degree of concentration or strength in which it is used, and upon the materials in the stomach at the time, and the particular condition of the organ; and these effects are further modified by its habitual or only occasional use.

When an ordinary dram of spirit and water, or of wine, is taken by one not accustomed to it, the first noticeable effect on the stomach is to produce a feeling of warmth in it. If the stomach be empty this effect is more decided than when taken at the time of a meal or soon after. When food is present the liquor mingles with it, is diluted, and makes less impression on the coats of the stomach, and is more slowly absorbed. It causes in a short time relaxation and enlargement of the blood-vessels, and more blood is contained in them. There is present a state of irritation. There is in some cases a more free secretion from the glands, but it is more

or less perverted. This irritation, however, may increase the appetite, and cause more food to be taken, but its digestion is likely to be impaired, and if much alcohol is taken, the gastric juice is so changed by its direct action upon it that digestion is arrested. An unnatural condition of the nerves and vessels and of the whole tissue of the membrane is induced. If the alcohol is often repeated, the vessels become permanently dilated, the surface becomes redder; and according to the observations of Dr. Beaumont upon the stomach of Alexis St. Martin, a young Canadian, which was open to inspection by a wound in the side, a degree of congestion and a blush of inflammation, and often small points of oozing blood, appeared after each indulgence in a common drink.

When the drinking is free, though it may not be carried to the extent of drunkenness, the stomach is apt to be more seriously and permanently changed. The coats become thickened, the organ is sometimes much contracted, the secretion of the gastric juice greatly perverted and diminished. Then very little food can be taken and digested, in-

digestion, distress, and vomiting come on, and great depression and death follow. I recall cases in my experience where these results have followed the free use of spirits in men not regarded as drunkards, and who continued in successful business until the disease of the stomach arrested their course. Sometimes small and scattered ulcerations are produced, and then bleeding, pain, and more frequent vomiting are likely to occur, and death is apt to soon follow. Even when these conditions exist, though produced by the alcohol, the taking of a dose of the same article will, by its narcotic effect upon the brain and nerves, give for a time relief to the distressed feelings, and make the victim of the habit think that he cannot give up his drink, and that it is even doing him good.

When great excesses are indulged in, causing drunkenness, more immediate and violent effects upon the stomach are often produced. The organ becomes congested and inflamed so that days may be required for recovery from a drunken fit. When much alcohol is taken into the stomach as strong as clear spirits, or spirits but moderately diluted, the

gastric juice which digests the food is coagulated or thickened, and its power of digestion is destroyed. Those who take sufficient alcohol with a late dinner or supper to produce drunkenness, often vomit the food after some hours entirely undigested.

But these effects upon the stomach do not always follow from the use of alcohol; and in consequence of this many are encouraged to continue its use, and even advocate it as an innocent, if not a useful thing. Some persons who commence taking it in moderate quantities largely diluted, as in wine and beer, or in whiskey or brandy with much water, and especially if they take it at meal-time, do not have their stomachs materially injured though they carry the indulgence so far as to seriously and even fatally injure them in other organs and in other ways. No poisonous article operates in the same manner upon every person; and some will endure an amount of arsenic, or opium, or other poisons, when slowly introduced, without very marked effects, which would soon prove much more injurious or even fatal to others, especially if taken without the gradual training. This is the case with alcohol. Some

stomachs will endure a considerable quantity for a long time without very serious effects upon them, while others will suffer many or all of the bad results before described. When the injurious effects of alcohol upon the stomach are urged as a reason for not taking it, some old drunkard or free drinker is often referred to as having a good stomach notwithstanding his habits. Such cases, though not unfrequent, are still exceptional. The many whose stomachs are injured by the drink, and who have been forced to abandon it, or who are suffering or have died from it, are lost sight of, and the few who have endured it and survived, are regarded as examples of all.

As well might one say that a battle or the storming of a battery was not dangerous or destructive, since many old soldiers have gone through the ordeal with but slight injuries.

The dangers of alcohol to the stomach are great, especially when taken in the form of ardent spirits and between meals, and are often disastrous, though some escape this form of injury. The greater injury falls upon other organs and functions.

CHAPTER V.

Action of Alcoholics upon the Liver.

IN the preceding chapter the qualities of foods, medicines, and poisons, and the differences between them, were pointed out. This was done to determine the place of alcoholics. The word "intoxicants," which means poisons, so generally and properly applied to these articles, indicates the place to which they belong. As with other poisons, a medicinal effect from alcohol is possible; but the poisonous action is the chief, and, in the absence of disease, the essential or only one.

All scientific men, in writing upon poisons, class alcohol among them, and no one denies to this article poisonous properties. Like other poisons, independent of its bulk, it not only deranges life-actions, but is capable of causing speedy death. The account given of its action upon the stomach shows its capability of inflicting severe injury upon that organ, but its injurious effects are not confined

to the stomach even while remaining within it. The impressions made there affect other parts of the system. The nerves, which are distributed throughout every part of the body, carry impressions which are made upon one part to others, and thus change the actions and conditions of distant parts, and often of the whole system. When a swallow or two of brandy or whiskey is taken, an impression is made upon the nerves of the stomach which is at once conveyed to other parts, especially to the brain and heart, causing, for a time, an excitement of these parts. This is not the same in all persons; but usually an excited sensation is felt in the head, and the heart beats more rapidly. In faintness from whatever cause, the heart beats very feebly, and when one entirely "faints away" the beating ceases entirely, and the blood is not circulated in the brain. In this condition the impression of alcohol in the stomach may arouse those other organs to action, just as a smell of hartshorn, or the dashing of water upon the face, or the application of a hot iron, or a tingling blow will do, and thus relieve the faintness.

It is this effect of alcohol which makes people think it a stimulant—an exciter or increaser of strength and action; and in the sense that a strong odor, a hot iron, or a smart slap is a stimulant, the alcohol is a stimulant. But this effect of a drink of spirit lasts but a short time, usually but a few minutes. If the impression is very strong, if a large quantity is taken, instead of any stimulation, depression immediately follows, and as in the case of an extensive burn, or a severe blow over the stomach, death may speedily be produced. Men, and more specially children, have died in a few minutes from a large dose of whiskey.

But the principal, the more characteristic, and the much more permanent effects of alcohol are from its absorption from the stomach into the blood, its operation upon that fluid, and upon the organs and tissues to which it is carried.

Though alcohol while in the stomach acts upon the gastric juice, impairing its digestive power, and when the alcohol is much concentrated destroying its digestive action, yet under no circumstances does this digestive fluid change the alcohol. This

is not capable of being digested, but is taken up by the vessels of the stomach simply diluted, mingling with the fluids it meets.

It is first carried to the liver and then to the brain and the rest of the system, and its principal action upon the liver I shall now attempt to describe.

The liver and brain have more attraction for alcohol than any other parts of the body. When an animal or a person is killed by a large dose of this poison being absorbed, more of it is found in these organs than in any others.

3 The first effect of the alcohol on the liver is to irritate it, just as it irritates the mouth and the stomach, or, when applied strong enough, the skin. It causes distension of the blood-vessels, and the accumulation of a larger amount of blood in them than there should be. This results in swelling of the organ, partly from the larger quantity of blood in the vessels, and partly from effusion into it and an increase of the tissue. This change in the condition of the liver causes a change in its action, and even without much change in its size or structure,

decided changes occur from the alcohol in its actions, and its important work of preparing the food carried to it and making it ready for the uses of the body, its office of making blood, of changing waste matter so that it can be carried out of the system by other organs, and its work of secreting bile are all imperfectly done.

This defective work leads to general derangement of the whole system. There is what is called biliousness — disturbance of the stomach, a coated tongue, foul breath, deranged bowels, headache, dizziness, dimness of sight, distressing dreams, a feeling of fullness in the side and stomach, and general uncomfortable sensations. Notwithstanding that these unpleasant effects are so frequently produced by what are regarded as moderate quantities of wine, beer, or spirits, yet, each drink, by its narcotic or soothing effect upon the brain and nerves, may make the person feel better for the time, just as the distress produced by opium eating is temporarily relieved by repeating the dose.

But much more serious effects are in some cases produced by alcoholics, and beer is more apt to act

in the way about to be mentioned than whiskey. An accumulation of fat is often produced in the liver, causing its greater and more permanent enlargement, and impairing more permanently its action. When this is the case, stopping the use of the drink does not produce the same rapid improvement as in the cases before mentioned. But where the fat is deposited between the proper liver cells or structures, without taking the place of them, abstaining from drinking may in time be followed by much improvement.

There is another fatty change much worse than this, where particles of fat take the place of the structure. This is called fatty degeneration, and when it occurs other organs are likely to be affected in a similar way; and this disease before a great while ends in death. When any portion of the liver tissue is changed into fat, that part cannot do its work, and as the change goes on action will cease and death must follow.

But other changes take place in the liver, and the one now to be mentioned is oftener produced by ardent spirits than by beer or wine.

I am quite aware that young people, or older ones who have not learned about the particular structures of the body, will not be able fully to understand minute descriptions of these changes should they be given, and such persons will therefore not be interested in these details. But some useful ideas on the subject may be received by reading these more general statements; and by making inquiries of parents or others who are able to make explanations, satisfactory knowledge may be obtained by even very young persons who are desirous of learning.

I will here only say that there is a disease of the liver called *Cirrhosis*[1] from its yellow color, and the *hob-nail* liver from there being upon its surface rounded projections, looking like the large nails on the soles of an English laborer's shoes; and this disease is also called *gin-liver* from its always being produced by drinking strong liquor. The liver, though swollen at first, becomes shrivelled and much smaller later, and all through it are small masses causing the inside to look like a cake of

1 Pronounce sir-rō'-sis — a hardening and contracting of the liver.

beeswax in which, when it was melted, yellow peas had been mixed.

In this condition the blood cannot properly circulate through it, it cannot perform its proper functions, dropsy follows; and when the disease is established, death always occurs in a few months, or at the longest in a very few years.

As with certain alcoholic diseases of the stomach, particularly Cirrhosis and contraction of its walls, even the abandonment of the alcohol comes too late.

This Cirrhosis, as well as other structural alcoholic diseases, is more likely to occur from steady drinking, though it be not carried to the extent of positive drunkenness, than from occasional debauches, however excessive, and however morally and socially degrading and disastrous. These structural changes of the liver from the effects of alcohol, though sufficiently common to be very familiar to physicians, are not nearly so frequent as the derangements of action of this important organ from the same cause, without distinguishable changes of its structure.

Dr. Murchison, late of London, a physician of the very highest authority on this subject, in his standard work on Diseases of the Liver, says these affections are exceedingly common in his country; and Sir Henry Thompson, one of the very first surgeons of the present time, says that few are aware of the great mischief which is being done in England by what is regarded as the moderate use of fermented liquors (beer and wine).

Dr. Murchison, writing on the management of these cases, says: "A man first gives up malt liquors, and in succession, port wine, Madeira, champagne, etc.; then tries brandy or whiskey largely diluted with water. At last unless misled by the fashionable (as it was then in England) but to my mind erroneous doctrine of the present day, that alcohol in one form or another is necessary for digestion, or to enable a man to get through his mental or bodily work, he finds that he enjoys best health when he abstains altogether from wine and spirits in any form or quantity, and drinks plain water." The particular diseases which result from these derangements of the liver, produced

or aggravated by alcoholics, are very numerous. Dr. Murchison makes nine classes with several varieties in each class. Among them he mentions as very frequent in England, "gout, urinary calculi, biliary calculi,[1] degeneration of the kidneys, structural diseases of the liver, and in fact lowering and degeneration of tissue throughout the body."

In an approach to old age, in those of even moderate alcoholic habits, there is a likelihood of fatty and calcareous or chalky matter taking the place of natural structures throughout the body.

The increase of fat so frequent in beer and wine drinkers, mostly produced by the action of these articles upon the liver, makes some people think that these drinks are healthy, but such fat is an evidence of deranged nutrition and of lowered life power. There is a bloated condition which interferes with the ability to labor, and prevents the vigorous action of all the life forces. In the latter stages of "alcoholism" emaciation may take place, especially in spirit drinkers.

1 Gall-stones.

Bacchus, the god of drunkenness, was represented by the ancients as corpulent, never as emaciated; but with the ancients alcoholic drinks were in the form of wine, not made stronger by the addition of more alcohol, as in nearly all the wines in our markets. Still some old drunkards were doubtless emaciated in the times of Grecian and Roman art; but it was not the object of that art, as it is not the object of much of our literature, to represent the repelling evils of the wine cup, but rather to paint in attractive colors its short and spurious pleasures. History has here as elsewhere repeated itself.

Ancient art represented the god of wine in the bloom of youth and in rosy plumpness, concealing the advanced bloating, and the occasional haggard emaciation. Modern literature sings the praises of the sparkling wine, but fails to tell of the woes which follow. The inspiration of truth, however, says, *At last it biteth like a serpent and stingeth like an adder.*

CHAPTER VI.

Action of Alcohol upon the Lungs.

ALCOHOL, though first carried from the stomach to the liver, making there an early and lasting impression, does not stop there, but is carried on through the right side of the heart to the lungs; and its action upon these organs will now be considered.

When the alcohol reaches the lungs it makes an impression upon them; but from causes now to be mentioned its immediate local effect upon them is not very striking. It tends, however, to produce an impression on their delicate structures similar to its first local effect upon the stomach and liver, though in a less marked degree. The small blood-vessels are doubtless dilated and some retardation of the circulation through them results. This, however, is not great when only a moderate quantity is taken, and observations on this point have not been exact and conclusive.

The lungs are exceedingly porous, filled with open tubes and minute cells, or cavities, which are surprisingly numerous; and as the lungs are large bodies filling nearly the whole cavity of the chest, the surface of these tubes and cells is wonderfully large. All the blood in the body comes to the lungs and passes through them, and the alcohol which is gradually absorbed and brought there is mixed with so large a quantity of blood, and is distributed over so large an area, and so soon passes on to the left side of the heart to be sent to all parts of the body, that but a small quantity can at any one time be present in any particular part; hence the slighter primary local effect upon the tissue of those organs than upon many others. Its effects, however, upon the actions which take place here are more important.

The function of the lungs is to change the blood from an impure, dark, venous fluid, unfit for the uses of the system and even poisonous to it, to a pure, vivifying one, which is essential to all the activities of the body. This change is effected by the oxygen of the air taken in by the act of breath-

ing, a portion of which unites with certain of the impure matters in the blood, changing their characters, and causing them to pass out of the body by the expelled breath, while another portion of the oxygen unites with the blood-corpuscles [1] and is carried by them to the rest of the body, imparting life and activity to all the parts and tissues.

The principal material in the blood that needs to be removed is carbon. The oxygen unites with this material and produces carbonic acid gas, or, as chemists now call it, dioxide of carbon. If this, or its base — the carbon — be retained in the blood, very injurious effects result; and this gas passes off with the air which is breathed out. The alcohol which is in the blood is not known to be oxidized or changed in the lungs. Some passes off in vapor with the breath, but most of it passes on with the blood to the left side of the heart to be sent to the rest of the system.

The more complete the oxidation and purification of the blood, the more pure oxygen is united with the blood-corpuscles, the more real vigor is

1 Pronounce cor'-pusls.

imparted to the system. When one has been long in a close room where the air is exhausted of a considerable portion of its oxygen, and is contaminated with carbonic acid, the blood is not properly purified or vivified by the limited oxygen, and one feels stupid, and often faint and dizzy. Going into the pure, open air will produce a most reviving effect, as everybody knows. When persons remain a large part of the time in a confined and impure atmosphere, or when from any cause their blood is not properly purified by the free action of the oxygen upon it, weakness and derangements follow, severe diseases of various kinds are likely to occur, and prominent among them is consumption.

Now it is well known that the presence of alcohol in the blood diminishes the action of oxygen on the carbon and other impurities, and prevents the complete purification of the blood and the perfect change of venous into arterial blood. This is proved beyond all doubt by the diminished quantity of carbonic acid given off in the breath of one who has been drinking alcoholics, by the blueness of the surface often noticed, caused by

the darker and more venous blood in the vessels; and it is also proved by the greater liability of drinking persons to those diseases which are produced or made worse by the impurity of the blood.

The warmth of the body, called the animal heat, is largely caused by the union of oxygen with carbon and hydrogen in the lungs. A slow kind of combustion or burning takes place there, which, like the more intense burning of wood or coal, causes heat. It is well known by all physiologists that when alcohol is taken, less heat is produced, and that this diminution is in proportion to the quantity used. From the narcotic or benumbing effect of the alcohol the person may not feel colder, and the surface of the body by expansion of the vessels of the skin may have more blood in it, and the skin is sometimes temporarily warmer; but the blood throughout the system and in the deeper parts is colder, as is shown by the thermometer in the mouth; and it is well known that persons under the influence of liquor perish much sooner when exposed to the cold. No physiologist or intelligent doctor will deny these statements; and

their truth is confirmed by the experience of all arctic explorers — by Dr. Kane among others. All this goes to prove that alcohol diminishes combustion, heat-production, and purification in the lungs, and contributes to all the results dependent upon such diminution.

From the general effect of alcohol in lowering and perverting vitality and nutrition, the lungs suffer with other tissues of the body, and several diseases of these organs are more likely to occur in those using this article; and these diseases, when occurring from any cause, are much more likely to be severe. When inflammation of the lungs attacks a free drinker, a fatal result is vastly more likely to occur than when it attacks one who abstains. All medical men are agreed in this.

Some years ago an opinion originated in the United States, and became quite prevalent even among physicians, that the use of alcoholics, particularly of whiskey, in free quantities, tended to prevent that dreaded disease of the lungs, consumption.

It is difficult to say precisely how this opinion obtained such prevalence, as investigation shows that no substantial ground exists for it. It was probably, however, the result of an extreme reaction from the bleeding and other depressing treatment in this disease, and from the mistaken opinion that alcohol was essentially a tonic and supporting agent. It is most rational to conclude that anything which lowers the vitality and integrity of tissues, as certainly the free use of alcohol is known to do, will tend to the production of a disease which is acknowledged to depend upon depressing influences, and diminished life force. This conclusion of reason is sustained by carefully observed facts.

There are no statistics — no recorded observations and comparisons of numbers of cases — which afford the slightest indication that the use of alcohol in any form or quantity prevents consumption. This is not the place for an elaborate discussion of this subject, but some things may be mentioned, which even the younger readers of these chapters can understand.

British soldiers, when in their own islands in time of peace and living in barracks, are well known to be free drinkers. In proof of this the second most frequent severe disease among them is delirium tremens, which occurs only in free drinkers. At the same time the *most* frequent serious and fatal disease among them is consumption. It is stated upon the authority of Dr. Lombard, that forty-six out of every hundred of the deaths in the English army in garrison at home are from consumption. If whiskey prevented the disease in any degree it is readily seen that this would not be the case. It never happened among any large number of abstaining temperance people, that forty-six per cent., or almost one half, had consumption, or that this proportion of deaths was from that disease. The statistics of this army show that alcoholic drinking is a cause rather than a preventive of consumption.

As the opinion is still entertained by some (though fortunately not by as many as a few years ago) that whiskey antagonizes and prevents consumption, and as it is still taken for that purpose,

the opinions of some of the highest medical authorities, men who have given special attention to the disease, may be referred to.

No man is higher authority on this subject than Doctor Lebert, a voluminous writer and original investigator, and who has had an extensive practice in this disease in Germany, France, and Switzerland. He emphatically states and reiterates that the free use of alcohol is a cause of consumption, and nowhere in his work on the subject does he intimate that in any quantity it antagonizes or prevents the disease.

In England no names are of higher authority on this subject than those of Doctors Williams, Chambers, and Peacock. None of them intimate that alcohol prevents consumption, but all state that its free use is among the prominent causes of the disease, particularly of the variety called fibroid consumption. In London there is a large Institution called the "Brompton Hospital for Consumptives," where large numbers of these cases are treated, and the disease and all its relations, its causes, treatment, and the changes which occur

from it in the lungs, are carefully studied. One of the physicians there, Dr. R. E. Thompson, in a work on the examination of such cases, declares that "alcoholic intemperance has a very distinct effect upon the condition not only of the body generally, but also especially upon the lungs." He speaks of a particular form of the disease in free beer-drinkers, and another, the fibroid form, in spirit-drinkers, and speaks of these forms of the affection as produced by these indulgences. Indeed, the fibroid form of consumption is by all medical writers allowed to be most frequently produced by the use of alcohol. Other authorities of an equally high character might be referred to. My own opinion, the result of long experience in private and hospital practice, is that alcohol has no claim to be regarded as antagonizing consumption, or as preventive of the disease — none whatever — but that it is the chief cause of what is called Fibroid Phthisis.[1] I have seen many made drunkards, some in whom I had the greatest friendly

1 Pronounce FI-broid thī-sis, a form of consumption in which the lung becomes hardened and contracted.

and fraternal interest; but I have never seen a case where I had evidence that whiskey prevented or cured the disease.

An irritated and inflamed condition of the throat, often extending to the tubes of the lungs, producing a hoarseness and a husky cough, especially in the morning, is a common occurrence in free drinkers.

I have dwelt so long upon this subject because of its great importance — because so many have been led into injurious and fatal practices from what I am confident are false views. May not this be another instance illustrative of the wisdom and truth of the Scriptural declaration, that *Wine is a mocker, strong drink is raging, and whosoever is deceived thereby is not wise?*

CHAPTER VII.

Action of Alcoholics upon the Heart.

THE subject of the action of alcohol upon the heart is of great importance. There is an old and still-prevailing opinion, even among members of the medical profession, that the different alcoholic liquors stimulate that organ, whatever else they may do; that is, that they increase its power and cause it to circulate the blood with more activity and force; and it is for this supposed effect that they are most frequently prescribed as medicines, and taken as fancied aids in the performance of labor. The expression that "Wine cheers the heart," is regarded as meaning that it strengthens and sustains its physical action, and that it or some other alcoholic liquor is useful, if not positively needed, in low conditions of the system, with feeble heart force, and that it acts as a strengthener or tonic. That under peculiar circumstances of shock or great suffering, a stimulating

effect is temporarily realized from alcohol, I am not prepared to deny; but that this is its most essential action, or that it acts thus at all in ordinary conditions, is opposed to the present state of physiological knowledge. The truth in this matter it will be one of the objects of this chapter to set forth.

In preceding chapters we have traced the alcohol which has entered the stomach into the blood, through the liver, and into the lungs. When it reaches these last organs, a small part of it immediately passes off in the breath, giving an odor which is readily perceived. But very much the greater portion is hurried on with the blood to the left side of the heart, and from this through the arteries to every part of the body, and in the round of the circulation comes back to the heart. While in that organ in its first and subsequent passages it makes an impression upon it, and the character of that impression is what at present interests us.

The decision of the question as to whether it directly increases or depresses the heart's action by its presence there, does not positively determine the more important question as to its benefi-

cial or injurious effects, either in health or disease; but such decision establishes principles which have a most important bearing upon the practical question of its utility or harmfulness in various conditions.

It is held by physiologists that the direct action of an agent upon the muscular tissue and nerves of the heart, and upon its power and motions, is essentially the same in the lower animals and in man, and that whatever effect is demonstrated in the one is regarded as proof of the same in the other. It is this similarity in animals and man that makes experiments upon animals of such great importance to the interests of humanity.

Within the last few years experiments of the most exact and conclusive character have been made by skilled investigators, to determine the action of alcohol on the hearts of animals. To give the details of such experiments, even if fully intelligible to young readers, would occupy more space than is at our command. I must be content with stating the conclusions arrived at by acknowl-

edged experts of the highest authority in these modes of investigation.

Among the most careful and skilful experiments on this subject are those of Drs. Sidney Ringer and Harrington Gainsbury, of London, reported in *The Practitioner* (a leading medical journal) for May, 1883, and re-stated by myself, with comments, in the *Journal* of the American Medical Association, Vol. 1, p. 272.

These experiments made upon the hearts of frogs were instituted for the purpose of determining the comparative effects of the different alcohols in their direct action upon that organ. It was found that all the alcohols (including common alcohol, the active principle in all our liquors) diminished the force of the heart's action, and arrested it in a shorter or longer time, in exact proportion to the strength of the respective articles and the quantity applied. A long series of experiments furnished the same results and demonstrated their correctness. Common alcohol is weaker and lighter than some of the other rarer alcohols, but heavier and stronger than others; but the effect in

character was the same in all, differing only in degree. These eminent experimenters, in closing their report on these articles, declared: "That by their direct action upon the cardiac[1] tissue, these drugs are clearly *paralyzant*[2] (and not stimulating), and that this appears to be the case from the outset, *no stage of increased force or contraction preceding.*"

Professor Martin, of Johns Hopkins University, Baltimore, who has written an excellent work on Physiology, and who stands among the very highest in this country as an experimental physiologist, has made experiments on the heart of the dog, with the view of determining the precise effect of common alcohol, when in the blood in certain proportions, upon that organ. A report of his experiments was published in the *Maryland Medical Journal* for September, 1883. Professor Martin states the results of his exact and conclusive observations as follows: "Blood containing one eighth per cent. of alcohol (that is, in the proportion of

1 Relating to the heart. 2 Pronounce par-al-i-zant, causing loss of force in the heart's action.

one eighth of an ounce, or one teaspoonful, to one hundred ounces, or six and a quarter pints) has no immediate perceptible action on the isolated heart. Blood containing one fourth per cent. by volume (that is, two teaspoonfuls to six pints and a quarter) almost invariably remarkably *diminishes* within a minute *the work done by the heart;* blood containing one half per cent., that is five parts in a thousand (or four teaspoonfuls to six pints and a quarter) *always diminished it*, and may even bring the amount pumped out of the left ventricle to so small a quantity that it is not sufficient to supply the coronary arteries."

Professor Martin estimates that an ordinary, and what would be regarded as a moderate, drink of brandy or whiskey, containing half an ounce of pure alcohol, or an ounce of the whiskey or brandy would supply to the blood of an ordinary sized man the proportion of two and a half parts per thousand, the quantity he always found diminishing so positively the force of the heart's action, as tested upon the heart of the dog by instruments of precision. The results of these experiments have not

been contradicted by any other experiments of a similar character, and they conclusively prove that the direct action of alcohol on the heart is *paralyzing*, and not stimulating.

It is true that alcohol often, indeed generally, increases the *frequency* of the heart's action but not its *force*, when in a previously healthy state; except perhaps in cases where it excites feverishness, which is a diseased condition. Great frequency of the pulse is an evidence of weakness rather than of strength.

These conclusions of scientific experiment are not contradicted by correct observations upon persons. In faintness or depression from the shock of an injury or great suffering, a dose of alcohol, like a dose of opium, or the inhalation of chloroform or ether, by relieving the shock or the suffering, will often temporarily increase the action of the heart by its soothing action through the brain and nerves; but this action is indirect and not permanent, and when no morbid condition is present to be relieved by its anodyne action, the alcohol, like opium and chloroform, produces depression and dimin-

ishes action. Either of these articles may relieve a sense of weakness without producing strength.

The temporary effect of alcohol in relieving shock, and the relief it often affords to the feeling of fatigue, together with the slight and brief excitement it sometimes produces when first taken into the stomach, have given and keep up the notion of its essential stimulating effect upon the heart, which is so positively disproved by direct experiments and accurate observations. There is an instrument called a sphygmograph[1] which, when applied over an artery, as to the pulse at the wrist, accurately measures and records the force with which the heart sends the blood through the vessel. It is proved by this, as well as by the experiments on animals, that a healthy heart has its force diminished, rather than increased, by alcohol taken into the blood and carried to it. It is well known that extreme doses arrest the action of the heart, and the person dies with this organ paralyzed and distended.

But in corroboration of these more conclusive experiments we have the opinions of those who

1 Pronounce Sfig'-mo-graf.

have most carefully investigated the action of alcoholics upon the human body, and especially upon the heart, by the common methods of scientific observation. No man has given this subject more careful attention than the late Dr. Anstie of London. He concludes his statement respecting it by the following declaration: "A general review of the phenomena of alcohol-narcosis[1] enables me to come to the distinct conclusion, the importance of which appears to be very great, namely, that (as in the case of chloroform and ether) the symptoms which are so commonly described as evidences of excitement depending on a stimulation of the nervous system [and through it he might have added, of the heart] preliminary to the occurrence of narcosis, are in reality an essential part of the narcotic, that is, the *paralytic* phenomena."

Dr. Samuel Wilks, of London, one of the highest living authorities in the medical profession in England, says: "Alcohol, for all intents and purposes, may be regarded as a *sedative* or narcotic

1 Pronounce nar-cō′-sis, the effects of a narcotic.

rather than a stimulant." These declarations apply to the heart as well as to other parts of the body.

No man in America has studied the action of alcohol on the body longer or more carefully than Dr. N. S. Davis of Chicago. He has come to conclusions entirely in accordance with those already quoted. The effects of alcohol taken in the common manner are, he says, "those of an anæsthetic[1] and organic *sedative*." Other authority to the same effect might be quoted, but the foregoing must suffice.

Facts in the personal experience of individuals, and in observations of large bodies of men, are quite as conclusive in proving that alcohol produces weakness of the body, including the heart, rather than strength. It is now well known and acknowledged by scientific men, that less muscular labor can be performed under the influence of alcohol, in whatever quantity, than without it. In the performance of great feats of strength and endurance, as in the case of Weston, the famous

[1] Pronounce an-es'-thet-ic, that which produces insensibility.

pedestrian, alcohol has been avoided: and in the harvest field and the workshop, and with contestants in ancient Roman games, the advantage has ever been with abstainers. The most conclusive tests have been in armies in severe marches, where accurate observations on a large scale have been made by intelligent medical and commanding officers. In all such tests, whether in hot or cold climates and seasons, in Africa, India, Russia, Canada, and everywhere, it has been shown that those soldiers who abstained from alcohol could accomplish and endure more than those who indulged in it, however moderately or freely. In emergencies, those officers who allow its use at all, find that it must be given when the men have accomplished their day's work, and are resting after their labor. It may then blunt the sense of fatigue, and promote sleep, but, unfortunately, it lessens the power of work for the next day, and if its use becomes habitual, other mischief, as we shall see, will be done. The effects of the habitual or long-continued use of alcoholics upon the heart are similar to those upon the body at large.

Whether taken in the form of beer, wine, or spirits, the general effect is, *lowering of vitality, degeneration of structure, and diminution of power.* That the heart is rendered more liable to undergo morbid structural changes, all pathologists know. As with the liver, it is more liable to become loaded with and obstructed by fat, and to undergo fatty degeneration. Its vessels, its valves, and its general tissues are more likely to be impaired, and its force abates at a much earlier period; and these effects are likely to be in proportion to the amount taken. In wine drinkers the condition called the "gouty heart" is a not unfrequent occurrence. The heart is then liable to attacks of severe pain, or irregular actions, and of sudden failure. It is often the seat of "misplaced" gouty inflammation; and gout, in whatever form, is always the result of indulgence in alcohol, either by the individual or his ancestors. The gout is unknown among peoples, such as the Mahomedans, who have never used alcoholics.

Nothwithstanding the essential weakening effect of alcohol upon the heart, in those who have

established the alcohol habit, as with those who have established the opium or the tobacco habit, the privation of the accustomed indulgence is often followed by a feeling of depression, and sometimes of real weakness, which will be relieved by a repetition of the dose. No one supposes that tobocco is a strengthening article, and yet it increases the strength of an habitual user who has for a short time been deprived of it. It is so with alcohol when an habitual, but not an excessive, quantity is taken. This effect contributes to the false belief that it is a stimulating or strengthening agent.

CHAPTER VIII.

Effects of Alcohol on the Kidneys.

THE kidneys are two darkish red organs, about four inches in length, two in breadth, and one inch in thickness, with a convex outer and a concave inner surface, situated one on each side of the abdomen, the right just below the liver, and the left below the stomach and spleen, and both near the backbone. Their office is to carry out of the body, by straining them from the blood, various substances dissolved in that fluid, and held in solution by the water passing out with them. Some of these substances are formed in the body from worn-out materials of tissues, and some are matters taken into the system from without, and which are not appropriated to its uses.

The kidneys are supplied with large blood vessels which carry to and from them large quantities of blood; and the water, with the other ingredients

in it, which is separated from the blood, is conveyed from each of these organs by a tube to the bladder, from which from time to time it is expelled as waste and useless or injurious matter.

This is an office so important that if it is suspended for any considerable time, blood and tissue poisoning, and especially brain poisoning, is produced, and death soon follows. If this office is imperfectly performed, more or less derangement results according to the degree of such imperfection. Whatever, then, injures the kidneys and impairs their action, inflicts a serious injury upon the system. We are now to consider the action of alcohol on these organs.

Any substance taken into the body and passing into the blood, and not changed in its form or appropriated to the uses of the system, is carried out of it, and to a large extent by the kidneys. Poisons and medicines are thus removed from the blood as it is constantly passing through these organs. As alcohol is not digested in the stomach but passes unchanged into the blood, and is not converted, or, if at all, only in small quantities, into

any other substances to be appropriated to any uses in the system, it is certainly mostly carried out of the body as it entered it, partly by the lungs and skin, giving its odor to the breath and the perspiration, but largely also by the kidneys. It thus comes in contact with the very delicate structure of these organs, and makes its impression upon them.

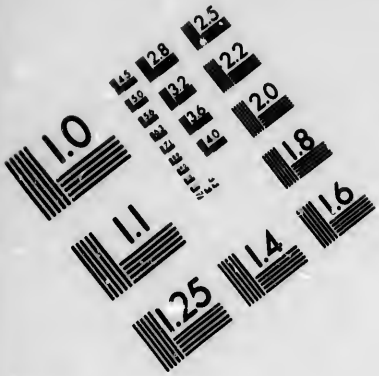
As is the case with other organs, that impression varies with the quantity taken, with the length of time it is used, and with the power of resistance to morbid impressions.

The first effect of alcohol on the kidneys, as it passes through them in the current of blood which goes to them for purification, is to produce more or less irritation. This is marked in some instances and scarcely perceptible in others. It should be understood that the liver, the lungs, the heart, and the kidneys have large quantities of blood carried to them to be acted upon by these organs respectively, as well as blood to nourish them in common with all other organs.

The vessels conveying the blood to and through the kidneys for whatever purpose, are dilated by

the alcohol, the organs are more or less congested, and usually their secretion is temporarily increased. Sometimes decided inflammation of these organs is induced by this irritation, especially where a free quantity of the alcohol is taken, or if in addition there is exposure to cold and wet, as when in a state of intoxication one is exposed to rain, or lies upon the ground. Cases are not infrequent where, after a fit of drunkenness and the exposure apt to attend it, an acute inflammation results, with such impairment of the structure and action of the kidneys as to lead to convulsions and death, or to the laying of the foundation for general dropsy, and other forms of more chronic but equally fatal disease.

The most frequent morbid effect on the kidneys of the long continued indulgence in alcohol is the much dreaded and generally fatal Bright's Disease. This affection is not always produced by alcohol, but all agree that tippling is the most frequent cause of its occurrence. In this disease the kidneys, by repeated irritation and a slow inflammation, undergo such changes that they fail to



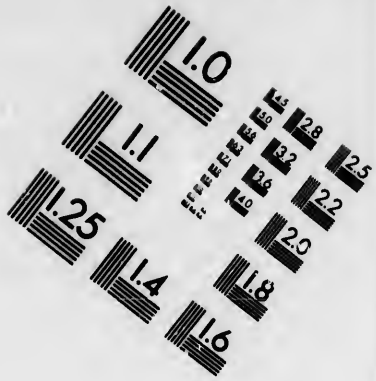
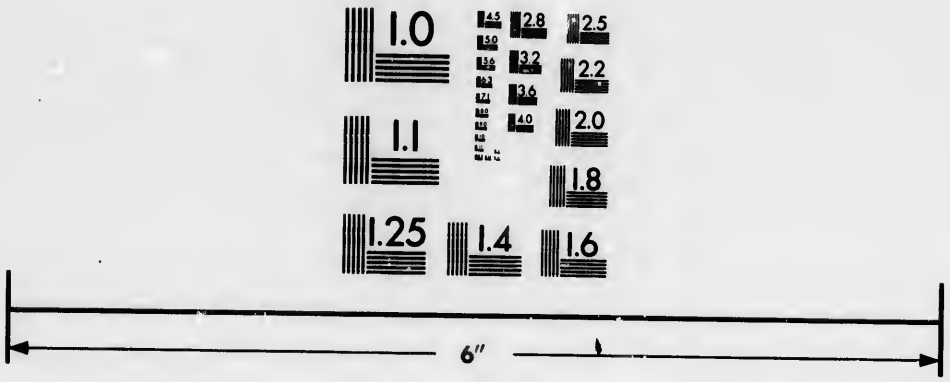
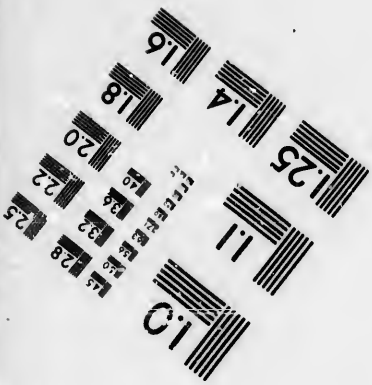
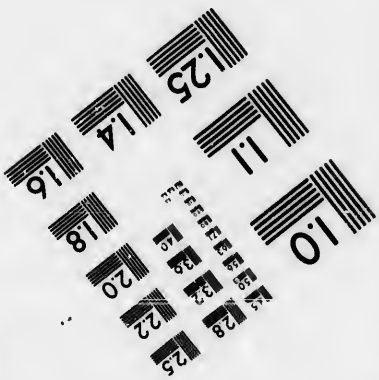


IMAGE EVALUATION TEST TARGET (MT-3)







Photographic Sciences Corporation

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

separate from the blood the materials that should be carried out of the system, and these matters, being retained, poison the brain and other parts, causing a variety of diseased conditions and symptoms. The kidneys are in some stages and cases enlarged, and in others contracted. They undergo fatty and other forms of degeneration, and the symptoms produced are dropsy, debility, blindness, paralysis or loss of power, stupor, convulsions, and almost certainly in time, death.

Besides failing to carry off these injurious matters, the kidneys, by these changes which they undergo, allow the rich portions of the blood (the albumen) to pass through them, thus depriving the body of nutritious elements, aiding in the promotion of weakness, paleness, and exhaustion, increasing the dropsy, and hastening the patient on to a fatal end.

A particular condition of the kidney sometimes occurs, called the Gouty Kidney. This is associated with other symptoms of gout, and is a form of Bright's Disease, attended with its consequences; and gout is dependent upon the use of alcohol,

either in the individual or his ancestors. Those peoples, as the Mahomedans, who, from their religious teachings, or from other causes, abstain from wine and other alcoholics, never have this disease, so common in wine and beer-drinking England.

Alcohol, in all its combinations in different liquors, in its action upon the kidneys, whenever its effects are noticeable, produces nothing but mischief, and no intelligent physician pretends that it serves any useful purpose so far as these organs are concerned.

I remember meeting a prominent medical gentleman of my acquaintance years ago, when the subject of the use of alcohol was introduced. In opposition to my own views he contended that, when used "temperately," it was not objectionable. He said, no man abhorred drunkenness or despised drunkards more than he. He said he was never drunk in his life, and to the end I presume he never was. He never drank in saloons, and very seldom at other than meal times; but his bottle of whiskey, he said, was on his table and by his plate as regularly as his knife and fork, and he always

took a drink with his food. His digestion was, he thought, not impaired by it, and his sensations were more agreeable and his general condition better, when he took his accustomed dram, than when on rare occasions he went without it.

As for the example, he said he was not responsible for others' excesses, and, in fact, he said he set a good example by his moderation. He should therefore continue to have his whiskey bottle by his plate and use it as he had done. No more favorable statement in regard to its use than this can be made, and he used it in a manner as little likely to do harm, considering the amount taken, and its continuance, as was possible.

Taken with his food and mingled with it, and diluted with water, though probably neutralizing a portion of the gastric juice, it was not applied in a concentrated form to the coats of his stomach; and it produced but little or no apparent irritation there. It was slowly introduced into the blood, and no sudden or strong impression seemed to be made upon the liver, the lungs, the heart, or the brain. His sensations were more agreeable

after each dose, on the same principle that opium, tobacco, and other narcotics than alcohol produce agreeable sensations. They all produce more agreeable feelings than those which are experienced when the accustomed quantity is omitted. These feelings of uneasiness, of depression, and distress, that result from discontinuing the indulgence, though produced by the habit, are wonderfully relieved for the time by a repetition of the usual dose.

But the alcohol, however taken, must be gotten rid of, and a large portion of it is carried out by the kidneys. Its repeated and long continued presence in them is apt to tell upon these organs; and in the case of this gentleman, in two or three years after his conversation, he was reported to have Bright's Disease of the kidneys, and soon after retired from his city work to the country, where in a few months he died, in the prime of his years.

This is not a solitary case. It is rather a typical example, and it illustrates the insidious manner in which this deceiver often produces in the end its evil effects.

CHAPTER IX.

The Nervous System and Narcotics.

IN the preceding chapters the effects of alcohol upon those organs of the body directly concerned in digestion, nutrition, respiration, circulation, secretion, and the purification of the blood, were discussed. These all are important organs, and the functions they perform are indispensable. When these organs are diseased — when they are lowered in their vitality and degenerated in their structure, in the manner that alcohol tends to affect them — the whole system suffers, but this suffering is primarily and chiefly physical. The mind, the most important part of the man — the feelings, impulses, and purposes, mental and moral, the intelligence, the knowing and reasoning faculties, and the governing will, are, by the impressions upon these organs, affected only secondarily.

We come now to consider the action of the narcotics on the *Brain and Nervous System*, and especially that of alcohol where its most characteristic effects are produced.

This Nervous System, of which the brain is the chief or crowning part, but which includes the spinal cord and the nerves, is regarded by all physiologists as the central and most important part of the organism.

It is the most important part for different reasons. It establishes connections and relations and maintains a harmony between the different parts of the body, and none of its actions are independent of the brain and nerves.

It would require a long time and much study for any one to learn what is well known by anatomists and physiologists respecting the nervous system, to say nothing of the theories and discoveries which still lack demonstration. The brain especially, but also the spinal cord, has many curious and delicate parts which perform a great variety of functions. There are myriads of cells which originate actions and receive impressions, and as many minute

tubes which convey impressions and forces to and from the cells to the different parts of the body. The details respecting the kinds of actions are too numerous to state; and it must answer our present purpose to say, that not only every organ of the body has a nervous supply, but every minute part of a living tissue, performing any action, having any power of motion or capability of feeling —every part constructing blood corpuscles or effecting secretions—is furnished with a little nerve fibre controlling its action; and any wrong state in the cells of the brain or the fibres of the nerves causes wrong actions, more or less marked, in the parts influenced by them.

But besides this, and what is of much more importance in relation to our subject, the brain is the organ of the *mind.* Everything we call mind, every feeling, emotion, disposition, impulse, and desire; all ideas, knowledge, reason, and thought, and all purpose, determination, and will—the power to feel, the power to think, and the power to act—all that pertains to our character or conduct, shows itself, or is expressed, through and by the

brain; and character and actions are influenced and determined by the conditions of the brain. Anything that acts upon the brain and the nerves —the appendages and servants of the brain— changing their conditions, changes the conditions and actions, not only of the body, but of its immaterial inhabitant, the mind.

Now, not only the most characteristic but by far the most marked action of alcohol is upon the nervous system—upon the brain, the spinal cord, and the nerves.

The brain has more attraction for alcohol than the other organs of the body. In case of death from direct alcoholic poisoning in men, as sometimes happens by accident, or in animals as produced by experiments, more of the poison is found in the brain and liver than in other parts, and there is a larger proportion in the brain than in the liver. But alcohol has not only a special aptitude to be in the brain, but to *act upon* its soft and delicate structures, and to change its important functions.

There is a class of agents, including alcohol, opium, belladonna, ether and chloroform, which are

called narcotics. Their effects are peculiar, all agreeing with each other in many respects, but differing in some minor particulars. Their action is specially upon the nervous system, and upon those portions of it concerned in mental operations. They are generally described as first exciting and then depressing nervous action, and as particularly operating upon the intellectual part of the brain.

The excitement which these narcotics produce is usually very brief, and is often, at least, indirect, and may be produced by the resistance of the system to the intrusion of an unnatural agent. The cause of a fever, though a depressing poison, produces an excitement of the circulation, and often of the operations of the mind, but neither this nor the narcotics increase muscular strength or any regulated or any useful form of activity; and the excitement produced by the narcotics is soon followed by the depression which is their most decided and characteristic effect. Many of their apparently exciting effects can be accounted for on the supposition that their entire action is depressing or paralyzant. Some nerves excite action in the

organs which they supply, and others restrain action; and the performance of proper functions depends upon the balance of these exciting and restraining nervous influences. Those that restrain and thus regulate action are called *Inhibitory* nerves, and when those supplying an organ are weakened, paralyzed, or destroyed, certain actions of that organ are increased, but these actions become irregular, and real permanent force is not produced. Some apparently stimulating effects are known to be caused by paralysis of the inhibitory nerves, and not by a stimulating effect upon the excitor nerves; and this is likely to be the case in more instances than have yet been demonstrated. But whatever and however apparently increased action is produced by narcotics, it is irregular and transient, and is accompanied by unfavorable activity, certainly when the narcotics are taken by persons in health, and such action is followed by the characteristic depression.

Among the most marked effects of opium is the production of sleep, of belladonna the production of delirium, of chloroform and ether the production

of insensibility, but the two latter articles, when not carried to the extent of causing insensibility, temporarily produce the state called inebriation or drunkenness. The effect of alcohol is similar to these, but more lasting, and when carried to a sufficient extent, it likewise produces insensibility. All these narcotics, when given in sufficient doses, cause death by paralyzing necessary life functions.

But these narcotics, even when not carried to the extent of entire insensibility, by their paralyzing effects on the brain and nerves, relieve pain when present, opium most of all, and all modify the feelings so as often to produce agreeable sensations and emotions, and all disturb in one way or another the natural operations of the mind.

Another quality all the narcotics possess, but some more than others, and that is, when taken repeatedly they create a desire for the continuance of these repetitions, and tend strongly to the formation of a *habit*, which it is difficult, and in some cases apparently impossible, to resist.

It is not possible fully and scientifically to explain the force of the *narcotic habits*. They are

allied to each other, and to a certain extent one may take the place of the other—at least the formation of one of these habits tends to the production of others. They are much more readily acquired by some than by others. The children of parents who have acquired such habits, from an inherited impulse, are much more liable to form them; and the use of some of the narcotic articles has a stronger tendency to become tyrannously habitual than that of others.

The opium habit, though readily formed, is perhaps, more difficult to break than any of the rest, but it will serve, in some respects, to illustrate them all. A dose of opium produces with many persons agreeable sensations, bodily and mental. It quiets restlessness, soothes irritation, and sometimes produces a temporary elevation of thought and a dreamy pleasure. This leads to a desire to again excite such agreeable feelings. But the after effects of the doses are unpleasant. Depression, uneasiness, and often pains are felt. These are readily mitigated or removed by repeating the dose, and the agreeable feelings take their place. This state

of things naturally leads to repetitions, until the indulgence becomes habitual, and larger and still larger quantities are required to relieve these secondary sufferings and to cause the agreeable sensations.

But besides and beyond this, there is a force in narcotic habits not fully understood. Repeated indulgence in any of these articles which make a strong impression on the nervous system, whether that impression at first be disgusting and distressing, as in the case of tobacco, or more immediately agreeable, as in the case of opium and alcoholic drinks, produces a fascination and an enthralment that those alone who feel their force can appreciate. A changed condition is induced with unnatural wants and propensities, which call for and insist upon gratification, however disastrous the results. But whether explained or not, these facts are too familiar to be questioned and too important to be ignored.

Alcohol is a powerful narcotic and has all the essential properties of the class; and though so small a quantity of any of them may be taken, or

they may be so seldom indulged in that their more disastrous consequences are resisted, yet there is always danger in their indulgence, and injury more or less is produced and in proportion to the extent of their use.

Though alcohol has many properties in common with the class to which it belongs — has a similarity of action on the nervous system with the others — yet it has qualities peculiar to itself, and its more particular actions on this system are next to be described.

CHAPTER X.

Action of Alcohol upon the Brain, Spinal Cord, and Nerves.

IN the last chapter some of the effects of the Narcotics, as a class, on the nervous system were pointed out, and their liability to produce narcotic *habits* was dwelt upon.

Nothing relating to our existence is more interesting in Science, or more important to our well-being, than the formation of habits. Men are sometimes said to consist of *bundles of habits*, and certainly our habits largely determine our characters, our usefulness, and our happiness. They not only make us what we are, but what we shall be.

Habit is defined as a quality given to our organism by use. The primary law of habit is, that all vital actions tend to repeat themselves, or to become easier of performance, and more likely to be performed the more they are repeated. Every act, physical or mental, performed or suffered, leaves an impression upon the organ performing it, ren-

dering the organ more able and more inclined to perform it again. There are exceptions to this broad statement, but it is strictly true in reference to the formation of habits. As we have seen, many strong impressions upon the nervons system create an intense desire for their repetition, and acts in general tend to be habitual. Addison, the essayist, long since said, "Do that which is best, and habit will render it most agreeable;" and when we do what is worst, habit renders it, if not most agreeable, at least more easy and more likely to be continued. The habitual acts of young people establish in them dispositions and characteristics which are seldom materially changed, and almost never completely eradicated; and the qualities thus acquired become so fixed and constitutional as to be transmitted from generation to generation. It is by this law of transmission that the sins, or evil qualities, of the fathers are visited upon the children; and by the same law blessings come to thousands who on the part of their ancestors and themselves keep the commandments — obey the physical and moral laws. A wicked disposition,

acquired by wicked habits, desires wickedness; and a narcotized brain desires narcotism, and is followed in after generations by brains more inclined to acquire the narcotized state.

These facts of habits and their hereditary transmission are so important as to justify their repeated statement in a series of articles intended to convey scientific truths which have a bearing upon the deepest interests of all for whom they are designed.

But what are the effects, immediate and remote, which alcohol, in the different degrees and modes of its use, has upon the Brain and Nervous System, and through these organs upon character and destiny?

In answering this question it will be well to consider, *first*, the more immediate effects of a single dose, or a few doses, and then the effects of their continued use in different quantities. It should be borne in mind that we are not discussing the strictly medicinal effects of alcoholics in special diseases, or in the shock of accidents. These are questions which belong to the medical profession, and respecting which those without the profession are not

supposed to have definite opinions, at any rate, not more than they should have about arsenic, strychnine, or other powerful medicinal agents. We are considering the essential action of alcoholic drinks on the system without reference to their modifying influence upon diseases; though the opinions entertained respecting their essential or what is called their physiological action, should largely govern their omission or use in diseases.

The first impression alcohol makes upon the brain, after being taken into the stomach, is that conveyed from the latter organ by nervous sympathy, or by that peculiar relation between different parts of the body established by the everywhere prevailing nerves, by means of which an impression upon one part produces an impression of some kind on other parts. The sympathy between the stomach and brain is very intimate as is well known generally, and is especially understood by those who are dyspeptic.

The first impression of alcohol upon the brain, by sympathy with the stomach, is very speedily produced, and is comparatively short; or if con-

tinued longer, it is obscured by the stronger and more enduring effect produced by its being absorbed and carried by the blood to this organ.

This first sympathetic impression, when only a fairly moderate quantity of the alcohol is taken, is to a certain extent, and in a certain way, often exhilarating. In depressed conditi it often arouses the system, and it relieves fainting almost as speedily as dashing water upon the face; indeed it acts upon a similar principle, though rather more permanently. It is this sympathetic, transient, apparently exhilarating effect that gives the idea, which is so common, that alcohol is a stimulant; though it is not so in its direct effect by its presence in an organ, as was shown in the experiments upon the heart, an account of which has already been given.

But very soon after being taken into the stomach the alcohol begins to be absorbed and carried to other organs, and it speedily reaches the brain. Free portions of it are retained there, and produce other effects to be described.

Though alcohol is a narcotic, producing a more ordinary effect, like other narcotics, by its peculiar

relations to the vital properties of the brain, yet unlike most of them it has chemical or mechanical effects upon the brain's structure. From the peculiar composition of this organ, and perhaps from its containing more moisture than other organs, a larger quantity of alcohol, after its imbibition, is found in its substance than in other tissues of the body. By its great affinity for water, it takes from the soft, delicate, and moist tissue a portion of its moisture; and when the alcohol is free in quantity, it takes the water to such an extent as sometimes to coagulate the jelly-like matter; but ordinarily it produces a slighter physical change in the brain's structure, but which nevertheless interferes with those minute motions which take place in the performance of proper functions.

The long-continued use of quantities not immediately so disastrous, produces various structural changes, which are often markedly perceptible; and in chronic alcoholic disease, hardening of the brain structure, increase of the connective tissue, with diminution of the proper brain cells, thickening of the membranes, and effusions of serous fluid

into the ventricles or cavities, are among the appearances often found. All these changes are usually accompanied with more or less inflammatory and other degenerative processes, with a lowering and perversion of function, and with premature decay of all mental and physical powers.

But the more common and therefore more important effects of alcohol upon the brain, usually produced by smaller quantities than cause the gross chemical and mechanical effects just referred to, are produced by its *narcotic* or *vital*, rather than its chemical or physical properties. Other narcotics, such as morphine, atropine, nicotine, prussic acid, produce their effects independently of any recognized chemical or physical action, and alcohol produces its more ordinary effects by properties which do not produce these gross changes. The special cause of such effects — the particular change produced in the brain and nerves, is not in all cases known. But the fact is known that changes in the vital conditions and actions of these important organs do occur; and when enough of the poison is taken, all action is arrested and death is produced,

although no gross changes of composition and structure are discovered. Without further attempts to explain the cause of the peculiar action of alcohol on the brain and nerves, I shall endeavor to describe the leading phenomena which we see that it produces.

Alcohol, chloroform, arsenic, opium, or any other narcotic or poisonous substance, may be taken in such minute quantities as to produce very little or no perceptible effect. A single whiff of chloroform may make an impression upon the sense of smell without any further effects being noticeable. So a single sip of wine, or a small quantity of brandy, as used in cooking, may impart a flavor, and possibly cultivate a taste, but without producing any other observed change in the organism.

When, however, sufficient of any of the alcoholic liquids is taken to produce appreciable or more marked effects upon the brain and nerves, *four stages* of effects may be observed. These stages shade off into each other, and are determined by the quantity taken and the susceptibility and other conditions of the person.

When a moderate quantity, as a glass or two of wine, or of spirits and water, is taken by one not much accustomed to the use of these articles, a flush of nervous action is immediately experienced, and, as already stated, is chiefly from an impression conveyed from the stomach. There is usually an increased disposition to motion or to some form of action, a greater sensibility to some impressions, and a more ready response to them. There is often, perhaps generally, a more rapid flow of ideas, and more agreeable feelings are commonly experienced; and if there be a sense of fatigue, it is apt to be relieved. A feeling of coldness, if existing, is abated; and by an impression made upon the nerves controlling the vessels of the surface they become expanded, more blood is brought to the skin, especially of the face, an increased external warmth is often perceived.

The heart, by the same nervous impression, is generally increased in the frequency of its beat, and possibly for a very short time in its force, especially if the person is fatigued, or depressed from any temporary morbid influence; but when the

alcohol reaches the heart through the blood and is thus applied to its substance, the force of that organ is *diminished*, as was shown from the experiments recorded in a previous chapter. This is the *first* mild stage of alcoholic action upon a person in a state of comparative health, and all these effects soon pass away where so small a quantity is taken, leaving only a slight feeling of languor behind.

In the *second stage* when more has been taken, or when that taken has had its more full effect, the alcohol having accumulated in the brain, the flush of the face may continue, or become purplish, or in rarer cases it may fade; the temperature of the surface may continue, or it may be less, but that of the internal parts of the body, as a rule, is diminished; there is now a degree of mental confusion, with less precision of muscular motion, though there may be increase of the flow of ideas and of words from weakening or partial paralysis of the regulating and restraining functions; and for the same reason there is a more ready excitement of the feelings of mirth or anger, of affection or hatred, and a more ready and unrestrained expression of

such feelings. Indiscrete confidence, silly sentiment, extravagance, and boasting are apt to be indulged. There is now, in different degrees, the condition of "tipsiness." The man regards himself as stronger, wittier, and wiser than he is. The cares and responsibilities of life rest less heavily upon him, and in this condition he is less careful of proprieties and of obligations. With many the sensations are now more agreeable, and a sensuous hilarity is experienced. This release from care and these agreeable sensations have given rise to many a eulogy in song upon the "pleasures of the wine cup," and have inspired the worship of Bacchus. It is claimed that the feelings of friendship are more ardent when pledges are made in wine; but it should be remembered that feelings of hatred are as apt to be excited as those of love, as is attested by the quarrels in the cups; and in lower natures impurity and fights are apt to result. In these lower natures, recklessness and criminality in this state are common.

But if indulgence was never carried beyond this point, was only occasional, and was practised only

by men of well-regulated minds and characters, the immediate individual results would not be so disastrous, though often when the drinking is indulged only to this extent, the effects are markedly injurious upon the health of both the body and the mind; and constantly the short pleasure is followed by a much longer period of depression, and the sum of happiness is diminished rather than increased by ever so judicious an indulgence.

The great objection, however, to such indulgence is, that a taste is developed and a habit formed which in so many instances carry the victim far beyond these limits, producing results which are to be described as we proceed — results not confined to the individual, but extending to his associates, to his family, to society, and to his offspring to after generations. If the pleasure of this moderate indulgence were much greater, it could not compensate for the danger to the individual, and the injury of the example to others which such a drinking custom would inflict.

CHAPTER XI.

Action of Alcohol upon the Brain and Nervous System (*Continued*).

IN the preceding chapter, the milder acute or immediate stages of alcoholic action were briefly described. In these milder stages, amounting in the highest degree only to what is called "tipsiness," as well as in the more pronounced stages of intoxication, the peculiar action of alcohol on the brain induces *feelings* of strength, of self-importance, and of well-being, which are entirely deceptive. This is demonstrable with the muscular power. The tipsy man boasts of his strength and is ready to use it in contests, but he is more readily defeated than in his natural state; and in lifting at weights, where there are accurate tests, it is found that every degree of alcoholic action upon a healthy system diminishes muscular power.

But the more advanced, or *third* stage, presents more striking phenomena. In this stage the man

is regarded as *intoxicated*, or drunk. The face may now be purplish, or pallid, the temperature is reduced, the motions of the heart are usually diminished, often in frequency, but more constantly in force; vascular tension, or the pressure of blood in the arteries, is less; there is marked failure of muscular direction or control, and of muscular power; the gait is unsteady, the tongue is thick, the lips and limbs are more or less paralyzed, there is sometimes double vision; and now there is more marked obscurity and confusion of intellect, and more change of mental feeling. There is generally either an increase of irritability of temper, or a development of foolish sentimentality, with still greater recklessness of conduct, a loss of a sense of propriety, and often a disregard of the rights of others; and now pugnacity, brutality, violence, and criminality are apt to appear.

When not too advanced, this is the stage of brawls and fights, of shooting and stabbing in saloons and in the streets, of beating of wife and children at home, of profanity and obscenity everywhere, and of all the horrors so familiar to the

frequenters at public places, the visitors at the homes of drunkards, and the readers of the daily papers. This stage may terminate in an unnatural sleep, with restless mutterings, semi-convulsions, or more quiet narcotism.

In the *fourth* stage, or that of dead drunkenness, there is the full development of alcoholic narcotism. The anæsthetic phenomena, or those of insensibility, such as appear under the influence of chloroform or ether, are present. There are muscular palsies, irregular and stertorous breathing; feeble, often intermittent, heart action; great fall of temperature, with utter insensibility and unconsciousness; and the next step is death. Death is more likely to occur when the same degree of narcotism is produced from alcohol than from chloroform or ether, because of its longer continuance. The alcohol necessary for these effects is larger in amount and slower in leaving the system than the chloroform or ether. The awakening from the obliviousness of the more advanced degrees of drunkenness, whatever may be the sensations and visions in falling into it, is a painful

reality. Confusion, depression, and distress, and, before the drunkenness becomes habitual, remorse and shame are keenly felt in all but the lowest natures. For hours, and often for days after, there is pain in the head, often sickness of the stomach, the tongue is coated, the hands tremble, there is frequently feverishness, and languor and inefficiency continue for a longer time.

With some, in these fits of intoxication, violent and repeated convulsions occur; and with some others there is active delirium—*crazy drunkenness*—but such cases are not common. It is a curious and most unfortunate fact that, however painful these results, however strong the motive and firm the resolve not to repeat the debauch, there is in many cases an imperative impulse to indulge again in the same manner, especially if any, even the least, intoxicant is taken; and in spite of a knowledge of consequences, and the remonstrance and persuasion of family and friends, the terrible practice becomes habitual.

The strong resemblance between the narcosis of alcohol and that of chloroform or ether is appar-

ent; but that of alcohol is much more likely to become habitual. The essential character of the conditions is so similar that the same terms may be applied to each. If chloroform is a narcotic, so is alcohol; if one is a depressing, lethal agent, so is the other. If chloroform is a poison, so is alcohol. The greatest difference in their immediate action is, that the chloroform is more speedy in its effects and sooner over; and its secondary consequences are less severe.

But in studying the effects of alcohol on the brain and nervous system, we must go beyond the speedy action of a single or a few doses, and consider the more important, because the more permanent, effects of its continued use. These effects are varied by the quantity used, the length of time it is continued, and by the temperament and power of endurance of the drinker.

In its habitual use, *four* stages of alcoholic change are recognized, corresponding in many respects with the four acute stages that have been described.

There is a mild *first* stage where only small quantities are used, as where an occasional glass of light wine or beer is taken with the meals, and where such limits are not exceeded. In this the condition of the brain and nerves is but little changed from the physiological or natural state.

There is a *second* stage where a change from the normal state is more perceptible—where the force and regularity of brain and nerve action is impaired, but not in an extreme degree; but where the tone of the intellectual and particularly of the moral character is lowered, but yet where the subject of it is not regarded as a drunkard.

There is a *third* stage where there is unquestionable intemperance or inebriety—where the subject is called a "hard drinker" or "drunkard" according to the degree of indulgence; and there is still a more advanced or *fourth* stage, where the victim is a complete sot, given up to continued and extreme indulgence, whenever the means are within his reach, where there is the greatest debasement, physical, mental, and moral, where there is advanced alcoholism or alcoholic

disease, where the wretched victim is tottering on the verge of destruction, unfit for any useful occupation or respectable association, a disgrace to himself and friends, and a nuisance to all about him. These stages shade off into each other with no abrupt line of demarcation, but are different degrees of the one general process of abnormal change. The first two milder stages will require more discussion, as respecting them there are the chief differences of opinion; but this discussion will not be entered upon until a fuller account has been given of the more advanced stages.

All are ready to admit the very great, the almost inexpressible, evils to the brain and nerves of individuals, to the happiness of families, to the interests of communities and the country, of the third and fourth stages of habitual alcoholic indulgence. The changes of the brain usually discoverable in its structure, but which more certainly exist in its functions—in its actions and tendencies—are most profound; and are all in the direction of physical, mental, and moral degradation.

The structure of the brain is changed in various ways from its normal state. It is sometimes hardened from the increase of its connective tissue, and sometimes softened from a form of fatty change; and in both cases the proper brain cells —the seat of cerebral action, of physical and mental power—are more or less diminished in number, altered in structure, and impaired in activity. The vessels are often found degenerated, and are liable to great distention and rupture, constituting congestion and apoplexy. The membranes of the brain are often found inflamed and thickened, their transparency and pliability impaired; and, in short, the whole organ is degenerated, enfeebled and perverted.

Under the immediate effect of the liquor, the drunkard is regardless of his duties and obligations to himself, his family, and to society. He is inefficient, improvident, unthrifty, unreliable; often violent, dangerous, and criminal. When deprived of his accustomed dram, he is morose, despondent, and often unendurably wretched, with a craving for the liquor, which in the perverted state of

his brain is irresistible. His depression and despair sometimes lead to suicide, preceded, it may be, by the murder of his family, with the motive of relieving himself and them from their living death. Mingled with this despair are often fits of fury which the drink excites; and his causeless and unreasoning vengeance may be inflicted indiscriminately on himself, his family, his friends or strangers, as well as on imagined or real foes. In many cases nothing is too absurd or too depraved for him to do, and no suffering is too severe for him to endure.

The drink which for a time relieved his agony, at length fails to do so unless carried to the extent of stupefaction and approaching unconsciousness. This quantity is therefore taken, and this increasing indulgence, if it does not induce sooner some fatal form of disease, brings him to the fourth and extreme stage of habitual drunkenness, which usually soon results in death.

Besides rendering other diseases and accidents much more severe and fatal, this excessive drinking produces several particular diseases of the brain and nervous system.

The one best known to persons not of the medical profession, because of the striking character of the symptoms, is Delirium Tremens. In this terrible disease the brain becomes so affected by the alcoholic poison that all its functions, physical and mental, are performed in the most irregular and fearfully perverted manner. There is usually a premonitory stage in which the patient is restless, wakeful, and apprehensive of some violence, misfortune, or calamity. When attempting to sleep he is awakened with frightful dreams which are so vivid as to appear to be realities for a time after awaking. These and other symptoms may cause the patient to stop his drink, but too late to prevent its effects. In other cases, quite as numerous, the premonitory symptoms are less regarded, and the full development of the disease comes on in the midst of gross indulgence in drink; but the phenomena in either case are similar. The face now becomes paler, the surface is covered with a profuse sweat, there is trembling in every muscle, the patient looks wildly about him, seeing in his delusions frightful objects in every quarter; and

though his pulse is weak and fluttering, and his whole appearance indicates great debility, he still moves about restlessly, and often actively, and he frequently exerts himself violently to escape from imaginary enemies. His whole mental functions are perverted even more than his bodily ones. The most characteristic mental condition is *fear*, which is always present. His ever-present hallucinations, or morbid imaginings of sight, sound, and feeling are of a frightful character. He thinks he is pursued by "a man with a hot poker," that "snakes are in his boots," that disgusting bugs are crawling over him, that great bats are flapping their skinny wings in his face, that vampires are sucking his blood, or that demons are about to seize him, and he cries out and struggles in mortal agony. He may make a fatal leap from a high window, or, escaping from his room, may run half naked through the streets. No condition of mental suffering can exceed this state. The ancient ideas of Gorgons and Furies must have been derived from this disease, which occasionally occurred among the wine-bibbers of the time.

In this disease, left to itself, sleep and rest are banished, and death by exhaustion is likely to occur in from a few days to a week. Many cases, however, under proper management recover from a *first*, and some from a second or third attack. It would seem from such a warning that the first attack would be the last — that the cause would be avoided. But the desire to return to drinking is so great, the force of habit so strong, the self-control through brain impairment so feeble, that indulgence again occurs, and subsequent attacks generally follow. With each recurrence of the disease the chances of recovery diminish, until death closes the earthly scene. Subsequent attacks of this particular disease may not occur, death following from other forms of alcoholism, or from complications of other diseases; but when the brain is so far impaired as to produce delirium tremens, permanent reform is almost hopeless, and the victim is almost sure to die a drunkard.

Death to our natural instincts is a fearful thing, come in what form it may; fearful when amid friends, and family, and loving care; made less

appalling by affection earned by years of self-control, of duty done, of virtue, kindness, and love. It is a terror even when life passes away with these surroundings, in resignation and hope, and ceases as gently as music from a slumbering harp-string. What then must be this dread event to him who drives from his death chamber, or perhaps his gloomy cell, by his raving violence or his profane mutterings, his family and kin, who may have but the tattered remnants of abused affection, while he puffs out his last foul breath, a token of the corruption within, and nothing remains but an inheritance of painful memories, and, possibly, of propensities which may lead his offspring to repeat his career.

Can it be possible that an article which so often produces the effects upon the brain and nervous system which have been sketched in mere outline, is as a beverage, ever necessary, useful, or safe; or indeed entirely innocent, habitually used in any quantity, however moderate?

CHAPTER XII.

Further Influence of Alcoholics.

IN the last chapter some of the effects of the habitual excessive use of alcoholics were mentioned, especially *delirium tremens*.

Insanity is another morbid condition of the brain caused by chronic alcoholic indulgence. The statistics of all insane asylums bear evidence of this fact. In the list of causes of this most terrible of calamities intemperance occupies a prominent place; but those who have given most attention to the subject express the opinion that this disease is more likely to attack the offspring of drunkards, than the drunkards themselves. These latter cases are not usually charged, in the statistics, to intemperance, though they are the remote consequences of it.

The first attack of insanity in the drunkard is usually recovered from under asylum treatment, and where further indulgence is prevented; but the patient too often returns to his drink when

released, and subsequent attacks are very liable to occur, from which the patient is far less likely to recover. Occurring in the children of drunkards, the first attack is more liable to be permanent. Idiocy, blindness, deafness, and other defects of the nervous system are painfully common in the children of the intemperate.

In what is called Chronic Alcoholism, paralysis from brain and nerve impairments is a not infrequent occurrence. It takes different forms as it affects different parts, and usually indicates such an advanced and extreme state of alcoholic poisoning as renders recovery very rare. Fits of apoplexy, often speedily fatal in the first paroxysm, and almost inevitably so when repeated, are another result of intemperance; and when partial recovery takes place, brain impairment remains, frequently accompanied by palsy. Epilepsy is another disease of the brain and nervous system sometimes produced by alcoholism.

The term Inebriety, or [1] Dipsomania, is applied to a condition in which the subject of it is supposed

1 See Introduction.

to be incapable of self-control, and is given up to periodical or constant drunkenness.

There has been much discussion of the question as to whether this state should be considered a *disease* or a *vice*. That it is a disease or a morbid state of the nervous system there can be no reasonable doubt, but it is a disease produced by alcoholic indulgence, and that indulgence, while controllable, and in view of its probable effects, must be considered as a vice.

Theologians generally consider drunkenness in all its forms as a vice, and there seems ground for this opinion in the Scriptural declaration, "No drunkard shall inherit the kingdom of Heaven." But in the case of the confirmed dipsomaniac the sin, if sin there be, was committed before disease had rendered the person irresponsible — before the brain became so diseased as to deprive the victim of self-control.

But whether it should be called a disease or a vice, it is the effect of alcohol upon the nervous system; the tendency to the condition often being hereditary — generally from alcoholic indulgence

in parents — but developed into the actual morbid state by the indulgence of the individual.

Whether a disease or a vice, it is very difficult of cure, and if temporarily relieved, either by physical or moral means, it is exceedingly liable to return, and result in moral and physical death.

Space fails, and the object of this work does not require that all the diseases which alcohol is capable of inflicting should be even mentioned, much less dwelt upon. But, after all, it should be understood that by far the most frequent evil effects of alcohol do not consist in the production of special diseases peculiar to itself, but in a general perversion and lowering of vitality which renders one more subject to diseases of various kinds, and causes diseases and accidents to be more fatal. In all reports of the causes of deaths the different diseases and accidents are named, but the alcoholism which rendered them fatal is not mentioned; and even when the disease and death are caused by the alcoholism alone, the truth and the warning example are sacrificed to what are regarded as the proprieties of the occasion — a sentiment

of respect for the dead and the feelings of friends. In public reports alcohol and alcoholism do not receive a tithe of credit or responsibility for the evils they accomplish.

But as the last subject of these articles on the action of alcohol on the brain and nervous system, I shall endeavor to notice some of the effects of its shorter, more moderate use upon the mind and body.

In some of these cases of habitual tippling, as distinguished from drunkenness, only functions or actions are perceptibly changed, while in others the structure of the brain and nerves is more or less profoundly affected.

Often among the first symptoms will be observed a perversion of moral sentiment. There will at least be an indifference to the dangers of drink and a general recklessness of conduct. This is a natural result of the narcotic, benumbing influence of the poison. There are apt to be improvidence, sensuality, an absence of restraint of the lower passions, malfeasance in office, unfaithfulness to trusts, indifference to the feelings and claims of

parents, wife, and children, and disregard of the advice of friends. There will generally be noticed unsteadiness of the hands, and often of the movements of the lower extremities, inquietude, especially if the doses be not regularly increased, want of refreshing sleep, at first fitful, but often more constant, particularly when the accustomed amount is diminished or withdrawn; and now the general appearance and expression of an habitual drinker appear. The irregular motions can, for a time, be restrained by a decided effort of the will. They are worst in the morning, especially when the sleep has been broken, but are steadied by food and the usual dram. Headache, buzzing in the ears, irritability of temper, cloudiness before the eyes, and, in more severe cases, flashes of light and various hallucinations may follow. There are uncertainty of purpose, mental instability, though sometimes dogged obstinacy, feelings of dread, but without the purpose to avoid evil or danger.

Partial paralysis of the nerves which cause contraction of the bloodvessels of the face, consequent enlargement of these vessels, and redness and erup-

tions of the face are common. There is foulness of the breath, not so much from the simple smell of the alcohol passing off, as from its vapor changed in character and mingled with effete and decomposing matter from the system; and if a strong odor of tobacco be added to these, the effect upon the senses and feelings of others, especially upon a wife with delicate nerves, I shall not attempt to describe.

All this may happen to a steady drinker who would warmly resent being called a drunkard, and whose friends would feel greatly scandalized by such a charge. He may never have been so much under the influence of liquor as to be deprived of self-control or to become incapable of doing routine business. A temporary abstinence may for the time diminish his capacity or disqualify him for business, and he may readily persuade himself that the indulgence is a good, if not a necessity; thus he floats on into a whirlpool of more degraded drunkenness, or is prematurely arrested by some disease rendered fatal by his condition, or his powers fall early into general decay, That this is a true account of the average tippler, few will deny.

But it may be inquired, "Cannot one indulge in the habitual use of moderate quantities of alcohol without all these results?" Certainly this is possible, and the possibility has been illustrated in numerous instances. But is any one in health the better for any use—for ever so temperate a use of alcoholic liquors? Is he not the worse, in some degree, for such indulgence?

This is the only question which remains, and it is one which must be determined in the light of the scientific facts which have been stated, though imperfectly, in the preceding chapters; by the general experience, and by observing the condition of abstainers, and those who moderately indulge.

The essential effect of alcohol upon the heart has been ascertained by mechanical instruments of precision, and has been demonstrated to be sedative or depressing, and not stimulating. By other precise means it has been demonstrated that oxidation in the lungs is retarded and not increased by the ingestion of alcohol in whatever quantity. It is also demonstrated by the thermometer that

the production of heat in the body is diminished rather than increased, though by its narcotic effect the sense of coldness may be obscured or overcome. We determine also by chemical tests that alcohol neutralizes the gastric juice when present in any considerable quantity, and diminishes its action in the digestion of food. It has also been determined by the lifting of weights, before and after alcohol has been taken, that it diminishes and does not increase muscular power; but we have no such positive mechanical or chemical tests to determine its action upon thought and feeling, upon reason and impulse, upon the intellectual and moral operations of the brain. Of its effects in this respect we must judge from our experience and our observations upon functional manifestations, which are not susceptible of the same precise measurements; and here conclusions are less capable of physical, chemical, and mathematical demonstration. But these experiences and observations are sufficient to prove to those who carefully observe and correctly infer, that alcohol as a beverage, however guarded the indulgence, is use-

less, injurious, and dangerous; that its apparent beneficial effects are deceptive, while its injurious effects are positive. Nothing outside of physics, chemistry, and mathematics, it appears to me, is more certain, and nothing in its bearing upon our individual, domestic, social, and national life, is more important. If the views which have been expressed are correct, they should be disseminated, emphasized, and impressed, especially among and upon the young, on whom the conditions of the future depend. The influence of physical, chemical, and physiological laws upon intellectual, moral, and social states is with every year becoming better understood and more fully appreciated; and if this effort, the work of some occasional hours snatched from other engrossing labors and cares, shall have the effect to increase the knowledge of such conditions and laws, and improve the practice in relation to them, its object will have been accomplished, and its author gratified.