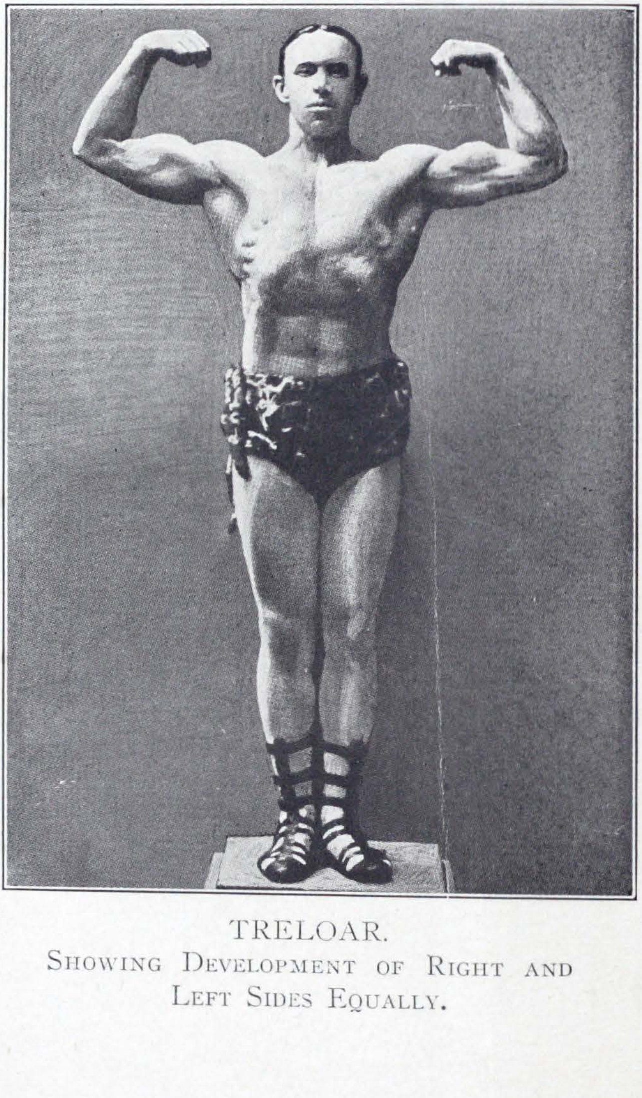
QT 255 F598p 1909 v.1

Fleming, William F.,

Physical culture classics,

STRENGTH FROM EXERCISE AND DIET



TRELOAR.
SHOWING DEVELOPMENT OF RIGHT AND
LEFT SIDES EQUALLY.

Physical Culture Classics

IN FOUR VOLUMES

VOLUME ONE

COMPILED AND EDITED BY

WM. F. FLEMING

Published in the Interest of the United Schools of Physical Culture

E. R. DUMONT

NEW YORK

W. B. CONKEY COMPANY
CHICAGO
THE HAMMOND PRESS

PRINTERS AND BINDERS

Physical Culture Classics

List of Authors and Contributors

BERNARR MACFADDEN
CHARLES MERRILLES
GEORGE BARTON
CHARLES E. PAGE, M.D.
M. J. RODERMUND, M.D.
GERTRUDE COGHLAN
OTTO CARQUE
CHARLES H. WESTFIELD
GEO. RUSKIN PHOEBUS
ALVIN B. KUHN
ALBERT TRELOAR
SIDNEY CUMMINGS
EUSTACE H. MILES
JAMES J. JEFFRIES
HAROLD N. JENNINGS
EDNA TEMPEST
MAUDE ODELL
R. C. SMEDLEY
F. H. WILKEN
WILLIAM BASH
J. P. WOOD

Among Other Authorities Cited Are

Horace Fletcher, Dr. J. H. Kellogg, Dr. E. H. Dewey, Dr. Isaac Jennings, Dr. Robert Bartholow, Dr. H. W. Wiley, Dr. Wm. Gilman Thompson, Dr. Felix L. Oswald, Thos. Campenella, and U. S. Army Surgeons' reports.

INTRODUCTION.

In this work it is purposed to present in compact and well-ordered form the best possible selections from publications that are acknowledged as standards of merit in this field, because they treat of principles about which there is no longer any controversy among their advanced exponents. Hence the title, PHYSICAL CULTURE CLASSICS, conveying the notion that the volumes consist mainly of material by universal consent lifted from the region of untested theory into the domain of established fact. The reader is therefore imbued with the certainty that proceeds from the tutelage of the masters in this science, each one having exemplified in his own life the correctness of the views he champions.

Of the authorities drawn on (more than twenty in number) one may receive special mention without disparagement of the others furnishing material no less essential, though in smaller quantities. We refer to Mr. Bernarr Macfadden, whose monumental labors have made his name a guaranty for success to those who are guided by his precepts. Not content with the publication of an imposing array of authoritative books—alone sufficient to insure lasting fame—he has furnished a remarkable object-lesson in the form of his sanatorium at Battle Creek, Mich., where the weak and the ailing may recover strength and health by natural methods. It is significant that many there treated afterwards attend the celebrated training-school, now in Chicago, for teachers of the science which restored them to pristine vigor. What will be news to many also is the fact that the mortality in Mr. Macfadden's sanatorium is far lower than that of the most healthful American cities, or modern hotels even, though he deals with invalids, whereas a city or hotel is supposed to house chiefly well people!

In addition to the activities named, Mr. Macfadden is the editor of "Physical Culture" magazine, and its pages serve as a convenient medium of expression for him and the growing number of those actuated by the same motives and having a similar "message" to humanity.

One work which we have used as a source deserves special mention for style and clear arrangement: Treloar's "Science of Muscular Development," on which Miss Edna Tempest collaborated. Mr. Treloar is noted as the winner of the highest prize for the most perfect physical development in the competition at Madison Square Garden, New York.

With the consciousness, then, of having gone to the fountain-heads for the information that is to give a new direction, an added importance to the lives of many, we conclude by emphasizing the necessity of UTILIZING to the utmost teachings that have so convincingly proved their efficacy. Each reader of this work has it in his power to rehabilitate himself physically, elevating the entire plane of his existence and extending its scope till he becomes noteworthy even among the noted.

W. F. F.

VOLUME I.

CONTENTS.

Treloar's "Muscular Development."

TRELOAR'S MUSCULAR DEVELOPMENT.

[Pages 15 to 63 inclusive are from the above named work.]

A Plea for the Body.

Paradoxical as it may seem, the task of an advocate is sometimes more difficult on account of his own strong belief in the cause he urges. Physical exercise is now so generally regarded as a necessary part of every person's daily life that the statement "Physical culture is a good thing" seems almost axiomatic.

Next to a clear conscience, a strong body is the most desirable thing in life, and the possession of the latter often assures the former. Physical exercise brings bodily improvement, and therefore better health with all that that implies. Pain is the greatest affliction of human life. Good health, which nearly all can get by exercise, means freedom from pain. The study and habit of exercise call attention also to the general laws of health, and create an ambition and desire for bodily perfection, thus hastening the desired result.

Another aspect of the results of exercise that will appeal to busy people is the greatly increased capacity for work produced. The business man or mental worker who gains a strong and healthy physical make-up will not only endure more hours of work, but will be able to accomplish *vastly more and better work in the same time than before.* Not only are one's chances of high success increased by fine bodily vigor, but from the examples we see one is almost led to believe that a well-trained and vigorous body is *necessary* to the best success. There have been instances of exalted genius in a puny body. Cicero and Voltaire, those two mental giants with tongues like rapiers, who, had they lived in the same age, might have been brothers—or the bitterest enemies—were men of puny physique. But they can scarcely be said to have lived successful lives. The names that we find at the top in all departments of human effort in the past and now, are those of men who intelligently cultivated their physical powers. Washington, perhaps the greatest name in the history of all ages, was a skilled athlete. Andrew Jackson, one of the most masterful executives any country ever had, was a seasoned veteran of camp and field, whose commanding voice and presence bespoke the robust physical manhood that marked his rugged character. Theodore Roosevelt, the young athlete who has proved himself well fitted for the highest position in the land, is by no means the least of the long list of great exponents of strenuous physical life.

Physical training and care of the body not only wing one's feet in the race for success; they change the whole mental tone and attitude. Optimism, liberality and kindliness are traits directly fostered by and resultant from physical activity. Cheerfulness is the result of health and presupposes health. The man or woman who enjoys the exhilaration of perfect health is never a victim of worry. There is no better friend in the time of adversity than the self-reliance which accompanies physical strength.

Physical and mental strength go hand in hand. The student whose memory is unreliable, and who finds it difficult to concentrate his mind, will find himself in better command of his mental forces, and the way of scholarship made smooth, if he will but set aside a short time each day for vigorous exercise. Statistics of schools and universities show that the students who excel in athletics also stand well in their classes. Also the winners of highest honors for scholarship are almost invariably men who attend the gymnasium as faithfully as the class room. Still other instances are noted of men who studied long and hard with little success, who took up exercise and then took great strides forward in their studies.

Cultivation of the body lengthens life. If some great athletes have died at an early age it was not because they were athletes. Either the temptations to which their fame expose them led them into dissipation, or their eagerness to excel caused them to overtax their powers. Under the same conditions one may be sure they would have died the sooner but for their strength. How many old men can be found who have not been physically active the greater part of their lives? The tremendous significance of the statement that exercise lenthens life commands the attention of all thoughtful men. In all the varied pursuits and standards of different lands and times there has been one great, unsatisfied wish common to all the inhabitants of earth—the desire for immortality. Religions are founded upon it and owe their origin to it. Fable and legend of every land and language are full of its expression. Our present science of chemistry sprang from the efforts of the ancient sages to discover the fabled elixir which was to confer on wistful man the boon of endless days. Stronger than the greed for gold, stronger than the lust for power, stronger than the love of kin or country, strongest of the human passions, is the natural love of life. Of what incomparable value and importance, then, is any action such as exercise that will actually stretch out the span of life, not a little, but perhaps for many years, that will thwart, push back, delay for a time the black shadow of death, which man alone of living creatures sees ever at the pathway's end!

But if the arts of man are powerless to secure perpetual life we can still put ourselves in condition to get the very most of pleasure out of the time allotted to us. One of the greatest values of exercise is the *increased capacity for enjoyment* which it gives. If this were solely through the added powers of resistance given to the damaging effects of brutal pleasures, the cause would have no dignity; but the clear health and consciousness of strength which come from exercise give enjoyment to life in a different way. The healthy man or woman finds pleasure in mere existence, the mind is fresh and clear, enthusiasm lends delight to every deed and thought, food tastes better, sleep is sounder; in short, every part of life is brightened and made complete by exercise.

There are strong altruistic as well as selfish reasons why all men and women should build up their bodies by systematic exercise. Self-improvement is a duty to the community as much as to the individual. If all persons could find increased power for productive work through greater strength and health, and gain cheerfulness and virtue, as would surely be the case with universal exercise, the social tone of the whole nation would be raised. In fact, such pictures lead us rapidly to thoughts of the millennium, when poverty and crime shall be unknown. The stimulating effect of popular exercise on national life is forcefully illustrated in many historic instances. Greek art and civilization reached its zenith when athletic exercises were most generally practiced and admired. The Swiss people, who had given the world many object lessons in good government, have always engaged extensively in athletic sports. When Father Jahn started the great movement for popular gymnastics in Germany his original purpose was to educate and train the people physically, so that they would be able to fight for their religious beliefs and personal liberties. As the movement grew, however, a spirit of liberality grew with it; undoubtedly the result of the introduction of exercise into the daily lives of the people, so that all cause for fighting disappeared.

Attention to exercise as a means of bodily improvement is not alone a duty to the nation in that it makes the individual a more useful citizen. The duty of example is important in this as in all other policies of life. If one man takes up exercise, others will note the benefits he gains and be induced to do the same.

Our duty to future generations should be a cogent reason for physical as well as mental self-improvement. The man or woman who brings his or her body to the highest possible state of perfection not only lays up a store of health and happiness for personal enrichment, but is bequeathing to the children a legacy of strength, vigor and life; a freedom from evil tendencies and a pleasure more valuable than palaces or titles. For the rewards of the father's right living are as surely visited upon the son through many generations as are the penalties of sins.

Encouraging a love of strength for its own sake is not acquiring a new taste. It is natural to every one of us. Through all ages the love of bodily grace and vigor has characterized mankind. Savage races have worshiped strength in nature, and further progress brought the worship of gods and heroes, conceived as personifications of bodily strength. The athlete and warrior, in all history and to-day, holds first place in the hearts of the people. This universal admiration of physical prowess was not solely because of the greater efficiency it gave in self-defense or war, but was to a great extent a love of beauty and strength for its own sake. Our conceptions of courage, chivalry, patriotism and honor carry with them the idea of physical strength. The picture of great strength is, therefore, rightly the delight of the age, and childhood's summit of imaginary glory.

Some writers have pictured the human beings of a future age as creatures with enormous brains and little bodies, retaining just enough of physical power to operate the great machines which are to do the work of the future world. Such writers have not counted on the artistic side of human nature. Physical strength may cease to be a necessity for work, but it will never disappear. Just as the horse will surely be kept from extinction for his beauty alone, though his usefulness cease, so the artistic sense of the people will foster, not neglect, the development of strength.

The tendency of modern thought is toward the completest life. All rational physical pleasures are conserved as adding to the great total of pleasure for which we live. Physical training, then, is advanced as one of the most effective means to the realization of the greatest ultimate pleasure in living.

IDEALS.

In taking up exercise we have, of course, a general idea of greater strength, more graceful carriage, better health, etc., as the objects of our endeavor. It is doubtful, however, if many will have, without instruction, a very clear conception of the results in exercise which are of the most importance; which should be the most desired. It is no doubt a fact that people need advice as to the selection of ideals, as much as about the methods of attaining them. In development of the body, the greatest total efficiency is the first desideratum. To gain the greatest possible quickness and accuracy of movement, the greatest possible muscular strength, the highest degree of health should be the object of exercise. Contrary to the belief of many, quickness, strength and health are not separate qualities developed by different means, each more or less at the expense of the others. They are not separate qualities, but parts of one quality which we may call efficiency. They are not developed by different means, and it is impossible to become quicker without increasing both health and strength thereby. Strong men are not always quick, but they are quicker *by reason of their strength* than they would be otherwise.

Occasionally we see a man of fine muscular and nervous organization whose health is by no means perfect. Perhaps in spite of his strength and skill his stomach is bad, or his lungs are weak. To these cases the negative argument emphatically applies; if it were not for his strength, his general health would be far worse than it is. But the cases of sickly athletes are rare. In nine hundred and ninety-nine cases out of a thousand the man or woman who develops fine bodily strength will at the same time gain buoyant, lasting health. There are probably very few persons so unnaturally constituted that they really do not desire strength. Yet many beginners are heard to say: "I don't want to be strong, I am simply exercising for health." The same amount of effort will bring great strength and health too. Why not accept both?

From the standpoint of the athlete let us study the relation of strength and quickness. Certain heavy exercises, such as lifting, increase muscular strength. It has positively been shown that *these same exercises,* properly done, will increase quickness.

Quickness is largely temperamental and a form of skill. Some persons could never acquire quickness; others, without any training, are marvelously quick. Exercises for quickness may be summarized as the practice of quick movements. The possession of great strength developed by special exercise will be an assistance, not a detriment, in the acquirement and practice of quickness. Some athletes, following certain specialties which require quickness and particular skill, have found that much heavy exercise hurts their efficiency in their specialties. Thus some have reached the erroneous conclusion that the possession or development of strength is always at the expense of quickness. An athlete has only so much attention, so much energy to bestow, and if he devotes a considerable part of this to heavy weight exercises, or to reading, or to playing the piano, or anything outside of his chosen work, his specialty will suffer. If a musician neglected his instrument and spent all or much of his time playing billiards, he would soon lose his fine execution in his own specialty; yet no one could say there is anything about the game of billiards in itself to hurt a musician. So let the sprinter, the high jumper, the boxer, base-ball player, fencer, and all the other specialists who value quickness, try a little of the heavy exercise—not enough to exhaust them for their own work —and see how much *quicker* and stronger and generally effective they will become. As for the beginner, do not be led astray by fallacies. Get all the quickness you can and also all the *strength you can.* Develop strength in its broad meaning; strength of mind, strength of nerve, strength of sense, endurance, strength of lungs and heart, *and* *also* strength of muscle. Obey the laws of health, neglect not the acquirement of skill in the varied application of these powers, and you will be working toward the true ideal, the greatest possible efficiency of mind and body.

Physical efficiency is worth the effort, not solely because of any practical use to which we may wish to put our powers; although one's life, or the lives of others, may at any time depend upon physical strength and activity. There should be an artistic consideration in the selection of ideals—the pleasure of possessing a thing for its own sake, aside from practical use. In taking up exercise, not the least important object, consciously or unconsciously, will be, and ought to be, the symmetry, grace and muscular beauty which distinguish the perfectly developed man and woman.

From the foregoing outline of the true general ideal in self-improvement let us turn to what should be the immediate aims of certain classes of individuals. What, for instance, should be the object of the small-salaried young clerk or bookkeeper in taking up exercise? Though there is much talk about the long hours and need for more recreation for workers of this kind, the fact is that most of them do not work hard enough or long enough for their own good. There is no doubt about tyranny and oppression in the pittance of salary paid; they are always underpaid, and will be till a better social system is enforced. But if retail salesmen, office clerks, bookkeepers and others in similar lines were compelled to work ten per cent harder and ten per cent longer than they do, and were properly paid for it, they would be better men. The point is this: Wage earners of the class described almost always have plenty of leisure time. They have comparatively little responsibility, and little or no preparation to make in connection with their work. What an admirable chance, then, to take up exercise, not merely to straighten the drooping shoulders a little, or to avert for a time the threatened attack of sickness, but for its own sake to make soecial athletic training a hobby.

The human mind seems to demand at least two directions of effort. This is shown by the amateur specialties, the hobbies which many people have quite apart and different from their daily work. Theodoric, a Roman Emperor, had his garden, which interested him more than his imperial duties. Fox, the great English statesman, raised pigs, on which subject he would talk enthusiastically at any time, to the neglect of affairs of state. President Cleveland was a fisherman, and President Roosevelt is an enthusiastic amateur athlete. One man devotes all his leisure time to ping pong; chess or whist may occupy the thoughts of another, even to the detriment of his business. A few spend their leisure time in the practice of gymnastic feats. By far too great a number have no set pursuit outside of business, but look forward to the closing hour simply as a release from work. These hurry through an unhealthful meal and hasten to meet their idle associates, with whom the evening is spent in ways that leave them worse instead of better.

So much can be accomplished along the line of a hobby that a thoughtful man must feel the responsibility of selecting as an object for his leisure efforts something which will be of permanent benefit to himself and the community; something that will make the world better. Of all the various pursuits, pastimes and pleasures which attract the interest of men, there is nothing so pleasing, so profitable, and of such far-reaching importance to the race, nothing so well-adapted to be made a hobby, as Physical Culture. Its results are a source of pride to the possessor and a guarantee of health and fitness to his children, such as the best collection of postage-stamps or the greatest skill at whist could never be.

As there are exceptions to all rules, so there are different aspects of every question. It is impossible to give one's best efforts to more than one thing at at time. The student studying for an examination which cannot be put off, the inventor on the eve of a discovery, any worker who wishes to add to the world's knowledge in his line, cannot afford a hobby, even one of such value as exercise. To be sure, exercise must not be neglected altogether by the student or specialist, or his health will slip from under him, and where will his work be then? But the man who wishes to distinguish himself in some line of scholarly research cannot hope for high expertness in physical things.

PRACTICAL PHYSICAL TRAINING

DIRECTIONS.

The time of day for exercise depends largely on habit and convenience. For business people and students the late afternoon will probably be most convenient. Those who work till five or six o'clock will be constrained to take their exercise in the evenings. The only rules to be observed as to time of day are in relation to meals. Exercise should not be taken less than an hour after eating. For the same reason prolonged and arduous exercise should not be taken before breakfast.

As to amount, after the habit of exercise is formed, it may be said that the results obtained will be in proportion to the amount of exercise taken. One hour twice a week will produce noticeable results. One hour four times a week will enable the student to improve very greatly in a year's time. A person with a genuine desire to develop splendid health and strength should not regard an hour a day as too much time to devote for such an end. The amount of exercise both as to time and in terms of energy expended, that is, severity of the work, should be considerable. There need be no fear of overdoing when the constitution is sound.

The clothing worn while exercising should be loose. The more of the body the pupil leaves bare the better except in the case of very fat people who are working specially to reduce flesh. Exercising entirely naked before an open window, if possible, and letting the air play upon the body while going through the movements is a tonic that only those can understand who have tried the experiment. Practicing before a mirror, watching the muscles as they work during the exercise especially aids in directing the flow of blood to the part of the body in use and greatly assists in bringing on the development that is sought.

The speed or tempo of most developing exercises should be slow and deliberate, say forty to fifty counts to the minute on arm movements and still slower on body movements. The contraction of the muscle in some cases may be made rapid if it is complete. The return, however, should always be deliberate to allow plenty of time for complete flushing out of the tissues involved, with fresh blood.

The beginner should devote careful attention to muscle control to the end that only the muscles concerned in the exercise be contracted. To accomplish this all movement should be done as *easily* as possible. Fatigue should be produced by doing a considerable number of counts but not by straining the opposing muscles.

Rests of short duration may sometimes be indulged in when the momentary fatigue is very great. The number of counts given in the description of the exercises is approximate only, yet the number will give some idea of what one should do. If it is found very difficult to do a certain exercise the number of times given, a short rest may be taken and then the remaining counts finished. It must be borne in mind that the rewards of exercise will not be gained by setting aside an hour and donning an exercising costume for that time. Hard work must be done and a great deal of it.

EXERCISES—DESCRIPTION.

The various groups of exercises are given in the order in which they should be done. It will not be practicable to do all the exercises described at every period of exercise. Do about 20 to 25 exercises each day, selecting, say, an average of two from each group. The number of counts suggested is for men of average strength. Women and children should do from one-third to three-fourths as many in proportion to their strength. But be sure you do enough to produce sensible fatigue. If you find you can easily do more than the number suggested, increase that number by 10 or 15. When an exercise can be done easily 60 or 75 times, some more severe form should be used for the same muscles, either by using a heavier weight or assuming a more difficult position.

PHYSIOLOGY IN ITS RELATION TO EXERCISE.

The tissues of the human body are constantly being broken down and repaired. This wearing out and renewal is the fundamental process characteristic of life in all forms. It is called *metabolism,* which means change. The destruction of bones, muscles, vascular walls, membranes, etc., is comparatively slow and due principally to mechanical "wear and tear," when the supply of food is normal. In the glands, however, and in the blood the change is very rapid and is at different times, both the cause and effect of the various manifestations of energy constituting life. It has been estimated that the entire body is changed and renewed in the space of about seven years.

The *nutrition* of the tissues is accomplished by the blood which has in it the nutritive elements assimilated from the food. The blood circulates to all parts of the body, the intricate ramifications of the capillaries bringing it in close proximity to all the tissues. The various tissue cells are believed to receive the elements they require for their renewal directly through the walls of the minute blood vessels, unloading upon the blood in return the waste products of their activity. The blood then becomes *venous* or impure and is conducted back to the heart and lungs where the impurities are, to a great extent, thrown out with the breath.

The *growth* of tissue depends upon the balance maintained between the breaking down of the tissue cells and the supply of the materials necessary to their renewal. In the muscles, growth is brought about principally by exercise, although inducing a better blood supply either by massage or by hot applications will, to a limited extent, produce growth. Comparatively little actual muscular tissue is broken down by exercise unless the work is unwontedly severe. This is shown by the fact that there is very little increase in the amount of nitrogenous material (of which muscles are mainly composed) disposed of as waste, following exercise.

Experiments have shown that the living body is a machine for the conversion of energy from food in precisely the same way that the steam engine extracts energy from coal. There are, however, certain important differences in the relative amount of heat and work developed from the latent energy of the fuel (for food is the fuel of the body). The most perfectly constructed engine only gets about one-tenth of the energy from coal in the form of force or motion. All the rest of the latent energy of the coal is wasted as heat. To change the other nine-tenths of energy from heat into force has been the problem before inventors from the days of Watt down to the present. The human body, however, is able to show as force or motion *one-fifth* of the energy obtained from the food and four-fifths as heat. In the body there is another demand on the food besides the production of energy. The tissues themselves must be renewed as fast as they wear out. To produce the necessary chemical changes in the food materials to make them suitable for incorporation in the tissues requires some of the kinetic energy developed. The steam engine, being of hard material, shows no appreciable wear or diminution in size of any of its parts, so there is no demand on the coal for material to rebuild or renew the engine itself as would be the case if the analogy to the body were complete. Ultimately some part of the engine gives out and it is renewed as a whole—not from coal, for engines are not made out of coal, but from metals.

The following closer view of the production of energy from food will show that the analogy between the body and an engine is more direct than at first glance it would seem. The same sort of food does not produce energy and rebuild tissue equally well. Muscles and soft tissues are built chiefly from nitrogen-bearing, or *proteid* food materials. *Proteids* are substances (always containing some nitrogen) like the white of egg. Albumen is a representative proteid. Proteids of course contain some carbon and give rise to some kinetic energy, but their chief use is in rebuilding and adding to the tissues. Another action of the proteid food materials is believed by some to be that of irritating or stimulating the nerve centres. Thus the eating of meat, eggs, cheese, etc.,—the principal nitrogenous or proteid foods—seems to facilitate the use of the energy derived from other kinds of food. The stimulation of a meal of meat is well known and yet it has been positively shown that meat produces much less kinetic energy in the system than starch and sugar.

Energy is produced from food or coal by combustion or burning, that is, its combination with oxygen. Combustion may be completed in a few seconds as in the burning of a match, it may extend over years as in the gradual rotting of a fallen tree in the forest or it may be a question of hours and be regulated by the demand for energy as in the body. The rapidity of combustion will depend upon many circumstances, such as the size of the object being burned and the consequent relative amount of surface exposed for the oxygen to act upon, the temperature, etc., etc. The kinetic energy manifested in the body as heat and motion is chiefly derived from the combustion in the blood of non-nitrogenous food materials, such as fats, which may be found in nuts, olives, olive oil, and dairy products, and starch and sugar, found in the fruit and vegetables. Just how this energy is transmitted, just how it makes the muscles move, we do not know. But that the combustion of carbon-bearing materials does produce and limit the kinetic energy of the body is proved by the exact relation between the energy manifested by a living body and the amount known to be produced by the burning of a given quantity of food. So we see that the old idea of the body as a *creator* of energy and the comparison of life to a spark or the flame of a candle was not exactly accurate. From these facts we see, too, that the total amount of energy capable of being developed by the body is distinctly limited, whether it be used in mental or physical work.

Before leaving the subject of energy a few words about the generally accepted theories of conservation and source of energy will undoubtedly be of interest to many. Latent energy is the term used to express the work which would be done by a given object or substance if at liberty to act. Thus the water above a dam, a stretched rubber cord, a coiled watch spring, or a pile-driver weight pulled up to the top against the force of gravity, all represent varying amounts of *latent energy*. When liberated, each will do a definite amount of work. Now comes the important fact. The water at the top of the fall can impart no more energy to the mill-wheel than was required to raise the water in the first place. The stretched rubber when let fly will exert no more force than was used in stretching it. The spring as it uncoils will exert upon the watch-wheels no more force than that which wound it up. As a matter of fact the energy gotten out of a machine is usually a great deal less than put into it, on account friction, disadvantageous application, etc. For instance, the falling of a pile-driver weight could not be made to raise another equal weight to the top of the tower. It is this principle which makes perpetual motion impossible.

Another example of latent or potential energy is the chemical affinity of certain elements as oxygen and carbon. These elements are found united in nature. The light of the sun in some unknown way enables plants to separate them, incorporating the carbon in their tissues and giving off the oxygen to the air. Afterwards the carbon stored up by plant life, for instance coal, is gathered and burned by man, who thus gets back some of the energy given by the sun. Every manifestation of energy on earth can be traced back ultimately to the sun. The origin of the sun's energy can only be guessed at, but that its supply is limited and will sometime cease seems certain.

We will now turn to a more detailed consideration of the workings of those most delicately adjusted transformers of energy, the muscles of the body. Even when at rest muscular tissues display some cellular activity. Metabolism, or change, is always going on and combustion of carbon is taking place even during rest to keep up the temperature of the body. Muscles are elastic, and so arranged as to be always slightly on the stretch. If this were not so the first stages of contraction would be wasted in tightening the muscle.

The contraction of a muscle is produced by the contraction of its fibres, thus shortening the whole muscle and approximating—that is, bringing closer together—its points of attachment. The irritability of muscle is its power of responding to stimulus. The stimulus which causes a muscle to act is normally transmitted to it by the nerves. Just what this stimulus is we do not know. The strength of contraction is greatest at the beginning and decreases progressively till complete contraction is reached. This refers to the muscle itself, not to its effect in work, for a muscle's leverage upon a bone is often so much better when partly contracted that more strength seems to be exerted then than at the beginning of contraction. Successive contractions are progressively weaker till at last the muscle is exhausted and will respond no more until restored by rest. Exhaustion takes place very much sooner if the supply of arterial blood is interfered with. In fact a plentiful supply of fresh blood is necessary to the most effective action of a muscle. So in exercising this must be provided for by position and by frequent relaxation to allow the blood to flow through the muscle.

In tracing the analogy between the human body and the steam-engine at the beginning of this chapter we considered the various ways of converting and utilizing energy in these two machines. There remains to be stated the fundamental difference between them in adaptability—the power of self-adjustment to varying circumstances. No sooner is there a demand or need for certain powers in the body and *attempts made to exert these powers* than their development begins. There are many curious examples of this specialized development to meet unusual needs. An interesting one is the Japanese dentist who from long practice is able to pull the strongest and most deeply rooted teeth with his thumb and forefinger. In ancient times one of the contests of the gladiators consisted of a sort of boxing in which the blow was not delivered with the knuckles but with the tips of the fingers extended and stiffened so that the hand was not unlike a sword. By thrusting the fingers against boards, etc., such strength was developed that a gladiator, getting a straight blow at his antagonist, could drive his hand right through flesh and ribs. This pleasing pastime is illustrated in Canova's great statue called "The Fighter."

This adaptability of the human organism is shown in structural changes as the thickening of the skin in places subjected to much wear, the thickening and strengthening of bones around a fracture and finally the increase in size and strength of muscles to meet increased demands upon their energy. Practice will increase the power for any normal expenditure of energy. The best preparation for fasting or for protracted vigils, however, would not be in the experience of these conditions beforehand.

It is upon this power of the body to meet new demands that development by exercise depends. When regular exercise is begun, the muscles in some unknown way send in a requisition through the nerves for more material with which to enlarge themselves. Hence the increased desire for proteid, or tissue building food resulting from exercise. This demand is not simply to supply the place of tisue broken down or used up by exercise, for it has been determined that very little if any muscular tissue is destroyed by exercise beyond the mechanical wearing out which is to be expected from the movement of such relatively soft structures. Development or growth of muscle depends primarily on blood supply for it is the fresh arterial blood that brings the nutritive proteids to the muscle cells. The initiative part played by exercise in the process of development is two-fold. Exercise tires the muscle, uses up for the time being its contractile power. The cells of an exhausted muscle are the more ready to seize upon nutriment and thus increase in size, though just why this is so we do not know, except that it is in harmony with the general scheme of auto-adaptation to needs before mentioned. Exercise when of a proper kind, also helps to supply the demand which it creates, by accelerating the flow of blood.

The exercises which are best, then, for muscle growth are those executed with comparatively slow rhythm, so that during the time of relaxation there will be sufficient time for the blood to enter and permeate the muscle. Muscular activity calls an extra blood supply not only to the muscles directly concerned in the exercise but to the whole adjacent region. So by exercising one set of muscles, many others lying near are benefited. It is not necessary, therefore, to analyze muscular action to the extent of devising an exercise for each muscle which shall as nearly as possible use that muscle and no others. All the muscular tissues will be just as well nourished by a less number of more general motions. In fact, exercises of a very limited local nature are not as valuable as those affecting many muscles at once, for reasons which will be set forth.

From the standpoint of Physical Training, the *nervous force* which stimulates muscle has two qualities, intensity and endurance. Whether either of these qualities may be said absolutely to belong to the nervous impulse or to the muscle's contractile power we do not know. For convenience we will assume that they belong to the nerve force. The only way to develop either intensity or endurance is to put the muscle often to the test. It is quite conceivable that muscles may increase in size as a result of better blood supply, etc., from exercise without increasing proportionately in intensity, which is another word for strength. To gain the strength itself the muscle must be exerted to its utmost frequently. The same principle applies in the development of muscular endurance. By frequently working a set of muscles almost to exhaustion their endurance will be increased.

Exercising one set of muscles produces a beneficial effect on many other muscles, not only by improved blood supply to the whole region, but through the nerves in a sympathetic way. Experiments have shown that if the right arm and shoulder are exercised and the left arm neglected the left arm will still increase slightly in size and strength, though not specially exercised at all. That exercise affects nerve power not only in its motor function, but in the mental processes is clearly shown by results in many instances.

In parts of the foregoing we have seen that a copious and unrestricted blood supply is necessary both to muscular action and growth. Let us consider then the sources of the blood supply. The blood holds in solution or suspension both the tissue building and energy producing elements which it has received from the food. Its quantity is maintained by the system of *lymphatic* or absorbing tubes which transfer water and food elements from the digestive tract to the circulatory system. The mechanical force which propels the blood to the various parts is the heart. When there is an increased demand for blood the heart has to do more work. The contraction of a large muscle uses up more blood than the contraction of a small one and obviously the simultaneous use of many muscles calls for a far greater blood supply and consequently harder work on the part of the heart than a local movement involving only one or two muscles. From this we see the value of general exercises or movements calling into play many muscles at the same time, for then the heart gains strength by increased work the same as any other muscle. When a course of purely local exercise is pursued, the body, to use the illustration of a well-known writer on this subject, is like a factory, the engine of which is powerful enough to run one or two machines very well, but which, if all the machinery were started up at once, would be inadequate.

Heat in the body is produced by combustion of carbon in the form of fats, starch, sugar, etc. This combustion is going on all the time in the various tissues and its waste products are carried away by the blood and mostly thrown out in gaseous form by the lungs and sweat glands. A part of the energy manifested in motion is mechanically changed into heat again when motion is resisted. A working muscle develops heat in the same way that an engine gets hot from rapid motion. Some believe that this development of heat for motion is the chief cause of the increase in temperature from vigorous exercise.

In the process of breathing the blood takes a new supply of oxygen from the air for future combustion and is relieved of the gaseous products of past combustion. If the supply of oxygen is cut off, death results in a few minutes. The immediate cause of death from stoppage of the breathing, however, is not lack of oxygen but the numbing effect on the nerve centres of excess of impurities which the blood cannot get rid of. Thus it is evident that holding the breath or in any way stopping or restricting the breathing, particularly while exercising, is likely to have injurious results. When the breath is held the waste products of combustion accumulate in the blood, being carried back again through the tissues with a distinctly *toxic,* or poisoning effect. These effects differ from complete suffocation only in degree.

The intellect directs muscular action and is the source of the stimulus imparted by the nerves. The mind, however, has little to do with development of muscle except in the way of arranging favorable external conditions. Directing the thought or fixing the attention on the muscles during exercise is not desirable except to the extent of making sure that the position is right. This extra mental effort uses up more energy and is without result. After learning an exercise thoroughly it is just as well to think of something else while performing it. Too close a concentration of mind on the muscles being exercised is likely to produce a contraction of the antagonistic muscles, thus partly defeating the purpose of the exercise.

The immediate intellectual benefit of exercise is in its recreative feature. After the habit of exercise is once formed this recreative element will not be confined to objective games, sports, etc., but will form an important part of special muscle-developing exercises as well.

In working for the greatest total efficiency we must take into consideration the effect of exercises on many other tissues besides the muscles. Exercises which are limited in scope are likely to injure the joints by decreasing the articular surfaces. The lubricating fluid will be freely secreted and the bearings kept smooth only in those parts of the articulating surfaces that come into play in frequent motion. So it is best in exercising to move every joint in every direction as far as it will go. To limit the scope of movement is an exercise, particularly if the exercise is done rapidly, has a tendency to shorten the muscles themselves and is one of the causes of the condition known as "muscle-bound."

For convenience in producing resistance to muscular effort, and to do without external appliances, the plan has been advocated by some of making one muscle pull against another. In most cases, complementary or antagonistic muscles are so pitted against each other. This plan has many serious disadvantages. In the first place the energy developed by the body was not meant to be so neutralized and wasted internally. Of still more importance is the fact that simultaneously hardening and exerting all the muscles of a certain region seriously restrict the supply of arterial blood, which, we have seen, is of primary importance in all muscular processes. The nerve stimulus, too, is unnaturally divided, rendering skilful concentration and use of nerve force impossible. If a muscle is made to pull against some other muscle remote from it in position as in resisting with one hand the movements of the other, the natural blood supply may not be badly restricted, but the objection of the unnatural and uneconomical use of nerve force still remains.

Exercises involving continued stress with little or no motion are bad in that they also prevent a proper supply of blood to the working muscle. Such exercises are called "tetanizing." A muscle is physiologically spoken of as "tetanized" when it is in a condition of cramp, that is, violent and continued contraction beyond the control of the will. Holding a weight at arm's length for a considerable time is an example of a tetanizing exercise. Such exercises decrease the irritability of the muscle and ultimately interfere with its nutrition, causing even *atrophy* or wasting away.

Great rapidity in exercise is to be avoided not only because it does not give the blood time to permeate the muscle, but because it wears out the joint. Many a young man going through a rapid wooden dumbbell or free hand calisthenic drill every day for his health's sake, finds himself growing stiffer and stiffer. The reasons are simply that antagonistic muscles are in action at the same time, thus limiting the scope of the movement. The continuous contraction of the muscles prevents proper blood supply and the rapid movement, long continued, dries the joints. If he would take heavier weights in his hands and make the motions slower and as complete as possible, his stiffness would disappear and his muscles would increase in size. He could still cultivate quickness of nerve action by practicing quick movements such as turning suddenly and starting forward if only for a few feet, and striking out quickly at an imaginary enemy.

One of the great discouragements to the beginner in exercise is the distressing muscular lameness which usually ensues after the first day or two of vigorous work. The lameness is undoubtedly due to the accumulation in the muscles of the waste products of the unwonted combustion which has taken place to supply the unusual demand for energy, the circulation not being sufficiently developed to take away all the waste. When the exercise is very severe the muscular tissue itself is more or less broken down as is shown by the increased quantity of uric acid and other nitrogenous waste materials. Lameness can be avoided by increasing the severity of the exercises very gradually from a small beginning. It is a question, however, whether it is worth while to try to avoid all soreness, as much time would be wasted. The soreness quickly passes away and it seems to leave the muscles in better condition for rapid development.

STANDARDS OF PHYSICAL PROPORTIONS.

It is difficult to state an absolute standard of physical proportion as an ideal. One man may be a perfect type of a runner, another a perfect type of a weight lifter or wrestler. Exercise will not change one's natural physical characteristics. A person born to be tall and slender may be greatly improved by exercise, but can never become thick set. An eminent authority on *anthropometry,* or the science of physical measurement, once measured nearly one hundred of the champion athletes in all lines, including running, swimming, etc., as well as pugilism, wrestling and heavy lifting. He found that an average of all these measurements would be a man 5 feet 9¾ inches tall, weighing 180 pounds, and with principal girth measurements as follows: Neck, 16½; chest, natural 43; biceps, 16½; waist, 34; thigh, 24½; calf, 16½. A man with these measurements might therefore be expected to make a good showing at a great number of different athletic performances, but to hold records at none. Averages are not ideals by any means. They may be taken, however, as a comparative standard of estimate. The proportion of weight to height and the principal girth measurements, which is generally regarded as representing perfect development, is shown in the following table.

TABLE REPRESENTING THE POPULARLY ACCEPTED PROPORTIONS FOR ADULT MEN.

Height	Weight	Neck	Chest	Biceps	Forearm	Waist	Thighs	Calves
5 ft.	103-107	11⅛	33		8⅞	29	17	
5 ft. 1 in.	107-111	11½	34		9¼	29½	17¼	
5 ft. 2 in.	111-116	12	35		9⅝	30	17½	
5 ft. 3 in.	116-121	12½	36		10	30½	18	
5 ft. 4 in.	121-127	13	37		10⅜	31	18½	
5 ft. 5 in.	127-133	13½	38		10¾	31½	19	
5 ft. 6 in.	133-140	14	39	Same as Neck.	11⅛	32	19½	Same as Neck.
5 ft. 7 in.	140-147	14½	40		11½	32½	19¾	
5 ft. 8 in.	147-155	15	41		11⅞	33	20	
5 ft. 9 in.	155-164	15½	42		12¼	33½	22	
5 ft. 10 in.	164-174	16	43		12⅝	34	23	
5 ft. 11 in.	174-185	16½	44		13	34½	24	
6 ft.	185-200	17	45		13⅜	35	24	

Below is printed a table showing averages compiled from the measurements of some thousands of American college students, ranging in age from 17 to 25. The average measurements of biceps and forearms are not equal to those of European students. Legs and chests are slightly better developed among Americans. The whole table is disappointing, as compared with table given above, which is, no doubt, based upon measurements of athletes. Any young man who frees himself from the "light exercise" superstition and works hard every day will certainly excel the figures given for average students.

TABLE REPRESENTING AVERAGES OF AMERICAN COLLEGE STUDENTS.

Height	Weight	Neck	Chest	Waist	Hips	Biceps	Forearm	Thighs	Calves
5 ft. 2 in.	100	12¼	29	24½	31¼	9½	8¼	17¼	12
5 ft. 3 in.	108	12½	30	25	32	9¾	8½	17¾	12¼
5 ft. 4 in.	113	12¾	31	26	32½	10	8¾	18½	12½
5 ft. 5 in.	122	13	32	26½	33½	10½	9¼	19	13
5 ft. 6 in.	126	13¼	32½	27½	34	10¾	9½	19½	13¼
5 ft. 7 in.	131	13½	33	28	34½	11¼	10	20	13½
5 ft. 8 in.	140	13¾	34	29	35½	11½	10¼	20½	14
5 ft. 9 in.	149	14	35	30	36	12¼	10½	21	14¼
5 ft. 10 in.	160	14½	36	30½	37	12½	11	21½	14½
5 ft. 11 in.	164	14¾	37	31	37½	13	11¼	22	14¾
6 ft.	170	15	38	32	38½	13¼	11½	23	15

Women, as a rule, come closer to the ideal figure than men in all particulars, except the waist. The unsightly notch in the side contour of many women at the waist is, no doubt, due to the corset and lack of exercise.

Following are the measurements of six New York artists' models, supposed to have figures practically corresponding with the classical ideals:

Neck	Chest	Waist	Hips	Thigh	Calf	Arm Straight	Forearm	Wrist	Weight	Age	Height
13	31	24	33½	20¾	12¾	9½	8¼	5⅝	106	20	5 ft. 3 in.
12	30	22½	32	20	12	9½	8½	6	107	19	5 ft. 4 in.
12¾	32	25	36¾	22	13	10½	10	6	130	24	5 ft. 4½ in.
13	33	26	38	23	14	11	10	6	138	25	5 ft. 5 in.
13	34	25	40	25	14½	10½	10	6	140	23	5 ft. 6 in.
14½	35	31	42	23½	15½	12½	11	6¼	165	27	5 ft. 8 in.
*12 3	33.6	27.3	36.6	21.1	14	11.4	10.6	6.5			5 ft. 3 in.

*Supposed classical ideal as represented by the statue known as the Venus De Medici.

The average height of 315,620 white men drafted for the Civil War was 5 feet 7½ inches; chest measure, 33⅛ inches. The average height of American women is a small fraction less than 5 feet 3 inches.

EXERCISES FOR WOMEN.

Nearly all developing exercises can be done profitably by healthy women, the number of counts done being adjusted to their strength. There is absolutely no danger of a woman's becoming coarse or masculine in appearance as a result of proper exercise. A woman's muscles will never become corded in appearance, will never stick out on the shoulders and arms like a man's muscles, no matter how much exercise she takes. On the contrary the exercise will develop strength and elasticity of muscle and impart that grace and roundness of form at the neck, shoulders, and arms that is recognized now as an absolutely essential requisite of womanly beauty. In reference to the dress of a woman aiming to become a woman in every sense, I would advise strict adherence to the rules mentioned at the beginning of this chapter. The corset has been proved to be a barbaric appliance and its use damaging to the health of women. Those who take plenty of vigorous exercise will derive more than enough support from the muscles that they have cultivated and their bodies will be carried with a finer grace and bearing than they could ever hope from the practice of wearing the unsexing corset. In addition to the developing exercises already described the following series of movements will be found of great value in acquiring graceful carriage.

In these special exercises pay particular attention to smoothness and grace of movement. If at first your movements seem awkward do not be discouraged, but try again. The position of the arms as illustrated in the photographs is very important, as it gives control of all the muscles acting in harmony. Notice that when the foot is off the floor in any position the toe should be extended or pointed.

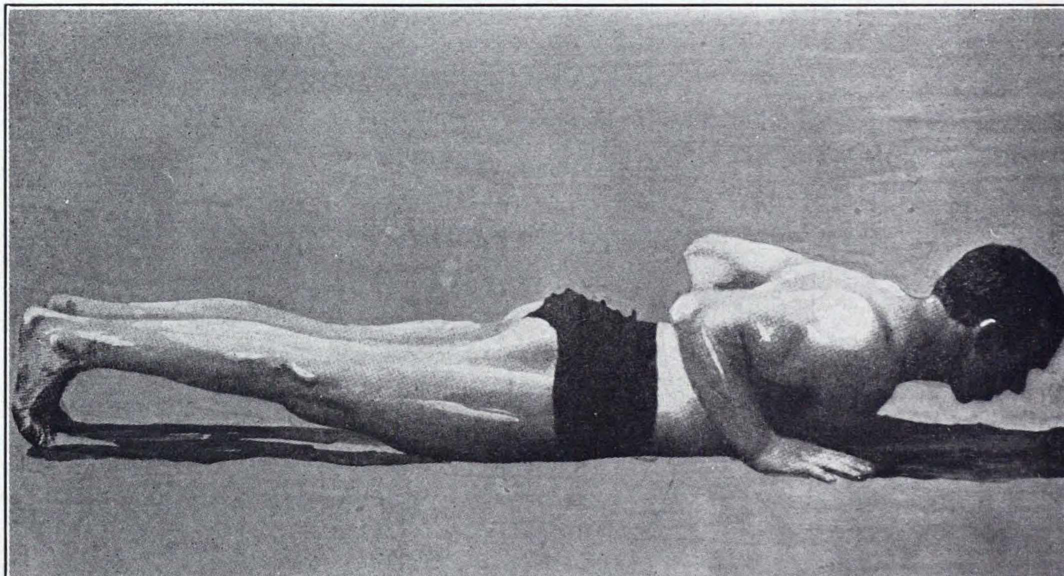
Specimen Exercises.

Exercise 1. (*a*) Stand facing toward the wall at a distance of three feet or a little less, according to your height. Place hands on the wall at shoulder height and lean toward the wall, bending your elbows till your chest touches the wall. Push back to erect position by straightening elbows. 20 times.

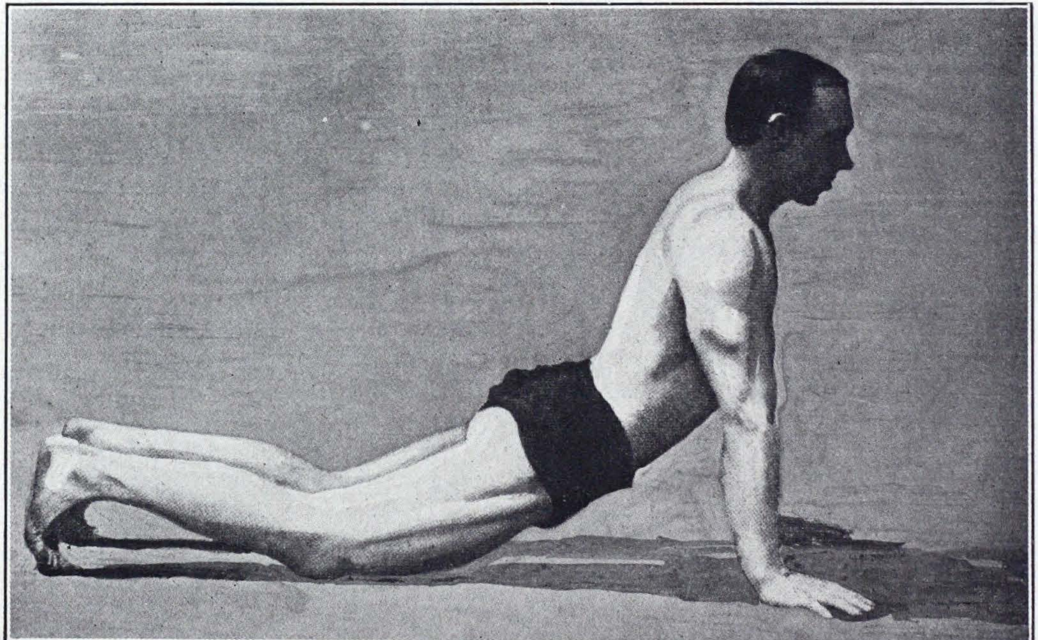
(*b*) Lie prone on the chest on the floor —photo 1b, 1st position. Push up to straight arm, bending at the waist, knees remaining on the floor. 30 times. Photo 1b, 2d position.

(*c*) Position of photo 1b, 1st position. Push up to straight arm, keeping body straight clear to the feet, 10 to 25 times.

Note.—(*a*), (*b*), and (*c*) are separate exercises or separate forms of the same exercise. Weak persons should do (*a*), stronger persons do (*b*), and persons of considerable strength may try (*c*).



Exercise 1 B, 1st Position.



Exercise I B, 2nd Position.

Exercise 2. Stand erect with arms at sides, feet six inches apart. Stoop forward and place hands on floor twelve inches in front of feet (photo 2), give a jump and extend the body and legs to position of photo 1b, 2d position. Do one count of Exercise 1 (*b* or *c*). With another jump return to position of photo 2, and from that to starting position, standing erect. Repeat rapidly whole exercise 12 times. [Accelerating heart and lung action.]

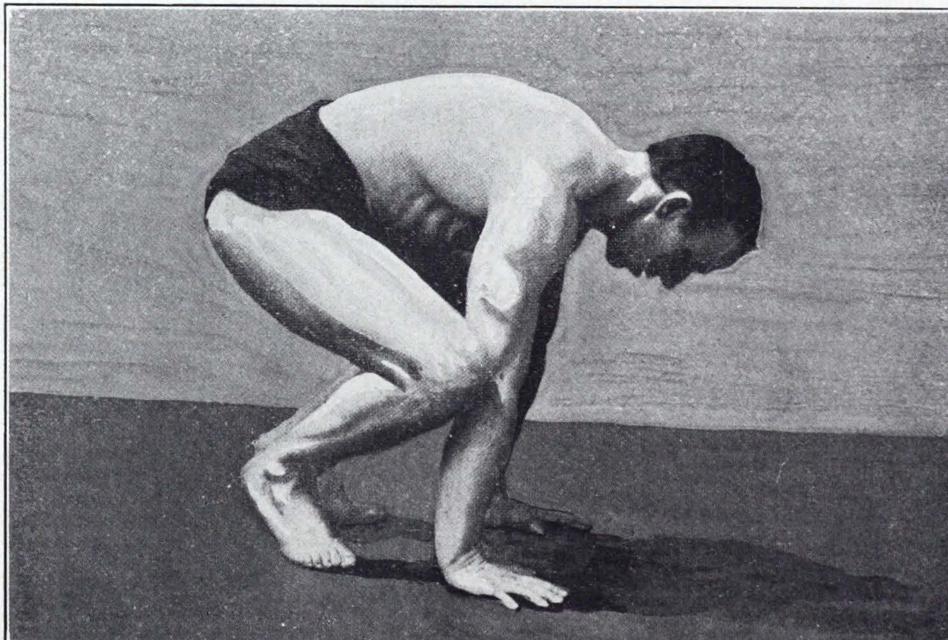
Breathing.—Take four or five fast deep breaths, inhaling completely with one quick effort, then instantly exhaling all the air you can with one quick puff.

GROUP. (Lower Leg.)

Exercise 3. Balancing on left foot, hands on hips, describe a circle with tip of the right toe, twisting and turning the ankle strongly in every direction. Repeat continuously 40 times. [Strengthening ligaments of ankle joint.]

Same with opposite foot.

Exercise 4. Rise on toes, settle back on heels, and raise toes from the floor. Repeat 25 to 50 times, counting each time you rise on toes. [Gastrocnemius, soleus, tibialis anticus.]

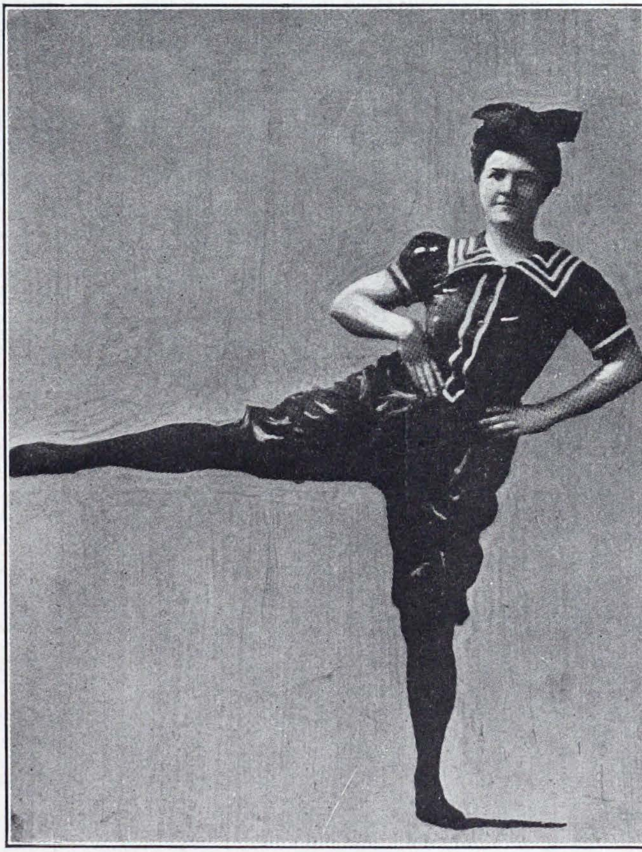


Exercise 2.

GROUP. (Hips and Gluteal Region.)

EXERCISE 5. Stand erect with hands on hips. Kick straight to the side, first with one leg, then with the other. Be careful to make the motion strictly in a lateral plane. Do not twist the body to the side toward which you kick—photo 5. 15 times each foot=30 counts. [Gluteus medius.]

EXERCISE 6. Stand erect with arms extended sideways. Kick straight to the front as high as you can, first with one foot, then with the other, keeping the knee straight and the toe extended. 15 times each foot, or 30 counts in all. Photo, Special Exercise 5. [Long head of quadriceps, abductor muscles.]



Exercise 5.

EXERCISE 7. Balancing by a chair if necessary, hold right knee at level of hip to the front. Rotate the foot inward—photo 7. 20 times. [Sartorius.]

GROUP. (Heart and Lungs.)

EXERCISE 8. Stand erect, hands at sides. Give a jump to a position with the feet twenty-four inches apart sideways, at the same time raising the hands sideways and slapping them together above the head. Return with another jump to the starting position and repeat in continuous rhythm. 20 times, counting every time the hands slap together. [Accelerating heart and lung action.]

EXERCISE 9. Stand with arms extended to sides, raise the bent knees alternately till they touch the chest. Repeat as rapidly as possible, making it more severe by jumping clear from the floor with each count. 20 times, rest a moment, then 10 times more, counting on both knees. [Accelerating heart and lung action.]

EXERCISE 10. Place light obstacle twelve to eighteen inches high, for instance a cane or umbrella resting on two piles of books. Stand and jump over it, then turn. and jump back again. Repeat as rapidly as possible. Count how many times you can jump over it in one minute by the watch. Then rest one minute and try again. Take three periods of jumping of one minute each, resting between. [Accelerating heart and lung action.]

Exercise 7.

GROUP. (The Thigh.)

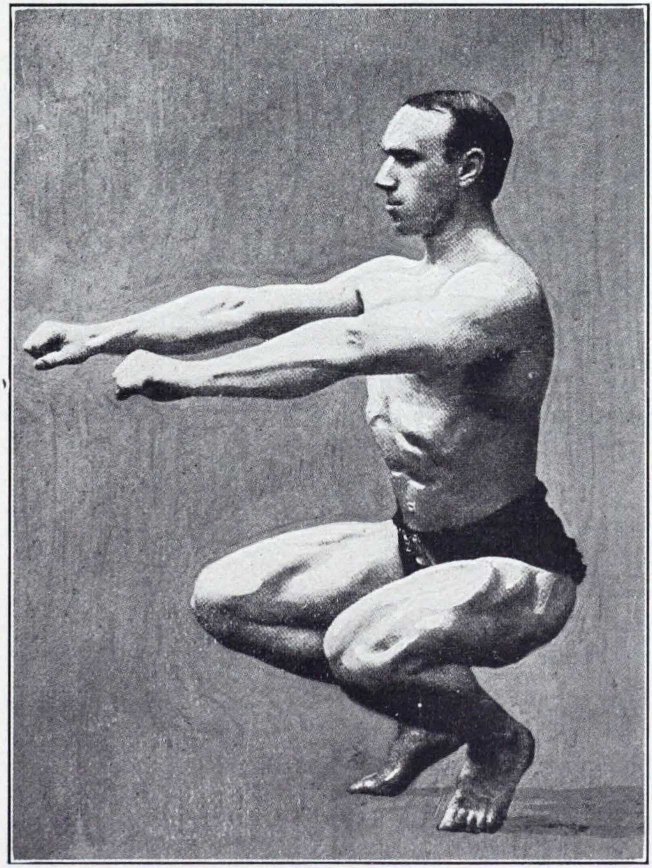
Exercise 11. Stand erect with hands at sides, feet two inches apart. Sink down by bending the knees, letting the heels rise from the floor; at the same time raise the arms as in photo 11. Return to starting position and repeat. Be careful to keep the body erect throughout the movement. 20 times.

Note.—If unable to do this exercise more than 8 or 10 times at first take some of the work on the arms by holding the backs of two chairs.

Exercise 12. Balancing by a chair, raise the right foot sharply to the rear by bending the knee. Let it down gently and repeat. Be careful to keep the right knee back even with the left in this exercise, so that the foot describes more of an arc to the rear. 35 times.

Same exercise with left leg 35 times.

Note.—Learn as soon as possible to do the foregoing exercise without holding on to a chair.

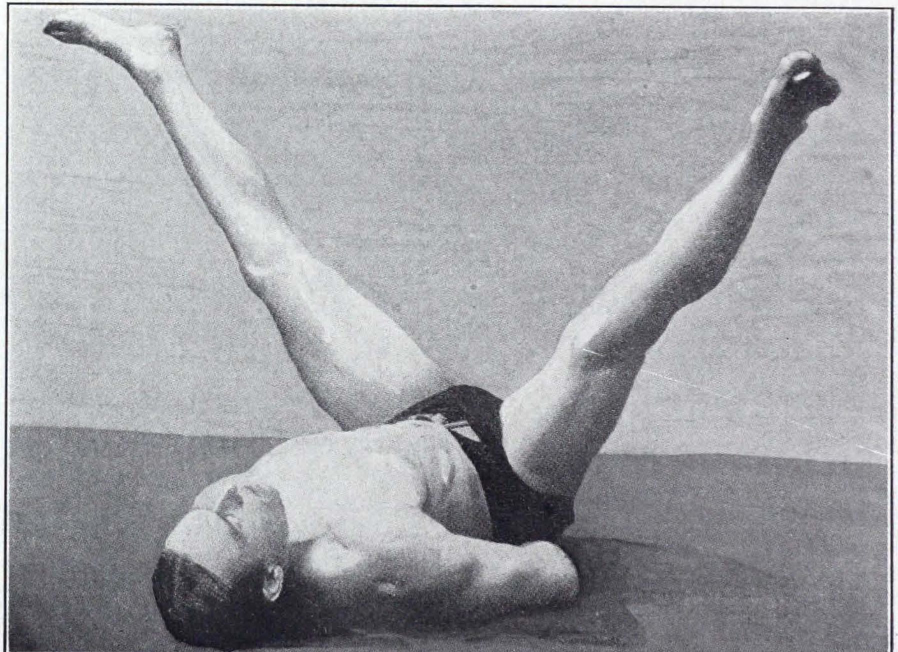


EXERCISE II.

EXERCISE 13. Lie on back with hands under hips, extend the legs straight up in the air. Let them fall apart and bring them together again. 20 times. Photo 13. [Adductor muscles.]

GROUP. (Waist and Abdomen.)

EXERCISE 14. Stand erect with dumb bells held at arm's length to sides, feet eighteen inches apart. Rotate the body as far as you can each way, keeping the arms straight to sides throughout the movement. Make the twist mostly above the hips. Repeat 15 times each way, or 30 counts in all.



Exercise 13.

Exercise 15. Stand erect, arms extended to sides, bend directly to the side as far as possible, first to right, then to left—photo 15. 15 times each way, or 30 counts in all.

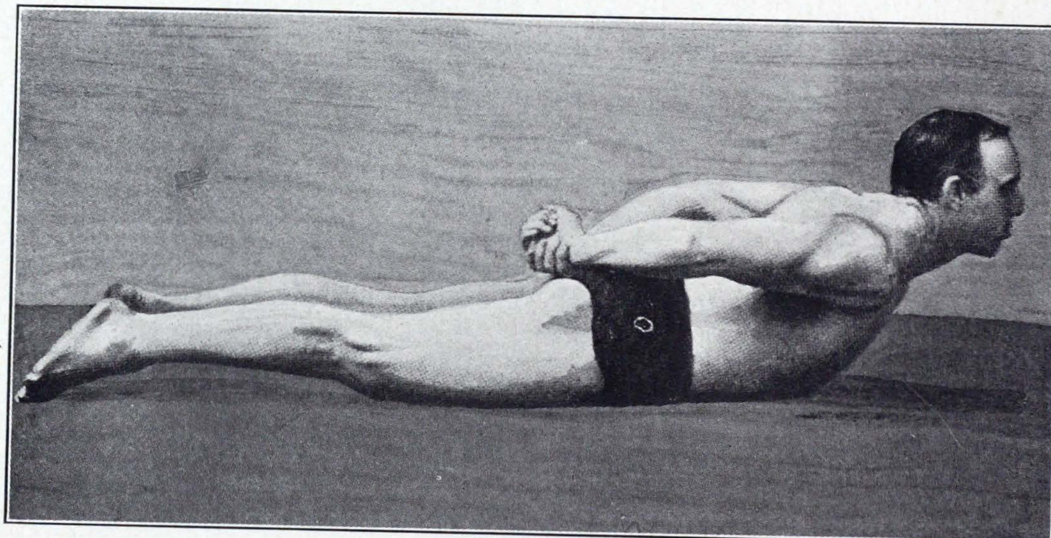
EXERCISE 15.

GROUP. (The Neck.)

Exercise 16. Lie on stomach, hands behind back—photo 16. Raise the head as high as you can, then lower it till forehead touches the floor. 50 to 75 times.

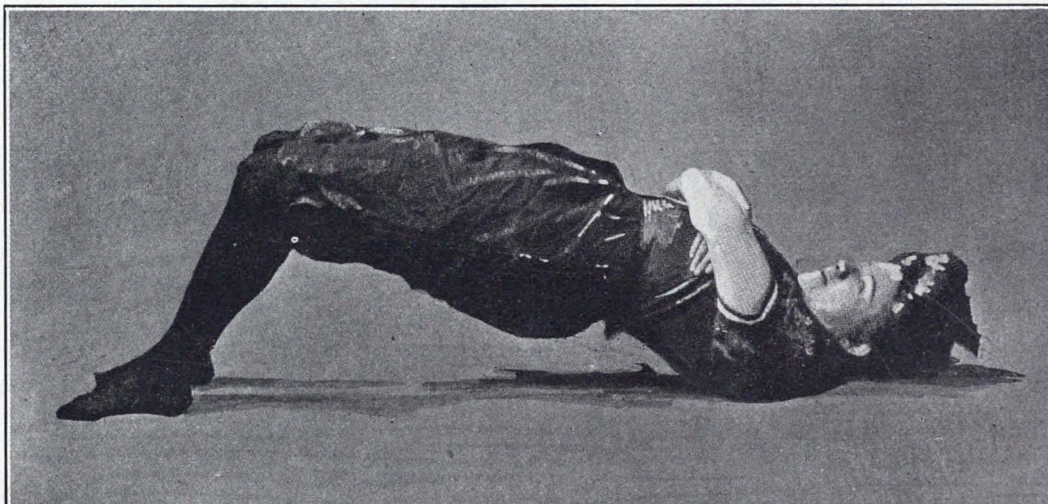
Exercise 17. Lie on back. Raise head till chin touches the breast. Repeat 30 to 50 times.

Exercise 18. Sit or stand erect, twist the head very forcibly but slowly from side to side as far as possible. 20 to 40 counts.



Exercise 16.

Exercise 19. Lie on back, draw feet up under as far as shown in photo 19, arching the back. 15 to 25 times. [Erector spinae.]



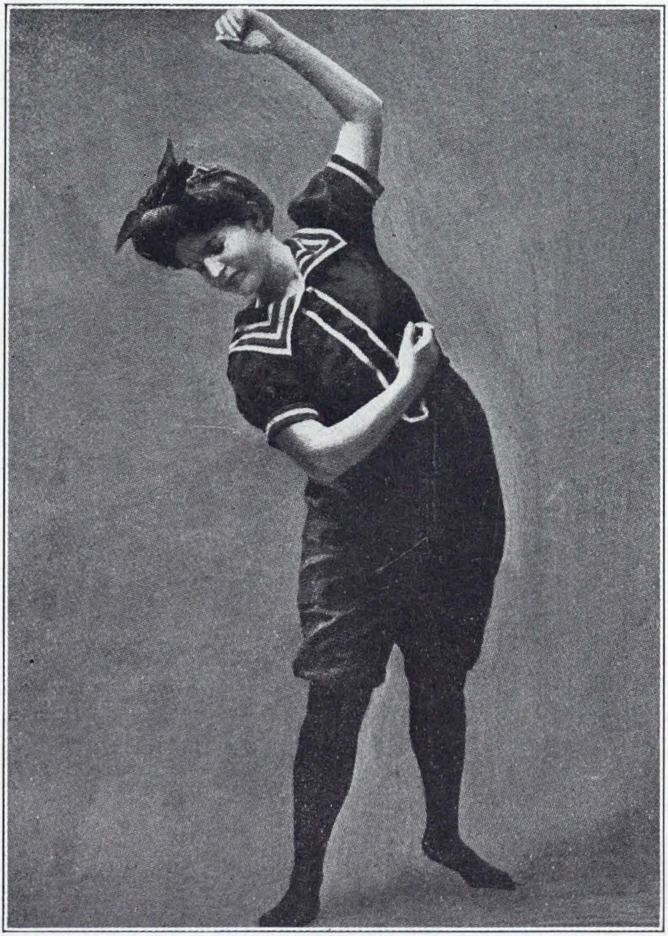
Exercise 19.

SPECIAL EXERCISE I. Change forward with right foot to position shown in photo, Special Exercise I, rotate the upper part of the body three or four times, swinging the arms through a horizontal plane, then return to erect position. Repeat three times advancing the right foot, then three times advancing the left foot.

Special Exercise I.

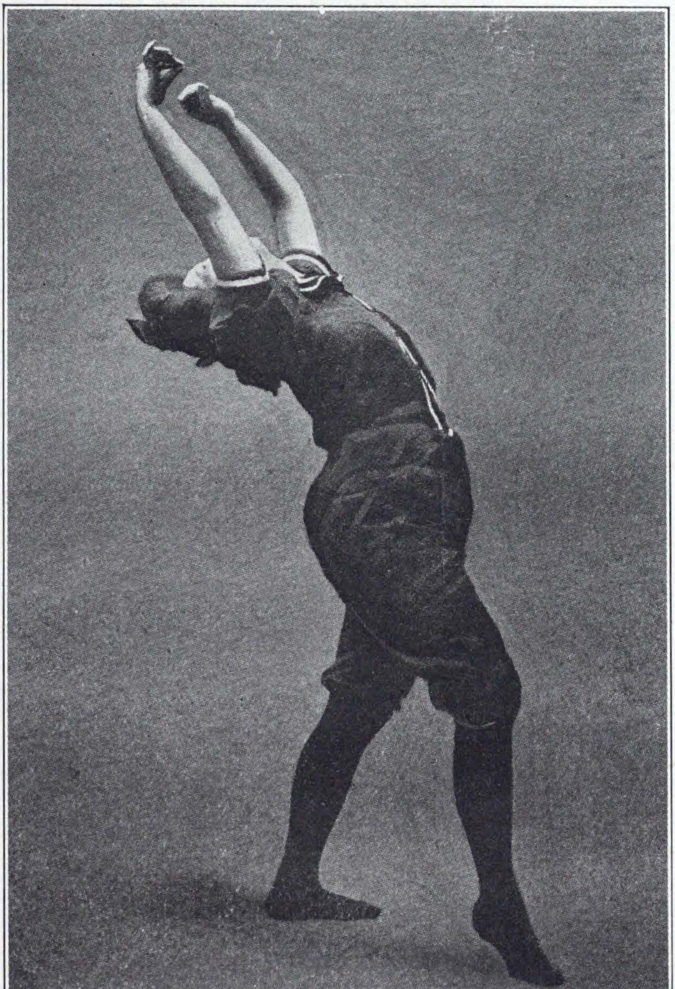
SPECIAL EXERCISE 2. Advance the right foot and bend to the right, raising the left arm as in photo, Special Exercise 2, then advance the left foot and bend to the left, raising the right arm. Repeat in this way across the room and back four or five times.

Cultivate smoothness of movement.



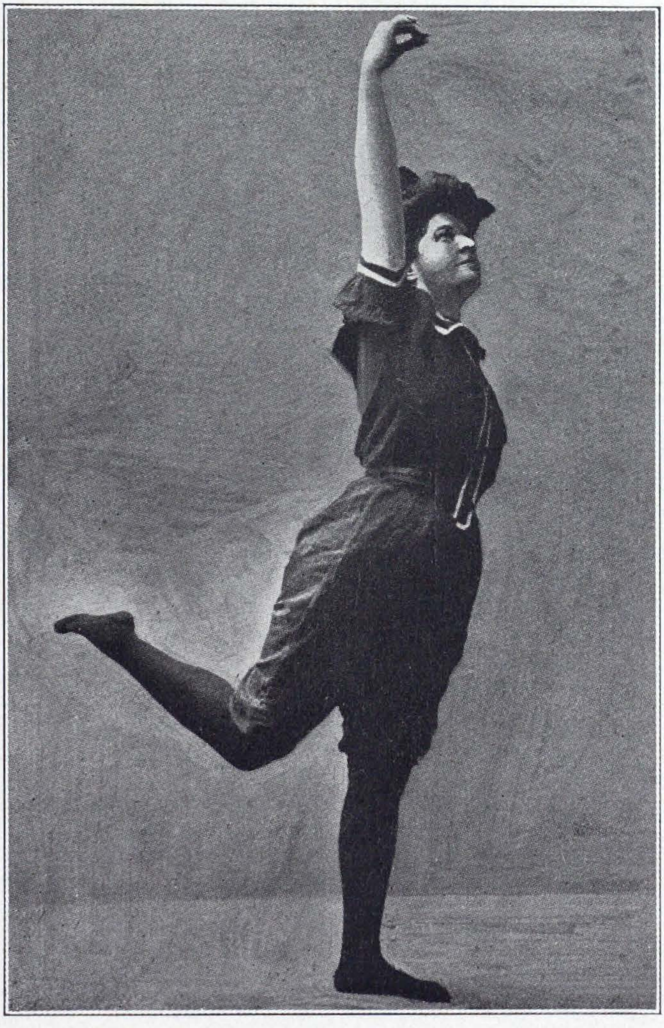
SPECIAL EXERCISE 2.

Special Exercise 3. Stand erect, place whole weight on left foot, then bend backward, at the same time advancing the right foot and throwing the arms over the head as in photo, Special Exercise 3. Let the right knee bend, but keep the left knee straight and the left heel and toe both on the floor. Repeat, changing right for left.



Special Exercise 3.

SPECIAL EXERCISE 4. Stand erect, swing right foot back and right arm up as in photo, Special Exercise 4. Kick high to the front with right foot as if to kick right hand. After the kick place right foot as in photo, Special Exercise 8, and bend loosely backward. Repeat kicking, etc., with left foot.



Special Exercise 4.

Special Exercise 5. Stand erect, kick straight to the front with right leg, with knee straight and toe pointed, at the same time raising the arms to the sides—photo, Special Exercise 5. Then swing the right leg back, bending the body back and raising the right arm as in photo, Special Exercise 4. Repeat, standing on the right foot and swinging the left leg.

Special Exercise 5.

CHAPTER I.

Ancient Ideals of the Perfect Man.

[The following chapters on muscular power are taken from Bernarr Macfadden's admirable work, "Muscular Power and Beauty."]

The Perfect Man! What a picture of health, of power, of noble beauty these words conjure up before our mental vision! For we of to-day are becoming re-born in the wisdom of the ancients in that we no longer see anything but the pitiful or contemptible in the physique that is not strong, undefiled and wholesome.

Physically blemished or undeveloped manhood would always arouse disgust in us did we not sometimes pity the unhappy one so afflicted. And when the blemish exists without need—as it does in nearly all cases—we wonder whether it is due to ignorance, to indifference or self-complacency. Why any man will be puny when he may as easily be powerful, why he will wilfully deny himself any charm of grace or of beauty when these last can be readily secured—these are problems that are most perplexing to us.

The men of ancient Greece and Rome were—MEN! Men powerful in every attribute of mind and of body, men able to dare and to do, men whose feet trod in conquest and whose war-banners waved victorious in every portion of the then known world; men made restless by the lust of travel, men of parts in the arts and in statecraft! Civilization can reach no stage so perfect that it will not turn gratefully back to Greece and to Rome to contemplate those noble conceptions of the best in the life of the mind and of the body that the ancients have dowered to us for all time.

Through the centuries, our universities have handed down to us the fruits of the mental conquests of these two grand and virile races of old. And now, tardily enough to be sure, we are turning back to these same great races for our strongest and truest ideals of physical manhood.

Magnificently perfect do the men of old stand out before us! We have reliable records of them as they were. They were strong and beautiful men, and through their literature we know all of that which made them so. We possess a perfect impression of the classic type, and we know the secret of its composition. What the Greeks and the Romans were, we can become also; aye, we can surpass them, for we possess greater and more exact knowledge of the intricate machinery of the body, and we know better how to care for and train that body.

Strength and beauty were deified in Greece and in Rome. Greek mythology became in turn the property of the Romans. In this mythology we find the aspirations of the people strongly outlined. We realize how they yearned for strength and for the beauty that is a part of it. History tells us how truly great these people were as long as they remained faithful to their ideals. History also tells us how the possession of wealth and the luxury that followed in its train destroyed these aspirations after manliness, and how in turn each of the two great states fell in consequence. We of today are citizens of the richest and greatest of nations. Let us profit by the lessons of history. Ere it is too late, let us go back to the glorious old standards of what the Perfect Man was and must be and our national efficacy and potency will be preserved for all time.

The gods and goddesses of the Greeks and Romans were originally embodiments of the national ideals. They were strong, agile, virile. Apollo, Hercules, Juno, Venus, Diana—all without physical blemish! The departures from morality which legend attributes to some of them, were not identified with them until a luxury debased people corrupted what was an initially pure mythology. Apollo and Hercules were favorite sons of Zeus or Jupiter, and they stand for the two types of men of whom we have the most need to-day.

Apollo was the most glorious and beautiful of the gods, the representative of life and light; he was lithe and supple, skilled in the chase, and terrible in combat with man or beast. Yet he was versed in all the Arts and became the leader of the Muses. He was the ideal of what the brainy leader of men and of women should be.

Statues handed down to us by the ancients show the strength and beauty of this young god as conceived by them. His face is instinct with majesty, in which there is, withal, a cheerful serenity of temper. He is shown with fair, clustering locks surmounting a head perfect in its proportions, and every line of his contour is truly and wonderfully beautiful. Such statues are the realizations in marble of the spirit and genius of the ancients.

Leto was Apollo's mother. Tradition relates that, forced, through the jealousy of Juno, to wander during her pregnancy, Leto led the outdoor life. And so she learned to draw her health from Nature's heaving bosom and absorb all that was best and noblest in her teacher. Living simply, therefore, and amid inanimate grandeur, Leto's was an ideal pregnancy, and the fruit thereof was seen in her god-like son.

Apollo was indeed that which such prenatal influences might be expected to produce. He was beloved by his worshippers, he carried his leadership by sheer might of both mind and body. It is true that he had the misfortune to be the father of Esculapius, the founder of the practice of medicine, but there is likely to be one disappointing son in all families. And as Apollo led men, so we find that his attributes made him a leader on the heights of Olympus.

In Hercules we have a type, not of the intellectual guide, but of the man of deeds, the brawny, powerful laborer. The twelve prodigious tasks of Hercules, all of which he performed successfully, are indicative of the best results of sturdy manual toil and untiring industry. Hercules is pictured to us as possessing an altogether different sort of physical perfection from that of his intellectual brother; for Hercules had a smaller head, a short, bull-like neck, and a body that was massive instead of lithe and supple. Yet he was credited with many kindly and helpful traits; he was ever ready to place his great strength at the service of those who needed it. It followed, as a matter of course, that he lived out of doors and was ever watchful for opportunities to develop his strength.

It may not be out of place to note that the end of Hercules' earthly career came through drugs. Deianira, tortured by jealousy, sent him a present of a sacrificial robe that had been anointed with a poisonous ointment. Hercules assumed this robe and went before an altar. The poisons in the ointment penetrated his body, causing such unconquerable anguish that the hero built himself a funeral pyre and lighting it, lay upon it until he was consumed. But his apotheosis followed and men worshipped him for his great strength and his helpfulness to others.

And to-day we find that while the worship of strength and of all phases of manly beauty is less idolatrous, yet it is none the less general and sincere. The classic ideal of powerful and prepossessing manhood once more obtains. And we have a type of such manhood that is new in our day, one that is popularly designated as the "college man." He might with more truth be styled the Physical Culture Man. In him we see again reproduced the god-like ideal of the ancients. Wherever we find this superb specimen of young manhood, erect, powerful, square-shouldered, with jaw firmly set, having eyes clear, kindly and sparkling, and face radiant with health and intelligence—all of us must admire if not envy him. But he is merely the sample of what all men may become who follow and practice the laws of the physical culture life.

Power and beauty are not for the favored few; they may become the property of any man in normal health who thinks their possession worth an expenditure of effort. It is the mission of this volume to point the way to the acquisition of these attributes plainly and unerringly, and in such terms that "he who runs may read" and that to his lasting advantage.

CHAPTER II.

Value of Developing the Muscular System — Increases the Nervous Forces and the General Functional Power—Adds to the Virile Qualities of the Blood, Thus Affecting for Good the Nerves, Brain and Every Part and Organ of the Body —Modern Methods of Training— The Author's Discovery of Simple Exercises Which, Without Instructors or Expensive Accessories, Bring About Marvelous Muscular Power and Great Physical Beauty.

Apollo, rather than Hercules, stands for the type of physical manhood that is demanded to-day. Powerful muscular development there must be in the ideal man, but there must also be a counterpoise of grace and of intellect.

True muscular development not only increases the general functional powers; but works marvellous effects upon those vigilant servants of the brain, the nerves, which are the master organs of the body. Muscular development brings in its train virile qualities to the blood, and this blood nourishes all the tissues of the body, including, of course, those of the brain. In other words, the more a man exercises his muscles—always within reason—the purer and better vitalized his blood becomes. And the better the blood, the purer and more enduring will be every tissue in his body; as has just been said, such blood feeds even the brain itself.

But the question will very naturally arise: What is the best system of bodily training to be followed? In this volume I shall answer the question by presenting fully and faithfully the system that my own hard-earned experience has shown me to be the best and the quickest method of attaining the highest muscular ideal.

The ancient Greeks, and likewise the Romans, were content with the simplest of accessories. The perfect man was developed without the aid of any costly gymnastic accessories. The youth of ancient days found full scope for his powers in swimming, running, leaping, wrestling, throwing the discus, riding and in bouts with arms.

With the resurrection of the Greek and Roman ideals of manliness we find a rather strange departure from ancient methods. Archibald Maclaren, who originated the present system of gymnastics at Oxford University, and who may be regarded as the father of modern physical training in England and in this country, introduced a scheme for the employment of numerous, ponderous and rather costly "machines." With the most careful economy it would require an outlay of many hundreds of dollars to fit up a small gymnasium with the different kinds of apparatus that the genius of Maclaren has bequeathed to us. Valuable these machines doubtless are in the creation of powerful muscles, yet they are also unnecessary. Just as perfect muscular conditions can be brought about without the aid of the Maclaren machines, and that, too, with more speedy results.

We are most of us familiar with the devices of Maclaren, for they are on exhibition in nearly every American gymnasium. There are the horizontal and parallel bars, the flying rings, the trapeze, the ladders, the elastic ladders, the rings in series, the bridge ladders, the planks with and without footholds, the "prepared wall," the vertical ropes, the beam and all the bewildering what-nots of the gymnasium. American genius has added the wall-machines with weights. The use of these devices, and in addition, football, baseball, rowing and field and track athletics in general, make up the system that has come to us mainly through the efforts of Maclaren and his co-workers.

Now, my friends, all this gymnastic apparatus is as unnecessary as it is costly. Mind you, I do not wish to be understood in the least as discrediting the splendid missionary work of Maclaren and all those who have followed in his footsteps. If you have free access to a gymnasium, all of the work that is done there—if you employ it in connection with your own good common sense and do not overtrain—will result to your benefit. If you have not access to a gymnasium, however, and do not feel like expending the money for costly accessories, you will save a good deal of hard-earned money by following in every detail the course that I shall outline. In any case you will soon discover, as I have done, that the methods offered in this volume are of infinitely greater value in the building up of the best muscular conditions obtainable than are those of the gymnasium.

So far it has been to our university gymnasiums that we have turned for our ideas of how to build the perfect body. Certainly these college gymnasia, with their complicated devices and their vast amount of hard physical work, have produced good results. But the tendency has already set in strongly toward lighter and still lighter work, and with less and less inanimate apparatus.

Take the methods of physical instruction, for instance, that are now in vogue at the Military Academy at West Point, and at the Naval Academy at Annapolis. The cadets who graduate from these two great American institutions average as fine a display of physical manhood as could be desired. The almost inexhaustible purse of Uncle Sam is opened freely in the equipment of the gymnasia at these places. Yet for years the gradual discarding of heavy, inanimate apparatus has been going on. And though the preference for lighter work and the gradual abolition of much of the machine-work were severely criticized at first, the results have justified the changes. The graduates of to-day make a better average showing than those of former years.

So the ice has been broken. To-day, those who are interested in the best possible development of the human body are prepared to take up a course of training as simple as was that of the ancient Greeks and Romans. Years and years ago I became convinced of the need of discarding heavy and costly apparatus in favor of "devices" that are supplied in the main to man by his own body. The few extraneous articles that are needed are such as are constantly at hand, or may be made quickly through the exercise of a little ordinary ingenuity and handicraft.

And while studying almost incessantly along these lines of exercises that more closely approximate the methods of the ancient athletes, I have not failed to note the results as compared with those obtained in the ordinary gymnasium. The new methods are incomparably better than those in vogue during the last few decades. The new methods are closely in touch with those that made manly strength and beauty the rule rather than the exception in classic periods. And these new methods have the incalculably great advantage of being wholly in accord with our modern knowledge of anatomy, physiology and all the complexities of the body's varied functions and needs. This knowledge was denied the ancients, whose system of training, simple and effective as it was, was based, as Maclaren has pointed out, on observation of effects and not on knowledge of causes.

These latest discoveries as to the quickest, surest and at the same time simplest methods of attaining the highest physical ideals of perfect manhood and surpassing womanhood are now offered in their entirety for the first time. The task of arranging this complete system of exercises has been long and laborious. But the results and amazing benefits have been noted so carefully and methodically, that I can guarantee that the exercises comprise the best system of physical training that has yet been devised for the development of humanity on the lines of bodily perfection.

CHAPTER III.

Developing Great Lung Capacity is of the Highest Importance in the Attainment of Unusual Muscular Power.

"The maintenance of animal life necessitates the continual absorption of oxygen and excretion of carbonic acid . . . . the blood being the medium by which these gases are carried."—Kirkes.

To the intelligent trainer of the human body it is amazing that any one should attempt to reach great muscular development without paying the utmost heed to increasing the capacity of the lungs. Yet this is what thousands and thousands of men and women are attempting every day. Go into any gymnasium, or into any school where the instructor is not intelligent and alert, and you will see just what I mean.

In such institutions we may note young men working like beavers to pile on muscle and yet more muscle, hard muscle and still tougher muscle. But watch them when they cease work for a few moments. Note whether they are stoop-shouldered. Look to see if their shoulder-points droop forward, contracting and narrowing the chest. Observe whether they are breathing deeply and *properly,* or whether they take their breath in short, choppy gasps, and relax even this form of deep breathing as soon as their panting for air is over.

Would-be athletes who treat their lungs in this fashion are denying themselves the very benefits that they profess to seek. Men who do not at all times, when in the quest for powerful muscles, keep their minds constantly on the subject of the most perfect development of lung capacity, are stultifying their work and nullifying their efforts.

You cannot become extremely muscular, in the real sense of the word, unless your lung capacity is pushed to the utmost limit of normal development! You might as well try to satisfy hunger with nothing but water.

Muscle-making is accomplished by breaking down the individual cells of which every tissue in the body—whether of bone or of flesh—is composed. As these tiny cells are broken down, new ones take their place; and when the old and useless cells are destroyed through vigorous exercise, the new cells that take their places are larger, more vigorous *and more numerous.* Each one of these little cells, of microscopic size, is a tiny but complete living body by itself. Like all other living bodies it has the power of reproducing itself. Before the old cell dies it gives birth to a new one. If the old cell has been a healthy one, full of vim and vigor, its offspring are more numerous; the old cell gives birth to two or more new ones before it is destroyed. It is in this way that exercise, while eliminating the old cell, produces in its place more numerous cells of added vigor and vitality.

Now, the material that is used for the building up of these new cells, and thereby for the building up of newer and better tissues all through the body, is taken from the food that is digested in the stomach and in the small intestine. This vitalized nourishment is carried to all parts of the body by the blood on its mission of building up the new cells, and hence the tissues.

But what of the dead matter—the portions of the old cells that are constantly dying off? Such matter must be removed from the body, or very soon the system will become so clogged that death will follow from stagnation or toxic conditions. Not only does the blood carry new matter to build up the cells and tissue, but it is the blood that must bring the dead matter back to the lungs and the excreting organs, to be by them cast out of the body.

The dead matter is found in the tissues mainly in the form of carbon and its compounds. The new blood that the arteries carry from the heart to every portion of the body is laden with oxygen from the air that we breathe. The carbon is burned up by, or rather combines with, the oxygen and the result is a new compound, a gas that is called carbonic acid gas, or carbon dioxide. By the time that the bright red arterial blood has performed its mission of carrying new cell-food to the tissues, and has become the dark-colored, impure venous blood, it is heavily charged with the carbonic acid gas and other products of the burning up of the carbon by the oxygen.

The kidneys, the liver, the skin, and the large intestine do their share of the work of excreting waste matter from the body—*but of this same work the lungs form the great central market wherein is effected the exchange of the bulk of the worthless waste matter for the new and good matter that is used in building and strengthening and invigorating the physical system.*

These lungs of ours fill the greater portion of that part of the body which is called the chest or thorax. The size of the lungs alone ought to indicate their wonderful importance. On a superficial examination of a pair of lungs you would see, apparently, two masses of spongy material with several tubes or passages running through them. As a matter of fact a close examination, aided by a microscope, would show that the lungs, so far from being spongy masses, are two great organs that are made up of networks of infinitely fine air passages and tiny blood vessels.

If we consider the respiratory organs we shall find, beginning with the throat, first, the trachea, or wind-pipe. This trachea divides into two smaller air passages that are called the bronchi. One bronchus passes into the right lung, and the other into the left. Each bronchus is in turn subdivided, and these subdivisions are again subdivided, and so on and on, each new subdivision becoming smaller and smaller as the division continues. At the extreme ends of the very smallest air passages are the alveolar cells, or air cells. Thus through this network of air-passages the inhaled air is carried to every one of the tiniest nooks and crevices of the lungs.

From the right side of the heart the impure venous blood, laden with the carbonic acid gas and foulness that result from the destruction of the old, dead cells, flows into the lungs. This impure blood passes through divisions and subdivisions of the larger blood vessels until, in the tinier blood vessels, the impure blood is brought into contact with the air that is being poured out through the countless alveolar cells. Only the thinnest kind of membranes separate the impure venous blood and the new, pure air that has just been inhaled by the lungs. These membranes permit of the passage of the carbonic acid gas and foul moisture into the air passages, and permit also the passage of the new, fresh oxygen from the outer air into the blood that has just been relieved of its impurities.

An inhalation of air supplies the new oxygen that the purified blood needs before it can start properly equipped on its new round through the body; while the act of exhaling air from the lungs forces out of the body all of the poisonous gas that the venous blood had brought to the lungs. It is evident, therefore, that if the work of building up the body and of removing the waste, dead cell-matter is to be carried on without hindrance or delay, the supplies of fresh air to the blood must be both frequent and generous. *Our vitality depends absolutely upon the quantity of air that we breathe into the lungs!*

The lungs, my readers, cannot hold any more air than their capacity permits. If you have failed, so far, to develop splendid lung capacity, then you have wilfully or ignorantly failed to provide one of the principal means by which the building of a more powerful body is alone possible. Make a note of this, think it over again and again, and never forget it!

How is this great and indispensable lung capacity to be obtained? In a very simple way. By taking in great, deep breaths of air, filling your lungs to the utmost of their apparent capacity, and by exercises that will aid in throwing out the ribs and expanding the chest. Any plan that throws out the chest, either deep breathing or muscular exercise, or what not, will aid in increasing your lung capacity. Between the ribs are cartilages that hold the former in place and serve as cushions between them. Every time that the ribs are thrown upward and forward, the cartilages are made to stretch. Enough of this stretching makes the cartilages longer and more elastic. As time goes on, the ribs can be made to move further forward and upward at each inspiration of air. This constant exercise, too, strengthens the chest muscles, and they in consequence are able to lift the ribs more easily.

Now, as the ribs go forward and upward, our lungs follow, for they are very elastic. They are so elastic, in fact, that they would naturally contract away from the walls formed by the ribs, were it not for the pressure of the inhaled air against the *inner* surfaces of their air passages. Whenever the chest muscles become strong enough to lift the ribs further and further upward and outward, and the exercised and stretched cartilages between the ribs permit of the movement, the cavity of the chest is enlarged. When this enlargement takes place, the lungs follow the rib-walls, and thus the lungs themselves become more and more expanded. This greater lung capacity makes it possible to inhale more and yet more air. The changes in the bodily tissues can therefore go on more rapidly, and the carbonic acid gas and the foul moisture are more quickly and thoroughly removed from the blood. This leaves the blood in a proper condition to do its work of carrying nourishment to the cells and tissues. And it follows that a larger and better body is built up in the place of the old body. The muscles become larger, harder, firmer, more powerful, vitality is increased, health is perfected and the man is born again, so to speak!

Read this over and over again if need be, my friend. Don't let one iota of this information as to the prime importance of great lung power as a foundation for great muscular strength, escape you. Don't make the silly mistake of neglecting to develop your lung capacity to its very utmost when you are trying to obtain muscles, if not of Herculean, yet of satisfactory dimensions.

CHAPTER IV.

EXERCISES FOR DEVELOPING THE LUNGS.

"Under the conditions of a sedentary life, nearly one-half of the air cells in the lungs remain habitually contracted, and take scarcely any part in the act of respiration. These cells thus lose their elasticity, the chest itself becomes narrow and shrunken, and when a sudden call is made for a full and deep inspiration, the lungs cannot respond satisfactorily."—H. RIPPON SEYMOUR.

In addition to the reasons that I offered in the last chapter as to why great lung capacity must be provided for, we find another and very excellent reason in the statement of the author quoted above. He who has not the best kind of lung expansion is incapable of taking the sudden deep, full breaths that are absolutely needed when any unusual muscular exertion is to be made.

As to the kind of exercises that one must take in order to put the lungs in their best possible condition, it will be seen that Nature is always logical in her demands. Since we need larger chest dimensions in order that we may breathe as deeply as severe muscular exertion demands, it is necessary that we exercise the muscles that must be employed in the work of thus breathing. And we exercise those muscles by forcing them to perform, to the best of their ability, the kind of work that we want them to do.

> Exercise No. 1.—Form the mouth so that there will be a very small opening; then draw in the breath very slowly yet forcibly until the abdominal regions and chest have been filled to their fullest capacity. If desired you can draw the air through a small pipe stem or breathing tube when taking this exercise, or you can close the nostrils partially with the fingers and draw in the air slowly through the nostrils. This exercise greatly strengthens the muscles used while drawing in the breath.

Remember that the two exercises that I advise for the enlarging of lung capacity *are the basis, the foundation-work of all great muscular development!*

Exercise number one explains the method of inhaling air. The descriptive text should be read very carefully, and should be followed in the work with equal care. Do not breathe hurriedly. Do not try to see how quickly you can get the lungs filled. Take the inspiration slowly, and inhale the breath regularly right throughout the work. Do not stop inhaling until you feel that your lungs have been filled to the very last notch of capacity.

As soon as you have gotten the idea of this fully, you are ready for the complemental exercise that is explained in number two. In this, the work is exactly opposite. Now, you exhale a breath by a reversal of the process that you used in drawing in air. And this work should be done just as slowly and as regularly as in the case of the first exercise.

From the outset, and no matter how long you have been practicing these two exercises, you should begin every bout of exercise with several repetitions of each of these breathing movements. Practice them between any two other feats of exercise. Do so when you are resting, and be sure to breathe as deeply and fully as you can during any kind of muscular exercise. Get into the habit of practicing these two exercises at frequent intervals through the day, whether you are resting, or engaged in your usual occupations. Take these exercises in the morning, as soon as you are out of bed. Go through them at night, just before you get into bed. Whenever possible take them in the open air. There is more and purer oxygen out-of-doors than there can be in any wall-enclosed room, no matter how well ventilated the latter.

EXERCISE NO. 2.—This is a similar exercise to the preceding, though the force is exerted while expelling the breath instead of while inhaling it. First fill your lungs completely, then forming the mouth into a small opening, as described before, force the air out very slowly yet vigorously. A pipe stem or breathing tube can be used through which to force the air in this as in the preceding exercise if you desire, or it can be taken while partially closing the nostrils with the fingers. This exercise is for strengthening the expelling muscles of the chest used in breathing.

Many readers are sure to wonder why these two exercises need to be gone through so slowly, with the mouth but little open. Why could not the exercise be taken just as well with the mouth wide open? The reason is, that when you breathe in slowly through a very small opening of the mouth you keep the chest muscles and inter-rib cartilages that are set in motion longer at their work. You subject these muscles and cartilages to a species of strain that is not too severe. You make them do steady, gradual, sustained work, and it is this sort of work that strengthens the muscles and cartilages more than rapid work continued for a shorter time could do. With constant and patient repetition of these exercises, the chest muscles will become rapidly stronger, the cartilages more elastic, and the frequent use of the tape measure will show you that your capacity for lung expansion is increasing.

It is wonderful work, this building up of the lungs! It is work that is likely to add many years and incalculable health and happiness to your life.

CHAPTER V.

ANATOMICAL STRUCTURE OF THE CHEST MUSCLES.

Very closely allied to the development of the lungs is the development of the chest muscles. Yet it is not alone for breathing power that the chest muscles must be improved. Such muscles are of great use in other processes than breathing. The pectoral muscles, for instance, figure in a variety of movements of the arms and shoulders. To develop the biceps, therefore, at the expense of the pectorals would be but to half develop the arms.

Besides the pectorals, of which I shall say more later, the important muscles of the chest are the intercostals and the serratus magnus. (Now do not be dismayed at these Latin names. They are the names used by the anatomists, and I shall make the uses of these muscles quite plain to you.)

The intercostals are the muscles mentioned in the preceding chapter: They lie between the ribs, much on the same plan that the links are fastened between freight cars. Move the engine and the first car forward, and the whole train follows—if there is steam enough. It is much the same with the intercostal muscles. Move the first pair of ribs upward and the rest follow. Thus each rib is used to raise the one below it, and the whole rib framework goes up or down at the same time.

The external intercostals are the outer muscles of this class. There are eleven of these external intercostals on each side of the chest. The first intercostal is between the first and second ribs, the second external intercostal between the second and third ribs, and so on down the bony trellis of the chest. Each of these muscles has its origin, or starting point, at the lower edge of the rib from which it proceeds, and its insertion, or finishing point, at the upper edge of the rib next below.

The internal intercostal muscles are the same in number. Their origin is at the sternum, or breast bone, and from the ridge on the inner surface of each rib. The insertion of the internal intercostals is always on the upper border of the rib below. The direction of these internal intercostals is obliquely from the breast bone toward the sides of the body—exactly opposite to the direction taken by the external intercostals.

The serratus magnus muscle is a thin, irregular, four-sided sheet of muscle. It lies close to the ribs. It has its origin in nine thin slips of muscles that arise from the eight upper ribs, there being two of these slips attached to the second rib. This muscle extends across to the shoulder, and the insertion is at the scapula, or shoulder blade. This muscle, found on either side of the chest, is used to assist in raising the ribs.

Both the intercostals and the serratus magnus are strengthened by deep breathing, and are greatly helped, also, by any form of exercise that benefits the pectoral muscles.

In the way of direct exercise it is to the pectorals that the attention of the gymnast must be directed. "Pectoral" may be translated as "chest." These pectoral muscles are of two kinds, the major and the minor

The major pectoral muscle is a broad, thick muscle, triangular in shape. It covers the upper and fore part of the chest. It has its origin on the front of that half of the collar bone which is nearer the breast bone; and it also arises from the front side of the breast bone as far down as the point where the cartilage attaches to the sixth or the seventh rib. This muscle is also attached, by way of origin, to the cartilages of all of the upper seven ribs; although frequently it is not attached to the cartilages of either the first or the seventh rib, and sometimes to the cartilages of neither. The different portions of this muscle converge gradually, giving to it a fanlike shape. All portions of the muscle terminate, finally, in a tendon about two inches wide that is attached to the outer ridge of the humerus, the bone of the upper arm, and just at the base of the shoulder. The play of this tendon, and of the portion of the muscle near it, may be felt by moving the shoulder strongly backward and forward. In the same way, the movement of this muscle across the chest may be felt by the curious examiner.

The purpose of the major pectoral muscle is to draw the arm forward and across the chest. Thus, in general, exercises that force this motion will benefit the muscle. On a cold day it is a familiar sight to see a driver slapping his arms across his chest in an effort to warm himself by increasing circulation of the blood. This familiar movement is the most typical example of Nature's definite use of the muscle. In throwing your arms about a person, you exercise the same muscle. In climbing a rope or a ladder the pectoralis major is one of the muscles that is much employed; as it is in the raising or lowering of a flag or a sail. The same muscle must be used on one side of the body in sighting a gun. Driving generally gives this muscle some employment. So does rowing. An habitual oarsman is certain to have his major pectorals well developed, especially if he be careful to give both arms plenty of the exercise. By way of an industrial employment mowing with a scythe is an ideal form of exercise, or would be if farmers could but learn to use the scythe impartially on either side of the body, instead of, as is usually the case, only on the right. By way of sport, wrestling gives splendid exercise for this muscle.

In order to examine this muscle, and its gradual development, place the palm of the hand on the back of the neck with the point of the elbow extending sideways and about on a level with the shoulder. Then, by fairly rapid movements, force the elbow alternately far back and far forward. With the hand of the other arm, feel for the size and the motion of the major pectoral that is being exercised. Test the amount of development from time to time, by noting improvement in the size and hardness of this muscle.

There is another and excellent and simple way of testing the increasing strength of this muscle. If you have, or can obtain a pulley and rope, get an assortment of weights—flat-irons are about as handy as anything. Now, stand with, say, your left side toward the rope. Have a certain number of flat-irons attached to the weight-end of the rope. Now, hoisting the weights clear of the floor, and holding in your left hand the other end of the rope with your arm stretched out horizontally sideways toward the pulley, begin to move your hand inward until it touches your breast bone. Then straighten the arm out horizontally sideways again, and repeat this movement of straightening the arm and then touching the hand to the breast bone, several times. If you find that you can handle the amount of weight that is attached to the other end of the rope with a great deal of ease while doing this exercise, increase the amount of weight, bit by bit, until you find the amount that causes fatigue in doing the exercise. When you have reached what you find to be the limit of weight for performing this exercise without strain, note the amount of weight involved. A fortnight later, make the test again, noting with care how much more weight you are able to handle than you did at the former test. Keep up these tests with fair frequency until you find, at last, that no amount of exercise will enable you to handle more than a certain weight. Then you will know that you have reached the probable limit of development of the left major pectoral.

Test the right major pectoral in the same way, by standing with the right side toward the pulley arrangement and holding the rope in the right hand. Note with care whether you are becoming stronger in the pectoral muscle of one side than in the same muscle on the other side. If so, exercise the weaker pectoral more than the stronger one, and keep this up until the respective strengths of the two pectorals are equal. It is a great mistake to develop one side of the body more than the other.

And now we come to a brief consideration of the minor pectoral. This is a thin muscle, flat and triangular in shape. It has its origin in the third, fourth and fifth ribs, near their cartilages. These portions of the muscle converge into a thin, flat tendon that is inserted at the inner border of the upper surface of the coracoid process. This coracoid process is a bony projection, shaped much like a crow's beak, at the front side of the shoulder blade. It helps to form the socket into which the upper end of the upper arm bone, or humerus, fits.

The minor pectoral lies beneath the major pectoral, and hence its workings cannot be easily followed by the amateur investigator. The purpose of the minor pectoral is to depress the point of the shoulder; hence the best test of the gradually increasing strength of this muscle will be found by standing with the back to the pulley arrangement already described. Take the other end of the rope in one hand, raising that hand over the head. Step forward enough to lift the weights clear of the floor. Now, without bending the trunk, bring the engaged hand down across the chest until it touches the front upper leg on the other side of the body. Then return the hand over the head on its own side of the body. Repeat this several times. At every test, use all of the weight that you can without straining. As you are gradually able to use more and more weight at the other end of the rope, you will know that the strength of the minor pectoral is increasing.

Chapter VI.

Exercises for Developing the Muscles of the Chest.

The photographs, numbers 3, 4, 5 and 6, illustrate the best kinds of exercise for developing the muscles of the chest to the utmost. Study them well and practice them with a full remembrance of what I said of the uses of these muscles, and you will realize the application and value of the exercises.

Take, for instance, exercise number three, as shown in photographs numbers 3 and 4. In this, after an intelligent trial, you will realize that the hooking of the fingers and the ensuing tug is bound to benefit the major pectoral muscles, for here you are forcing each arm to do the work of crossing the chest. In raising the arms forward you are also exercising the major pectorals. At the same time, in starting, the shoulder points are naturally a trifle depressed. This gradual change from a position of shoulder points depressed to one with the points well backward, gives its true work, in an emphatic form, to the minor pectorals.

At the conclusion of the movement both sets of pectorals have been exercised in a thorough manner—*if!* And on this "if" hangs the secret of success with this exercise. There must be as much strength as possible used in the work. You can do this work lightly and with corresponding lack of benefit. So put vim, strength and *attention* into the work. Remember that every time you perform the movement weakly or slightingly, you have been careless enough to waste so much of the time that you have to devote to your muscular development.

Yet, take care that you do not make the mistake that some of my readers are sure to make. Do not imagine that these chest exercises are of but comparatively little importance. Do not try these only now and then, giving most of your time to making your biceps larger. Fine biceps are splendid, but they are not by any means the key to all muscular development. And remember that the practical strength of your arms will fall far below your proper standard if you do not pay attention to the vigorous development of your chest muscles.

Now, let us take a look at exercise number four, as it is shown in photographs numbers 5 and 6. Study the photographs well, and get a good mental grasp of the text. When you have done this, try the exercise —not in a lackadaisical way, but with strength and purpose. Put all of your normal power into the work. Then, when you have noted the effect, think over what I have written in the preceding chapter concerning the main purpose of the minor pectoral muscle.

Do you now comprehend the full meaning of this exercise? By starting with the shoulders well downward and forward, and by slowly forcing them backward and upward against the strong resistance of other muscles, you strengthen the minor pectorals for the natural muscular work that they have to do in depressing the points of the shoulders. And, after faithful practice of this exercise for some time, say every day for two or three weeks, you will be astonished at the increase of your strength in these little-heard-of but very important muscles.

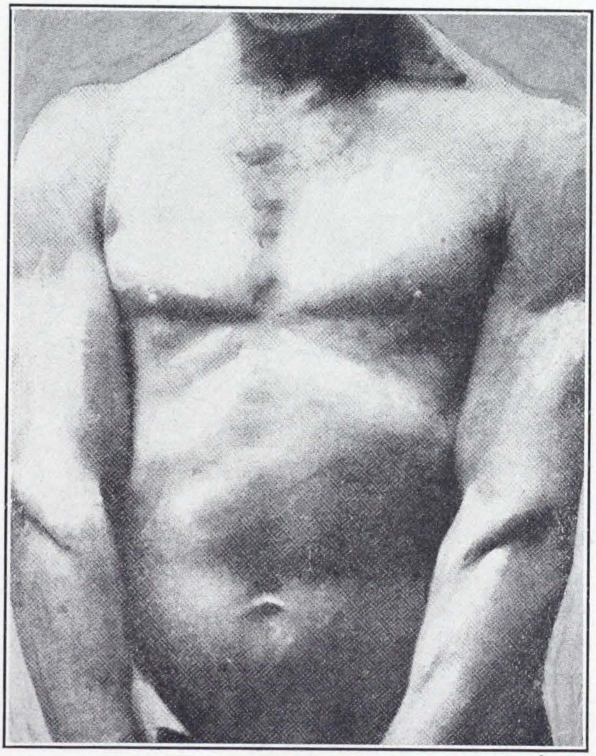
No matter how strong you become, these exercises for the chest muscles should be continued zealously and faithfully.

It is important to remember that a measure of interest and pleasure in the performance of your exercises will result in a vastly more marked benefit than their execution in an indifferent or perfunctory manner. Herein lies the explanation of the failure of the manual laborer whose muscles obey the mandates of his mind only under protest, to secure the development of the athlete, from the standpoint of either symmetry or endurance. You will gain more strength from a few energetic, concentrated efforts than from a thousand listless, sluggish movements. Furthermore, you will be able to enjoy every exercise if you enter into it vigorously. And if you can thus make your exercises appeal to you in the form of play, so much the better.

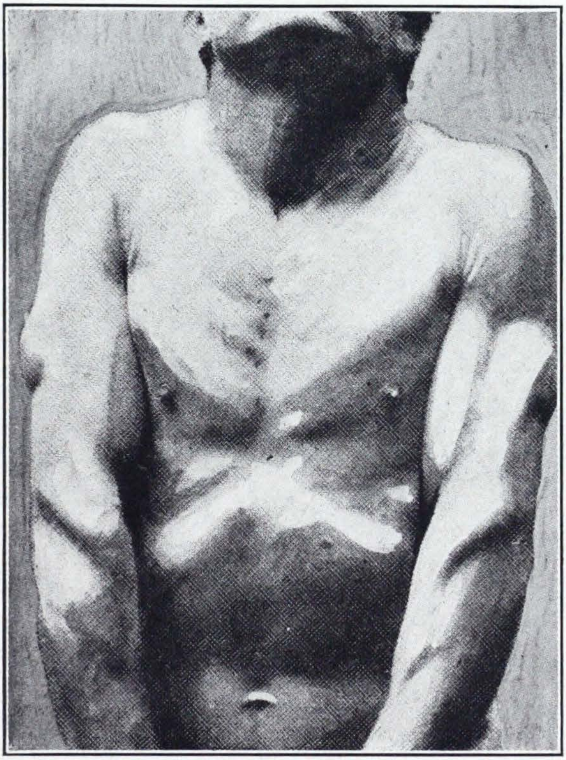
Exercise 3. Form one finger of each hand like a hook; then locking them together and balancing the body on the toes, as shown in the photo, slowly raise the arms forward and upward, all the time pulling vigorously outward and attempting to pull the fingers apart. (See next photo.)

Continue to slowly draw the arms upward until they are far back of the head, as shown in the above photo. Be sure to make vigorous effort to pull the fingers apart while bringing the arms upward. Use each of the fingers of both hands in this manner. This is a very good all-round exerciser for strengthening the fingers, arms, chest and legs. As a variation, if desired, you can raise up and go down by straightening the knees. If you have difficulty in maintaining your balance while taking this exercise, when first attempting it, you can lean against a chair or table. This exercise is also especially good for rounding the knees and for making the legs shapely.

EXERCISE 4. Bring the shoulders downward and as far forward as you can. Now slowly bring them backward and upward. (See next photo.)



To position shown above, throwing the head as far back as you can at the same time. This exercise is especially beneficial in straightening round shoulders, and it should be repeated until tired, two or three times a day, if bothered with a defect of this nature. The exercise can be made still more difficult if you will, after having brought the shoulders up and back as far as you can, make two or three attempts to bring them still farther back and down as far as you can.



Bernarr Macfadden's Preface to "Strength from Eating."

Strength! How we all yearn for this grand power!

No matter how much strength may be possessed, one always desires more. It is like money. You can never secure enough. No matter what may be your desires or ambitions; no matter what may be your occupation, strength is an actual necessity in order to accomplish anything of value in life.

From as far back as history dates the tendency of humanity to worship strength is noted. This inclination has not decreased to any extent even to-day. We all love and admire strength. Our heroes are all strong. We like to imagine them with all the vigor and beauty of body which every perfect human being should possess.

The normal condition of every human body is one of strength. Every infant which has vitality enough to be born and live, has sufficient vitality to grow into a vigorous man or woman. Where it is otherwise, the weakness and disease have been caused by unnatural conditions. In every case weakness is brought about by failing to observe the laws of nature, which demand the use of every part of the muscular organism, and a regular supply of nourishing foods.

Though the building of any great degree of strength is impossible without using it regularly as acquired, the influence of diet is very great. It requires but little intelligence for one to understand how greatly foods can influence the condition of the body. In order to build strength you must have strengthening and nourishing foods, and these foods must be eaten as nature demands; otherwise there is but little possibility of one gaining the desired physical power and beauty.

Reader, have you sufficient strength? Have you all the beauty and vigor of body that you desire? If not, it is plainly and clearly within your reach. It is simply required of you that you make determined efforts to bring about this natural condition of the body.

I have endeavored in this book to teach

some plain truths: I have endeavored to emphasize with all possible accuracy the plain laws of nature in reference to eating and drinking, for the attainment of the highest degree of health and strength.

Read and form your own conclusions.

Strength can be yours.

Let your determination be strong, and your perseverance unabating, and the suppleness, beauty and buoyancy of strength will appear as your reward in every instance.

**"The rest of this volume is from the work,
Strength from Eating."**

CHAPTER I.

APPETITE.

The Puritanical theory that all pleasures were evil in character, has probably done much to assist the human race towards the "mire" of physical degeneracy. There is no natural pleasure, or natural appetite, or natural desire that was not created for a particular health-giving purpose, the following of which will add strength to the body; and the sin, the evil, lies not in commission but in omission. Cultivate Nature, natural appetites, natural desires; develop that delicacy of intuition which will enable you to interpret and follow their dictates as nearly as it lies in your power, and you will be a stronger and nobler specimen of manhood or womanhood because of this.

Horace Fletcher says: "Taste has been considered the lowest, in usefulness, of all the senses. On the contrary, if properly understood, taste is the most important of all the faculties man possesses. Upon an examination, that any one can make for himself, it is revealed that taste is the faithful sentinel of the stomach, of the tissues and of the brain, whose guidance and warning, if heeded, will give heretofore unknown enjoyment to eating, and at the same time insure perfect health and the maximum of strength."

How many human beings eat their meals because it is meal time! They have no desire for food, absolutely no appetite, but they feel that it is their duty to eat.

Poor fools!

Duty, indeed! Why, friends, every mouthful of food swallowed without appetite is an outrage committed against the stomach: an outrage so fearful that every organ of the body is dulled and deadened by it. And those very persons who abuse themselves in this way are often the loudest in their condemnations of intemperance-alcoholic intemperance.

If the real facts were known, these sinners against the appetite, against the stomach, are the victims of an intemperance that is far more destructive in its character than those who indulge in alcoholic liquors.

There are occasions even when an alcohol fiend enjoys an exaltation of spirits which is the semblance of the exhilaration that often comes to those in a high degree of physical health, but the person who performs his "duty" of eating three times per day, "whether he needs it or not," year after year, never, on any occasion, has his pulse quickened by such an influence. Every organ of his body usually loses its acute power of sensation to a similar degree with the stomach. This poor abused organ is compelled to work against its will continually. Never at any time, under these circumstances, is it prepared to digest the "mess" that is dumped into it. Can you blame this organ for failing in its duty? Can you blame it if the food gives no strength? You may eat and eat, try every conceivable tonic on earth, go from one physician to another searching for a remedy to cure your trouble under such circumstances and your efforts will be of no avail.

If one would use his brains a trifle, and obey the natural instincts of his body, as does the dog and all other lower animals, the stomach would be allowed to rest until it cries out for the privilege of working. Then it is ready to work, to digest. It has all the digestive juices prepared in advance and the food is attacked by these juices immediately upon its entrance to the stomach, and is quickly dissolved, or reduced to that condition necessary for its absorption by the various glands with which it comes in contact during passage through the alimentary canal. The existence of an appetite for food indicates not only that the food is needed by the body, but also that the digestive organs are ready to receive it.

It is the enjoyment of food, "eating with appetite," which makes the salivary glands, and the glands that furnish the gastric and other digestive juices, pour forth their liquids in copious quantities. Under no other circumstances are these digestive liquids, necessary to proper digestion, furnished in the proper quantities or in proper strength. Therefore any one can clearly see the terrible sin of eating without appetite. The food is washed down into the stomach by coffee and other abominable liquids, and, in a haphazard way, the stomach may try to digest it. But there is no "vim" to its efforts. It is a grim duty performed against protest. Should one wonder that he suffers from indigestion under such circumstances? With all this "mess" of food fermenting, and sometimes actually putrefying in the stomach, how could it be otherwise? And some persons have the incomprehensible audacity to wonder why their breath is foul! When the contents of the stomach are in this condition, the whole system is actually poisoned—not only the breath, but the perspiration and every emanation from the body will have an unpleasant odor. This foulness is taken up by the blood in its effort towards elimination—it is therefore distributed everywhere, throughout the entire body, and under such circumstances it is really marvelous how the body can continue to manifest life when the conditions that create this filth are continued year after year.

Eating without appetite is actually the only cause for the depraved physical condition described above. There can be no other cause. Food cannot lie in the stomach undigested if the stomach is first prepared for it by appetite and the enjoyment that it gives to the process of eating.

Let me emphasize with all possible clearness that in eating for the acquirement of the highest degree of vigorous health, the necessity for obeying the dictates of the appetite must be recognized to the fullest extent.

The appetite is absolutely the only guide as to quantity and character of food needed to nourish the body at different times, and if the delicate sensibility of this guide has been dulled and deadened by failure to acknowledge and follow its dictates, by crowding the stomach with food against the natural inclination just because it is meal time, the only indication that suffiicent food has been eaten will be that the stomach can hold no more, and there will be no natural craving to indicate the particular character of food especially required to nourish the body at that time.

The unperverted appetite always craves most keenly that particular food element that is most needed by the system to nourish the body. Therefore, if the appetite is in a normal condition, the food that tastes the best will be that which is richest in the nourishment mostly needed.

"Taste, in its normal condition, when allowed to direct or advise, craves the kind of nourishment the body needs, invites to eating, gives enjoyment during the whole time needed for the fluids of the mouth to do their part of the assimilating process, ceases when the food is ready for the stomach, and thereafter fails to recognize the indigestible sediment which remains in the mouth after nutriment has been extracted; and, in these services, if consulted and obeyed, prevents indigestible matter from entering the system to burden and clog the lower intestines.

"Appetite and taste are the sense functions that are most important to health, and hence, are the most important to study and understand. They are the guide in nutrition and the guard of the body.

"Taste is also dependent on supply of the mouth juices, usually called saliva, and these differ materially in individuals, necessitating self-study, self-understanding and self-care to insure prevention of disease. Whatever does not taste, such as glass or stone, is not nutritious. The juices of the mouth have the power to transform anything that excites taste into a substance suitable for the body. If we swallow only food which excites the sense of taste, and swallow it only after the taste has been extracted from it, removing from the mouth the tasteless residue, complete and easy digestion will be assured and perfect health maintained."—*Horace Fletcher.*

Of course the needs of the body vary greatly at different periods. At one time one might especially crave an article of food that would not be at all appetizing on another occasion. This accounts, in a measure, for one becoming tired of any special article of food when eaten too frequently. The body is surfeited with the elements of nourishment which it contains, and hence all desire for it disappears. And, again, it will be noticed that those foods, like whole wheat bread, which contains all the elements needed to feed the body in almost perfect proportions, can be eaten with relish at nearly all times when an appetite for anything exists.

But the reader may ask, "How am I to

know if my appetite is normal or abnormal?" About the only condition that can be depended on absolutely to indicate as to whether or not one is living according to the dictates of the normal appetite, is the enjoyment of that high degree of health which makes every moment in life seem full of joy from the very exuberance of one's own feelings. This condition, one and all will easily admit, is rarely met with to-day, and it indicates quite clearly the usual abnormal state of civilized human beings.

The question will now naturally arise if the appetite is abnormal, how can it be made normal?

There is but one way of creating a normal appetite, and that is by fasting. One must fast until he has a clear, unmistakable craving for food, then the instinct will have no difficulty in selecting those foods most needed, if a choice of wholesome and nutritious foods are given. As to the length of time one should fast in order to bring about these results, it will of course depend entirely on the physical condition. If the appetite has been outraged in the usual way, year after year, and no attention has been given to the necessity for physical exercise, it would no doubt take a fast of several weeks to bring about an absolutely normal condition. I am fully aware that there are but few of my readers who would dare attempt a fast of such duration, and, in fact, practically the same results can be achieved without resorting to such extremes, though these results will of course not appear so speedily as they would if a total fast could be endured.

Begin this body-cleansing, appetite-creating process by missing one meal (breakfast) per day.

After having followed this for a while, miss two meals per day, breakfast and the noon meal, or, else, breakfast and the evening meal. This method will enable you to feel your way, step by step. After having gone without breakfast for several days, and the benefits of this have become plainly evident, you will be better prepared for the abstinence required in subsisting on only one meal per day.

The benefits that result from fasting are unquestionably greatly lessened if the confidence in its efficiency is not sufficiently strong, and this graduated process of teaching its advantages can be commended to those who are open to conviction, but who do not feel equal to a prolonged fast.

CHAPTER II.

MASTICATION.

Digestion begins in the mouth. The thorough chewing and mixing of the food with saliva is, consequently, one of the principal and important factors in digestion. All foods in a natural state require a great deal of chewing before they can be swallowed, but the various methods of preparing food, by which it is moistened and softened, usually enable one to swallow it with but little chewing. It therefore behooves us to remember this prime necessity for thorough mastication, no matter how soft the food may be. Even soups must be submitted to a certain amount of this chewing process, that the saliva may be thoroughly mixed with it before it is swallowed. Food is not in a fit condition to enter the stomach unless it is first thoroughly masticated and mixed with saliva. The necessity for this is almost universally ignored, and diseases of the digestive organs, both chronic and acute, from which human beings suffer almost universally in civilized countries, is ample evidence of the sins that are being committed against the stomach.

Eating without appetite is unquestionably a serious sin—there can hardly be a greater sin against the digestive organs—but the sin of deficient mastication undoubtedly comes next. In the previous chapter I mentioned the importance of the thorough enjoyment of all food taken into the stomach—how this ability to enjoy every morsel eaten not only aroused the salivary glands to vastly increased activity, but every one of the juices that assist in the mysterious process of digestion were made to flow more freely under those circumstances. Now, food cannot be thoroughly enjoyed if not thoroughly masticated. Thorough mastication is what produces this enjoyment—is what arouses the sense of taste to its highest capacity, and most delicate acuteness. How much enjoyment does one derive from eating when the food is hurriedly bolted? Practically, none. He is one of the "duty" eaters. He eats because it is meal time, and because he must keep up his strength, and, apparently, is ignorant of the fact that he is not only actually draining his strength, by this crime against his stomach, but is rapidly wearing out the entire internal organism. The digestive organs of such a person are continually overtaxed. They may adapt themselves to the abnormal habits forced upon them, and make no special sign that they are suffering from this abuse, but the time will come when the penalty for this infraction of Nature's plain law will be paid in full.

Nature's laws cannot be broken with impunity. The penalty of violated human laws is often hinged upon the fact of the transgressor being found out, but there is not even this chance of escaping the just punishment demanded from transgressors of the laws of Nature.

Nature demands that you must enjoy your food to the very fullest extent. The pleasure of eating should be so great that it blots out everything else for the time being. It should literally absorb your entire attention. Every worry in reference to business, or other trouble, should be discarded absolutely from the mind. If you are not able to discard all these interferences with your dietetic enjoyment you are eating without sufficient appetite, and you should immediately cease, and wait for an appetite which will enable you to completely lose all external thoughts in the pleasure of satisfying this natural demand of the body.

Then sit down to feast. Eat very, very slowly. Try to see how much enjoyment you can extract from every mouthful of food. Retain it in the mouth, chewing vigorously all the while, until it is absolutely reduced to a liquid, and until it is swallowed involuntarily. Gladstone's rule of chewing every morsel thirty-two times before swallowing is practically no guide for you. Even the soft foods, like mashed potatoes, for instance, will have to be chewed from thirty to fifty times in order to reduce them completely to a liquid, and to extract all the delicacy of flavor. Dwell on every morsel of food as long as it is possible to retain it without involuntary swallowing. As the morsel is submitted to the chewing process it gradually grows richer in flavor, more delicious to the taste, and the process should be continued until the maximum of this delicacy of flavor has been reached. Not until then is the food ready to be transferred to the stomach—not until then do you really get the richest, most delicious flavor of what you are eating.

All those who swallow their food previous to this point, not only miss the rarest pleasure of eating, but they swallow before the food is ready for the juices of the stomach to begin acting upon it.

"If we masticate—submit to vigorous jaw action—everything that we take into the mouth, liquid as well as solid, until the nutritive part of it disappears into the stomach through compulsory or involuntary swallowing, and remove from the mouth all fibrous, insoluble and tasteless remainder, we will take into the body thereby only that which is good for the body.

"If a bloated, pimpled, bilious tramp, sorely afflicted with two or three internal and intestinal diseases which have been declared to be chronic, can be brought to normal weight, purified in complexion, cured of a craving for drink, and put in possession of natural manhood and an energy for work, without use of medicines, but only with attention to mastication, and all within three months, what may not be the possibilities involved?"—*Horace Fletcher.*

Hygienists and physicians everywhere commend the mixing of conversation, and of other social diversions with the pleasures of table. In eating and masticating, as suggested here, there is no need for such diversion. In fact, conversation is liable to seriously interfere with the proper mastication of the food, and distract the attention from the pleasures of eating, which should be all absorbing for the time being. Of course, I will admit that the entertainment afforded by pleasant and agreeable companionship during meal time is a most decided advantage if one is in the habit of eating in the usual rapid manner; for, diversion of this nature compels one to eat more slowly, forces him to linger more over the various dishes, and holds him back from hurrying through the meal by the gorging process, adopted by so many persons when eating alone, with appetite, or merely from a sense of duty. As stated before, the all absorbing pleasure of eating, of gratifying the sense of taste, should command the entire attention during a meal. You should make a business of enjoying this particular pleasure in the greatest possible degree, and if this is done properly there will be no chance for the introduction of "table talk."

It is not absolutely necessary that one eat alone. No objection can be made to companions who do not insist upon diverting the attention from the main object of the moment, but it would be well to remember that, the commendable rule of "doing whatever you may be engaged in with all your powers," applies to eating quite as forcibly as it does to other habits or pursuits in life.

Much has been said in condemnation of the person who "lives to eat," but the one who really and truly lives so that the greatest possible enjoyment from eating can be secured, will eat practically but one full meal daily, and will dwell on the delectable flavor of every morsel, that this meal may continue from an hour to an hour and a half. The dietetic enjoyment secured by an ordinary everyday Epicure, who eats three meals a day, is as nothing compared to the intensity of that pleasure derived from eating as described. It is like comparing the dulled, transient and intermittent sensations secured from overwork and deadened nerves to those intense emotions aroused in one whose nerves are alive with joy and power of superb physical life.

It would be well, also, to note that the retaining of a normal appetite—of that sense of taste which enables you to discriminate not only as to the character of food needed, but also as to quantity—depends largely on perfect mastication.

"The message of warning which taste gives in connecting with eating is: 'That while any taste is felt in a mouthful of food in process of mastication or sucking, it is not yet in condition to be passed on to the stomach; and what remains after taste has ceased is not fit for the stomach.' "—*Horace Fletcher.*

If the food is bolted, if the sense of taste is outraged continually, its power naturally becomes dulled and you are left without a guide, which should at all times clearly indicate the character of the food needed to nourish the body, and which should refuse to recognize any flavor in any food after the needs of the system have been supplied.

One can readily imagine the condition of a man under the circumstances described. He has no definite idea as to what to eat, and his only guide is the feeling of fullness in the stomach.

The importance of good teeth is of course very great and extreme care should be given to them that they may be preserved to the end of life. The principal cause of decayed teeth, however, is the lack of exercise from which they suffer through persistent insufficient mastication. If they are given the proper use required in order to masticate the food as here suggested, they will immediately begin to improve in condition. The fermentation of foods in the stomach, as evidenced by a foul breath and coated tongue, also has much to do with the decay of the teeth; and upon the recognition and adoption of the habit of proper mastication, these foul conditions will naturally disappear, and the tendency of the teeth to decay from this cause will immediately cease, if the teeth are put in good condition, all decayed parts removed, and filling used where needed.

Chapter III.

Process of Digestion.

Though I have tried to avoid all possible use of technical terms, in the following very abbreviated description of the digestive organs and their processes, their use will be occasionally required.

In order to make the work of digestion as clear as possible without a lengthy description, we will follow the food in its travels through the alimentary canal, explaining the actions of the organs and various digestive juices with which it comes in contact.

After food has been called for by appetite and has gone through the first process of digestion by thorough mastication, it is swallowed and allowed to enter the stomach. Now immediately upon entrance, this food comes in contact with the gastric juice which is secreted by the peptic glands, and which exudes in tiny drops from the inner surface of the stomach like perspiration from the pores of the skin. Not only the quality but the quantity of this digestive juice furnished depends greatly upon how much food is needed—in other words on how hungry you are at the time the food is eaten. The feeling of hunger, the ability to heartily enjoy the food eaten, is an unmistakable indication that there will be secreted a full supply of these digestive juices, that will be poured forth copiously as the process of eating and digesting continue; and the more intensely the food is enjoyed, the more each morsel is dwelt upon in the act of mastication by the sense of taste in the endeavor to secure its most delicious flavor before swallowing, the more freely does the gastric juice flow, and, naturally, the more perfectly is the work of stomach digestion performed.

The time required for stomach digestion depends greatly upon the character of the food, and upon how carefully the work of mastication has been performed. If the food has been hurriedly bolted it will require much longer than if it had been practically reduced to a liquid before swallowing. The period of digestion has been variously estimated from two to five hours. The stomach, while digestion continues, involuntarily churns and presses the food back and forth within its walls that it may be thoroughly mixed with the gastric juices. Portions of the digested food that are rendered liquid are all the time being absorbed by the stomach during this process. As the gastric juice of the stomach only digests albuminous, muscle making, articles of food, that will readily account for the feeling of increased muscular power which so quickly follows eating when one is tired and much in need of nourishment; and, when mastication has been properly performed, the saliva begins the work of digesting all starchy, heating foods, and undoubtedly some of this is also absorbed by the glands of the stomach, thus also accounting for the feeling of increased warmth that usually follows half an hour or more after a meal. Of course immediately after a hearty meal the blood is attracted to the stomach in such quantities in its endeavor to supply the gastric juice and do the other work in connection with digestion, that one naturally feels the cold more than usual for a short time, if exposed, but this passes away within half an hour at most after a meal and a feeling of increased warmth is then noticed.

As part of the mass, being digested by the stomach, assumes a condition that indicates the process of stomach digestion has been completed, it is allowed to pass the pylorus and enter the duodenum, which is a part of the small intestines. Here the food comes in contact with two other digestive juices that are poured forth under normal conditions as needed—the bile and pancreatic juices. The bile is alkaline in character; it neutralizes the gastric juice, emulsifies the fats, making them soluble, and it also has antiseptic qualities which act upon the entire intestinal canal. The pancreatic juice is similar to the saliva of the mouth and performs important offices, though in addition to digesting starchy elements it also digests albuminous—muscle making—and fat.

From the duodenum the food enters the principal part of the small intestines. Here it comes in contact with another fluid called the intestinal juice. This juice possesses the power peculiar to itself of digesting all the various food elements, thus practically completing the work of digestion. The small intestines are supplied with a very large number of glands which absorb large quantities of the nourishment made ready by the various digestive juices with which the food had previously come in contact. From the small intestines the food is slowly forced into the colon where absorption still continues though in a much more limited degree.

For a technical description of the process of absorption of the nourishing elements of the food, I refer to the following by Dr. J. H. Kellogg:

"The process of absorption begins almost as soon as food is taken into the mouth, and continues so long as any soluble nutriment can be extracted from the alimentary mass. The work of absorption is performed by two sets of absorbent vessels, minute veins, and lymphatics, here called lacteals. The venous absorbents take up whatever is held in solution in the food taken into the stomach, and the principal portion of the digested farinaceous, saccharine, and albuminous elements of food. The lacteals absorb the emulsified fats and some portion of the other elements. The products absorbed by the venous absorbents find their way into the general circulation through the hepatic vein, after passing through the liver, which is apparently a wise arangement of nature, to provide for a sort of filtration before the more delicate tisues of the body are exposed to the action of whatever deleterious elements the food may happen to contain. It is claimed by physiologists that the liver has also an important function to perform in completing the work of digestion, especially that of starchy substances. The food mingled with venous blood is conveyed to the liver by the portal vein. Those products which are absorbed by the lacteals, reach the general circulation through the thoracic duct, a long, slender lymph vessel which empties "into the large vein from the arm on the left side."

CHAPTER IV.

WATER.

Though many do not consider water a food for the reason that it does not furnish energy, it nevertheless constitutes a large part of the body, and is as necessary to life as any other element which enters into its composition. The importance of pure water can hardly be exaggerated. That which comes from springs is usually considered the most wholesome. Well water, in numerous instances, has been found to be about as pure, though where a well is located adjoining outhouses—stables, privies, etc.,—there is always very serious danger of their impurities contaminating the water. The water supplied in cities, though in some instances very bad, is usually far better than the well water secured in such localities.

Referring to the mineral waters that are on sale everywhere I would say that as a rule they cannot be commended. About the only advantage possessed by these waters is merely the fact that one drinks a larger quantity of them than ordinary water, and the body is thus flushed and cleansed. If one would simply secure some pure water and by adding salt or any harmless element that will cause him to drink largely increased quantities of it, exactly identical results can be produced, to those brought about by the use of mineral waters. The principal ingredient in most of these mineral waters which causes one to largely increase the amount used is salt. This may have an advantageous influence upon the system when the body is filled with impurities, as the purifying quality of salt is well known, though some hygienists claim, probably with grounds for their conclusion, that salt if used continually in great quantities, has a tendency to dry up the tissues.

The best way to judge as to the purity of the water is to carefully note as to whether it has the slightest taste, and if there is no indication of this, you can depend upon its purity. Of course where one's taste has been blunted by over-eating and other intemperate indulgences it would be difficult for taste to distinguish the difference.

Most sedentary workers do not drink sufficient water. It is a well-known fact that a certain quantity of liquid is necessary to the proper circulation of the blood, and to enable all the organs of the body to properly perform their functions. In diseased conditions of all kinds the drinking of copious draughts of water will, in nearly every case, be found productive of beneficial results.

Distilled water can be recommended, and an apparatus can be bought which will furnish it, but it is well to remember that distilled water contains no minerals of any character, and numerous authorities maintain that a certain amount of mineral elements in water is advantageous. I would call attention to chapter referring to mineral food elements.

Filtering is of course of advantage, and whenever the water is inclined to be unsatisfactory a filter can be purchased, or a cheap one can easily be made for home use by merely arranging an apparatus so the water will pass through sand and charcoal. The necessity, however, for frequently cleaning the charcoal should not be forgotten.

The quantity of water needed to maintain the proper condition depends very greatly upon the individual and upon the temperature. In very warm weather considerable water is necessary, that the exterior part of the body may be cooled by evaporation, or prespiration, as it is usually termed. No matter how high the atmospheric temperature, the body retains in all cases when in a normal condition, a temperature of about 98½ degrees Fahrenheit, and this is maintained simply by the cooling of the exterior surface from evaporation; thus you can readily see, if engaged in some vigorous exercise that heats the blood, or if the temperature is high, the necessity for water greatly increases.

Though pure water is unquestionably of great advantage, it would be well to call attention to the fact that if the body is in a normal condition of vigorous health there is little danger from water which gives no evidence of impurities to the taste. Under normal conditions of perfect health no disease germs of any kind can live in the human stomach. There are germs of health as well as germs of disease, and when the body is in a perfect condition, these germs of health are always stronger than any disease germs which may be introduced, and under these circumstances they are always the victors when compelled to come in contact with the baneful enemies to health.

Chapter V.

Overeating.

One of the greatest sins against the body is overeating. The intemperate indulgence in alcoholic liquors, is, unquestionably, a great evil. It fills thousands of graves, and ruins thousands of homes, annually. But the evil of alcoholic intemperance is as nothing when compared to the evil of overeating. The habit of overeating is almost universal. Hardly a home exists that is not made unhappy, to a greater or less extent, by this habit. Hardly a life has been wrecked in health that this evil has not played an important part in causing the wreckage. In fact the evil of alcoholic intemperance itself, is largely caused by overeating. The stomach becomes overloaded; the mass refuses to digest—it ferments, and there is a desire for something, the victim hardly knows what—anything to rid the stomach of its vile contents. Alcohol affords this temporary relief. It spurs up the organs to increased activity, as they endeavor to quickly eliminate the poision, and when alcoholic liquors are taken under these abnormal conditions, it may actually be a natural appetite and productive of benefit instead of evil, for the evil that will result from the undigested mass of fermenting food if it remains in the stomach for a great length of time might be as great as or greater than that resulting from the use of liquor.

There has been so much preaching on alcoholic intemperance that whenever one speaks of intemperance he is supposed to refer only to this evil. But it is time these narrow-minded temperance advocates were awakened—it is time for them to realize that the real cause of alcoholic intemperance is intemperance in eating; and never until this is understood and made plain to the victims will anything of importance be accomplished towards stamping out the alcohol curse. Intemperance begins at the family table, and it is perfectly natural, perfectly logical, for it to drift to the corner saloon.

Overeating permanently distends the

walls of the stomach, and lessens their muscular vigor. It often actually strains these muscles permanently, and the churning process so necessary to perfect digestion, which the muscles involuntarily perform, cannot be properly accomplished. They become weakened just as would a muscle in the arm if unduly strained, or overworked. Their efficiency lessens under these circumstances a similar degree. It would be well for every reader to remember that the entire digestive process is brought about largely by involuntary muscular action, and when the muscles are unnaturally strained as they are where the stomach is habitually overloaded, all the muscles are weakened and their functions greatly impaired, and in the end destroyed.

"There are two ways of putting a limit to a meal—to eating. One—the wrong one—comes in the shape of a protest on the part of a too full stomach while the appetite is yet ravenous. The right one comes naturally from a perfectly satisfied feeling—a ceasing of desire for anything more, no matter how alluring to the palate—before the stomach is overburdened. The former is evidence of glut, or gluttony, and the latter is Nature's way, for which there is every desired reward."—*Horace Fletcher.*

The gastric and various other juices, so necessary in the stomach's perfect work of digestion, are not supplied in sufficient quantities, nor of proper strength, when overeating is habitually indulged in. This naturally causes serious complications, for which every remedy known to medical science has been prescribed without avail, unless the causes of the condition were discovered, and removed.

Thus, you can readily perceive that these two results of overeating—the weakening of the belt of muscles about the stomach and other vital organs that carry on involuntarily the very necessary work in connection with the digestive process, and the lessening in quantity and quality of the digestive juices—would seriously interfere with general nutrition. Not only is the quantity that could be secreted by the various glands of absorption lessened, but the quality of the secretion is poor. Every part of the nourishment absorbed under such circumstances is filled with impurities and foreign matter that the natural depurating organs have difficulty in eliminating, and the result is these impurities finally permeate every part of the entire body.

The presence of these impurities is manifested in various forms. Medical science has thousands of names for diseases that are nothing more than efforts on the part of the functional system to discharge superfluous and harmful impurities that have been brought into the body. Eruptions, boils and all skin diseases are the results of nothing but impurities being discharged through the skin. Rheumatism, pneumonia, fevers, headaches, neuralgia, etc., are nothing but impurities overburdening some particular part of the body, and the crying out of muscles and nerves against their existence; and in nearly every case whatever the so-called disease, or its nature, these impurities are present in the system primarily because food was taken into the stomach in excess of the body's needs, and beyond the powers of the digestive organs.

"It is generally supposed that if a man has an unusually large day's work to perform, he must eat an unusually large breakfast and a proportionately large dinner. This is certainly an error. Large demands upon either the muscular or the nervous system for the time being detract from the power to digest. The stomach requires nervous energy to enable it to perform its function. If the nervous forces are otherwise engaged or used, they cannot be utilized in digestion. Hence it follows, theoretically, at least, that instead of giving the digestive organs an extra task in preparation for an extra effort, they should be required to perform less than the ordinary amount of labor. Experience as well as theory supports this view. Sir Isaac Newton, when employed in his most arduous labors, lived upon bread and water, and fasted for long intervals. General Elliot, the famous defender of Gibraltar, is said to have subsisted for a number of days on a little boiled rice. The wonderful L'Homme Serpent of Paris, always fasted for twelve hours before attempting to perform his marvelous feats of agility. This plan not only secures a higher degree of efficiency in the effort made, but prevents, in great degree, the injury likely to result from excessive exertion. When required to overwork for a succession of days, we have found that we were not only able to perform much more work, but to do it with less effort at the time, and less exhaustion afterward, when taking a greatly reduced quantity of food than when attempting to do the same work and still taking the usual quantity of food. I have no doubt that a neglect of this precaution is a not infrequent cause of many of the sudden deaths of which we so often receive accounts, especially among politicians and public men. Overloading the stomach and overworking the brain at the same time is exceedingly dangerous. The man who overworks mentally must be temperate; he must exercise the greatest moderation in his eating, and must totally discard all stimulants and narcotics. A great share of the cases of apoplexy occur when the stomach is full. The increased clearness of intellect which results from abstemiousness will repay one for all the self-denial practised."—*J. H. Kellogg, M.D.*

The continued strain on the digestive apparatus caused by overeating not only weakens the general digestive powers, but the entire muscular and nervous system as well, as it suffers severely in consequence of this. That "tired feeling" is always present. You never have any energy—all your enthusiasm seems to have disappeared. The impure condition of the blood would naturally cause this, but the fact that all the energies are spent in the endeavor to right the digestive disorders, to rid the stomach of the loads that are continually being forced upon it, no doubt does much to influence this condition.

"Gluttony imposes upon the body a quantity of matter which is underdone; that is, under-prepared; so that only a small portion of it is suitable for nutrition, leaving the greater part to ferment within the channels and strain the intestines until they are contused and weakened.

"Such is the impetuosity of uncultivated or perverted human tendencies that the desire for acquisition, sometimes called greed, impels one to swallow one mouthful of food to take in another, without ever dreaming that the very last contribution of taste to the last remnant of a delicious morsel is like the last flicker of a candle, more brilliant than any of the preceding ones.

In eating, the last taste is more perfectly in possession of the solution, is better than all the other stages of the process. It is the choicest and sweetest expression of the incident, as related to each mouthful. Then why not court it and obey, thereby, Nature's first law of health?"—*Horace Fletcher.*

The brain, also, suffers intensely. It is almost impossible to do brain work with any degree of satisfaction. There seems to be no connection between your thoughts. The power of concentrating the mind upon any subject entirely disappears.

Another unfortunate result of overeating is the entire disappearance of a normal appetite. One cannot tell by the appetite what the system mostly needs. He or she simply eats until a feeling of fullness indicates that the stomach is crammed to its capacity, as a packing case, and that it is time to cease, instead of eating until hunger has been appeased. As explained in a previous chapter, eating, without appetite, is an outrage against the stomach. The victim of overeating always eats without appetite. He may have a desire for something—anything to relieve his unsatisfactory feelings—but a normal craving for food needed to nourish the body, he really never experiences.

These victims of overeating are sometimes thin, even to emaciation. They so overcrowd their digestive organs that really every particle of vital energy is used to rid themselves of the never-ending supply. Others assume chronically a bloated appearance, though the skin looks rough and unwholesome in appearance and color. Many victims of this vice will say "I never overeat. Why, I hardly eat anything—I have no appetite —I merely eat enough to keep up my strength."

The one who loads his stomach to its fullest capacity is not so great a sinner as he who merely eats under the idiotic idea that he is keeping up his strength. When one loads the stomach to repletion he usually eats with appetite, the food is invited, but the "eat-to-keep-up-my-strength" idiot never allows his stomach to prepare for food, never gives it sufficient rest that it may develop an appetite, and under these circumstances indulgence in the smallest possible quantity of food would be overeating.

CHAPTER VI.

THREE-MEAL PLAN.

Though I believe either the two or the one-meal plan would be found superior to three meals each day, one can undoubtedly follow this usual method and still retain vigorous health if he will occasionally fast by missing one or two meals, or a day or two when the appetite fails; and if he will abstain totally from food when illness of any kind threatens. In eating three meals daily there is always far more danger of eating beyond the capacity to digest. One meal is sometimes not digested when the next meal is eaten. The food, under these circumstances, is eaten with less appetite, and all the ills that are brought about by the sin of eating as a duty are invited. If three light meals can be eaten each day, always with appetite, and if they seem to digest without trouble, there is no very serious objection; but the moment any digestive disturbance becomes evident, the one or two-meal habit should be immediately adopted.

It would also be well to remember that the three-meal habit often tends to actually lessen the virility of the blood. The gastric, and other digestive juices are not sufficiently strong to abstract all the best elements of the food; the blood becomes filled with waste and other foreign matter, and the process of eliminating this, results not only in a waste of energy, but usually, under such circumstances, there exists at least a chronic "tired feeling," though often troubles are induced that are far more serious in character.

If one is doing hard manual work there will be found little or no difficulty in digesting three meals, though two meals would certainly be better; but mental workers, to my mind, make a great mistake if they attempt to force this same habit upon themselves. In fact the belief so universally held that we must eat three meals each day to maintain health is unquestionably one of the principal causes that lead to many serious illnesses. It is this false theory that compels many a poor weakling to eat because it is the usual time, and every morsel adds to the poison and filth that is already lessening his physical forces. Whatever habits of eating you may have adopted keep clearly in mind the necessity for that appetite described in previous chapter, to lead and guide you. If you do this the problem of how many meals to partake of daily will solve itself. You will at once avoid those meals for which you have no appetite and, in consequence, eat more heartily and with more benefit, of those you do enjoy. There is at least a grain of truth in the old and oft-quoted saying: "What is one man's meat is another's poison," and each individual must study out these problems for himself, and, though experiments that are extreme in character are not advised, still a trial of, first the two-meal plan, and, later the one-meal plan, can do no possible harm, and the experiment will enable you to determine just what is best for your particular needs. But little knowledge can be gained by one or two days' trial. At least a week should be devoted to each method if you are desirous of securing knowledge of value in determining as to your personal needs. The no-breakfast method often proves its advantage by showing an increase of energy the first or second day of trial.

I have nothing to say to those who consider more than three meals per day necessary. It is simply impossible to retain vigorous health for any length of time under such dietetic intemperance, and usually a liberal quantity of alcoholic liquors must be used to spur the digestive organs to their labors, and, though this alcohol may suffice for a time, there results such a waste in vitality, such a drain on energy, that the term of life is unquestionably lessened, and serious ailments are sure to be produced sooner or later, by the habit of continually overloading the stomach.

Chapter VII.

Two-Meal Plan.

Two meals each day will furnish necessary nourishment for any one, no matter what his occupation may be. The idea that the stomach must never be empty, that it must have something to work on or it will digest itself is the product of brains that cannot deduce true conclusions from plain facts. For the past fifteen years I have personally followed the two-meal a day habit. On numerous occasions I have tried, three, four and even five meals a day, but on comparison of my mental and physicial condition with that which was usual on the two-meal plan I always went back to two meals. At the time when I was doing the hardest physical work I ever was occupied with during my entire life, I only ate two daily meals, and one of these was usually a light lunch. This was when training for hard championship wrestling matches, and there is really no harder physical work than this. At this particular time, when my muscles had to be able to withstand the enormous efforts required in struggling with well-trained and burly antagonists I had an occasion to learn in a most striking manner, the value of the two-meal-a-day plan. In a wrestling match endurance is of great value. The ability to struggle and strain apparently with all your power and still seem not to tire, is one of the necessary qualities in a successful wrestler. I was some time in acquiring this, but when I finally concluded that diet was of some importance, and began to experiment, not only with different food, but also with the quantity necessary to maintain the greatest strength, I secured information of great value. My experiment taught me that the less you eat the better what you do eat is digested. That induced me to try the two-meal-per-day plan, and the almost immediate increase in my endurance so impressed me that he habit of eating only two meals per day has practically been followed by me ever since. On many occasions, after adopting this new diet I met wrestlers who seemed as strong and as scientific as I, but I felt at the time that they were doomed to defeat simply because my diet was superior to theirs, and, as stated in another chapter, never on any occasion after I adopted this plan of diet was I thrown a single fall in a wrestling match at my favorite style.

About the easiest method of giving this two-meal-a-day plan a trial, if living with a family where three daily meals are served, is to avoid breakfast altogether, eating your first meal at noon; or, if this is difficult, the first meal can be eaten in the morning, and the other meal in the evening. The best time to eat under these circumstances is the first meal between 10.30 and 11.30, and the second meal between 5.30 and 6.30. Usually the hours here mentioned will be found satisfactory, but the occupation, the hour of rising and retiring would naturally have considerable influence upon the proper time for meals. The first meal should be eaten from four to five hours after rising, and the second meal should follow this five or six hours later. As to which meal should be the heartier, I should advise one to depend altogether on the appetite; though, if the second meal is not eaten several hours before retiring the first meal should be the heartier, as the digestive powers must be very strong to counteract the evil effects of retiring after a very hearty meal.

Chapter VIII.

One-Meal Plan.

To most Americans one meal per day would seem like starvation, but many thin persons have been known to gain greatly in weight by the adoption of this abstemious diet. The explanation of this apparent phenomenon is simple. When following the regular three-meal plan, they had acquired a habit of eating beyond their power to properly digest, and of eating at meal time regardless of whether an appetite existed or not, and the result of this pernicious practice was naturally disordered and weakened digestive organs, and when the one-meal plan was adopted the food was not taken until there was an actual need for it, until the stomach was able to receive and dispose of it, and the natural result was gradual increase in weight and strength.

One's habits in eating must be determined largely by his occupation. One meal each day, though not by any means a hardship for those following mental and other sedentary occupations, would be rather difficult for the manual worker who begins early and labors until late.

I have personally followed the one daily meal for a month or more at one time, and have lost no weight worth mentioning and have been able to do my work with the same energy as usual. One very pleasant feature about this plan is the keenness of the appetite. There is no "dilly dallying" at meal time under these circumstances. You are there to eat, and even if your food is of the plainest kind every morsel is dwelt upon and enjoyed to the fullest extent. The great importance of enjoying your food has been explained in a previous chapter, and this one-meal plan will quickly, in every case, entirely cure any lack of appetite. And for this purpose alone—that is, creating a keen relish for food—it is especially advised and should be adopted in every case as the first means of remedying lack of appetite.

Of course, the meal under such circumstances is always quite heavy and no active work of any kind should be attempted for some time after. All the energies of the body are then needed to digest, and nothing should be allowed to interfere with this important work. This meal could be eaten in the middle of the day though the best time would naturally be in the evening after the day's work is done. It should of course precede the time for retiring several hours, as the work of digestion is not usually carried on with the same energy during sleep as when awake.

Many object to this plan because of the fear of overloading the stomach. There is but little danger of this if the rules in reference to proper mastication are followed. It is only when the food is hurriedly bolted that the appetite is unable to indicate when sufficient food has been eaten, and when you blunt and deaden the sense of taste by such unnatural speed in eating you must not complain if it fails in its duty.

Chapter IX.

Meat, or Mixed Diet.

Though I am inclined to favor what is called a vegetarian diet, when milk and eggs are not excluded, I am not one of those who hold that a high degree of health cannot also be acquired and retained with a mixed diet. I firmly believe that meat is, to a certain extent, stimulating in character, and that more impurities will be deposited in the body under its influence than that of the vegetarian regimen. Fasting will be necessary more often, as a means of cleansing the body when meat is used than with a strictly vegetable diet. However, if one takes regular exercise, does not gormandize, and fasts when necessary, he can undoubtedly follow the mixed diet, and live to a good old age, and probably enjoy as good health as the non-meat-eater.

The average man, if left to his own choice, readily adopts the combination diet. To some this might show that instinct influences this choice, and it is therefore the natural diet, but this is hardly the case. We might just as well say that instinct teaches one to like whiskey and tobacco. Human beings in their habits are not far different from sheep. They always follow some leader, and each leader in turn follows some other leader. It is really remarkable how little we question the wisdom of those who came before us.

In my own athletic experience, when I was compelled to carefully note the influence of all kinds of food on health and strength, I found that meat would increase my actual strength, but would lessen my endurance. I could lift a heavier weight under the influence of a diet in which meat was liberally supplied, but could not lift a lighter weight so many times. I found, also, that eggs were not open to the same objection as meats, though they seemed nearly, if not quite equal as a means of supplying strength. In eating the flesh of animals you, of course, consume not only the perfect muscle cells, but also a certain amount of waste matter that would naturally always be present, while in an egg you secure practically nothing but pure nourishment. Both strength and endurance are necessary, not only in all athletic contests, but in every condition of life, and in solving the problem of how to attain my greatest possible strength without losing endurance, I found, after many and prolonged experiments, that although some meat seemed necessary, it was desirable to greatly limit the quantity. I ate eggs quite frequently, but usually would not touch meats oftener than once in two to four days. At this particular time I was training for hard wrestling contests, where not only great strength but great endurance was required, and with my two-meal per day diet, consisting mostly of eggs, whole wheat bread, vegetables and fruits, with an occasional indulgence in meat, as mentioned, I was in such condition that no wrestler ever gained even a fall from me at my favorite style, and many of my opponents were men who weighed from ten to fifty pounds more than I.

A diet of meat alone, which has been advocated by some enthusiasts, has never in the slightest degree appealed to me.

Though I have been willing to experiment on all sorts of theories in reference to diet, this exclusive meat theory always appeared to be entirely devoid of the slightest excuse for existence. The individuals who have held these theories have, no doubt, effected temporary cures in numerous cases, as the average individual, if confined to any one particular food, would usually recover under its influence for the simple reason that in nearly every case the principal cause of illness is overeating, and whenever one article of diet is used and all others avoided, the natural result is the quantity eaten is greatly lessened, and the entire system secures an opportunity to thoroughly cleanse itself. It might be well to note that these same persons who were able to recover under the influence of a meat diet would have recovered far quicker under the influence of no diet at all; in other words, by fasting.

I have never met but one victim of the exclusive meat-diet theory, and his appearance would not by any means have influenced me favorably towards it. This man was at one time an athlete of great reputation, and his exclusive meat diet, together with other theories along dietetic lines, had simply rendered him a physical wreck. He was finally confined in an insane asylum as irresponsible, and afterwards died of consumption. I do not for a moment believe that the cause of all his troubles and untimely end was the meat diet solely, but I firmly believe that it had strong influence in bringing about these unsatisfactory results.

The question as to which diet is superior, the mixed or vegetarian diet, may be worthy of consideration, and each individual should settle it for himself and abide by his own conclusions, but the exclusive meat diet has not a single rational excuse which will uphold it.

Chapter X.

Vegetables.

Though I am inclined to favor a vegetable diet I am not one of the rabid kind. I usually eat whatever my appetite calls for, and sometimes do not touch meat of any kind for months. I firmly believe that if one can secure a sufficient variety of fruits, grains, vegetables and nuts that there is not only no actual need for meat, and that one would be far better off without it. Meat unquestionably tends to fill the blood with elements that cannot be readily eliminated by the depurating organs. If meat was included in my diet when attacked by illness, as a first step towards a cure, it was always immediately avoided, and often this has been all that was necessary in order to bring about the desired results. But the most startling evidence in favor of vegetarianism is the fact proven in my own athletic experience, and in the experience of many others, that the vegetarian diet gives one far greater endurance than the meat diet. It makes a better quality of muscle. The theory is maintained that the food in meat has already been used by the animal from which it was secured, and, in eating his flesh you really secure nourishment second hand. The life principle in the vegetable matter, that the animal converted into flesh, has been partly consumed by him, and in eating his flesh you are simply able to extract what remains.

There is no doubt that a better quality of blood is made from a vegetarian than from a meat diet. There is less danger of overeating. Many say that the average vegetarian does not seem as vigorous as the meat eater, and there is a certain degree of truth in this claim, but it must be remembered that vegetarians are not stimulated up to the highest point as meat eaters usually are. Furthermore, meat-eaters are more often addicted to the use of alcohol than are vegetarians. This naturally adds more flesh, and gives them a more vigorous appearance in the eyes of those who are unfamiliar with the natural signs of health. Fat is not health. Bloated red cheeks are not by any means a sign of health. They are a sign of disease and such a person is just "ripe" for the first microbe that happens to come his way.

Then again, many vegetarians are poorly nourished. They do not eat the proper foods. They eat too much white bread and other foods that do not contain the necessary elements to feed the body in proper proportion. Many vegetarians also eat too frequently, do not fast when nature commands, and they suffer from overcrowding their digestive organs, just as does the meat eater.

Vegetarianism is unquestionably the natural diet of man. He will attain a more mature age when subsisting on this character of food than when on flesh diet. When the fact is considered that nearly all of our own medium class farmers are practically vegetarians, not from choice, but because of their inability to get fresh meat, there remains but little to support the flesh-diet theory.

Attention is often called to the British as the meat-eating nation, and even there the poorer classes of England, Ireland and Scotland, which really furnish the vigor upon which is founded the brains of the country, are nourished almost entirely on vegetarian diet. Like our own middle-class farmers they can not afford meat more than once or twice each week, and sometimes not even so frequently. No serious objection can be made to eggs and milk if they seem to be properly digested, though in the strictest sense they are not really a part of vegetarian diet.

Each individual should study out his own salvation. Find the diet that seems to furnish the most energy and then adhere to it until you have good reason to change. If this suggestion is followed, sufficient care is maintained not to overeat, regular exercise is taken and if an occasional fast of a day or two is practiced when necessary, there will be but little deviation from that high degree of health which fills life with such vast possibilities.

CHAPTER XI.

RAW DIET.

From a theoretical standpoint it is easy to reason to the conclusion that a raw diet—grains, vegetables, fruits and nuts—should be the natural food of man. One can easily imagine how the first man to discover fire found comfort in basking in its warmth, and how natural it would be under these circumstances for him to also first warm any food that he might wish to eat.

Thus it is not at all difficult to find the origin of cooking, for, from warming to cooking food is but a step. Although from a theoretical standpoint raw food seems to have been intended by nature as the best for all animal kind, human and otherwise, the fact that we have for many generations subsisted almost entirely on cooked food must be considered. Although many experiments are recorded where a raw-food diet has been followed with advantage, there is not a large amount of satisfactory information to be obtained on the subject. It appears that those who have adopted a diet of this character were usually in bad health, and naturally not a great amount of confidence is created unless one can point to a vigorous example of the results of following a particular diet. Recently, however, there has been more interest in the subject, and I am personally carrying on some experiments that will no doubt enable me to say something of value along this line in the next edition of this book. This much has been conclusively proven, namely that diseased conditions of all kinds will disappear more rapidly under the influence of a properly arranged raw diet than with a cooked diet. A raw diet contains of course, all the waste that is so advantageous in keeping the bowels regular, while most cooked foods are sadly lacking in this regard. One enthusiast on a raw diet, who claims to have cured himself of serious physical weakness by adopting this diet, states that cooking destroys the life germs of all grains, and that in eating such food we lose just that much. In other words he maintains that if the food is eaten raw one will absorb this life germ, that it will add just that much to life, and strength, and the theory undoubtedly sounds quite plausible. I have done some experimenting with a raw diet and the results have been of a character to encourage me to desire to do more. But enthusiastic readers are warned to use great care in any experiments they may attempt. Do not go to extremes. In any radical change that you may contemplate making in your diet you should feel your way step by step. All the raw-food enthusiasts claim that there is not the slightest danger of overeating when following this natural diet, that it does away entirely with the desire for a stimulant of any kind.

There is, however, much to be learned along this line and it would be well for those inclined to be reckless to await the results of the experiments of those who have given the subject careful study before seriously considering the advisability of giving such a diet a trial. An experiment made by the U. S. Agricultural Department has clearly shown that cooking tends to decrease the digestibility of foods in the case of animals. Though it will naturally be argued that this proves little or nothing as to the value of cooking foods intended for the human stomach, because of our having been accustomed to cooked food for generations; still, it shows quite clearly that there is reason to believe that prolonged experimenting with raw-food diet for human beings may reveal some valuable information.

I quote the following from the U. S. Department of Agriculture's Bulletin No. 22:

"Ladd, while connected with the New York State Station, reported analyses of cooked and uncooked clover hay and corn-meal and determination of digestibility of the same. These showed that the percentage of albuminoids and fat and the relative digestibility of the albuminoids were more or less diminished by cooking. The experiments made by our experiment stations in preparing food have been mostly with pigs. At least thirteen separate series of experiments in different parts of this country have been reported on the value of cooking or steaming food for pigs. In these cooked or steamed barley-meal, corn-meal and shorts; whole corn; potatoes, and a mixture of peas, barley, and rye have been compared with the same food uncooked (usually dry). In ten of these trials there has not only been no gain from cooking, but there has been a positive loss, *i. e.,* the amount of food required to produce a pound of gain was larger when the food was cooked than when it was fed raw, and in some cases the difference has been considerable."

Prof. Byron Tyler has some interesting theories about raw food which I quote herewith:—

"All disease is the result of disobedience of Nature's laws. It is a crime against Nature to eat the food she provides in any other condition than that in which she provides them. Nature does not err.

"No one can improve upon Nature, yet that's what man attempts to do when he subjects his food to the heat of fire, destroying its vitality and changing its chemical constituents. The product of mother earth, given us for sustenance, are uncooked save by the heat of the sun—the source of all energy.

"The sun is productive of life. Fire is destructive of life.

"Cooking destroys the life cells in food —the cells which make and sustain life in man. Cook a seed thoroughly and see whether it will sprout when planted. Or graft a dead cutting to a live limb and see whether it will grow or whether it will help the growth of the live branch. All live vegetation is capable of either reproducing its own kind or of furnishing life or vitality to other organized living things; take away its life and it can do neither. Life cannot come from death.

"The man who eats cooked food subsists upon the few cells which escape destruction by fire. He is obliged, therefore, to take large quantities of food to secure the required amount of nourishment. He is surfeited with material which his system cannot appropriate—dead matter which must be gotten rid of. The system cannot expel this waste material fast enough, and much of it ferments or decays in the stomach or intestines, furnishing food for the germs and bacilli which daily enter the system.

"The raw-food diet prolongs life. Uric

acid is now recognized as one of the chief causes of old age. This poison is present to a greater or less extent in all persons who eat devitalized food, and the accumulation increases with the age of such persons. Another cause of sensibility is the presence of an oversupply of earthy salts or mineral matter in the blood and bones, this is also being produced by the eating of emasculated or lifeless food. These foreign substances ossify the bones and obstruct the blood-vessels, interfering with the exercise of vital functions and diminishing the vitality more and more.

"By natural dieting these calcareous deposits, uric acid and other poisons, are absorbed or dissolved and eliminated, and their further accumulation prevented. Thus juvenility is retained and 'old age' warded off."

CHAPTER XII.

COOKING OF FOODS.

To give any comprehensive information of value in reference to cooking would require a book in itself. But, I would like to call attention to the usual inclination to cook every article of food until a large portion of its nourishing, life-giving qualities are actually deorganized and destroyed. Now, no deorganized element can be used as a food. All foods for men and animals must come from either animal or vegetable life. For instance, a grain of wheat furnishes all the elements necessary to feed the body. A chemist may mix the exact chemical elements, in the same proportion, contained in this grain of wheat, but his mixture would be valueless as food.

Excessive cooking, also, so softens the food that it is swallowed without mastication, and the injurious effects of such a practice has been described at length in a previous chapter. A food should be cooked only so long as is necessary to bring out its richest flavor. It should never be allowed to assume the consistency of mush. Foods of this character are of little value to nourish the body, as they are hurriedly bolted, and but a small proportion is ever taken up by the absorbent glands as it passes through the alimentary canal. I am aware that almost every one desires his food so tender that it will "melt in his mouth," but, unfortunately for those who always insist on eating such mushy foods, teeth were made to use, and not only does the retainment of teeth depend upon the amount of service they get, but the general health depends almost to an equal extent, upon their use. Bad teeth—bad health. They are nearly always companions. Use your teeth properly and you preserve not only the teeth, but the body as well.

There is but little, if any, danger in eating foods not sufficiently cooked, provided the necessity for thorough mastication is not overlooked. For, mastication, if sufficiently prolonged, can actually be made to take the place of cooking. The changes that take place in food during the process of prolonged mastication are very similar to those brought about by cooking.

Another grave fault in cooking is the habit of boiling out all the flavor of vegetables in the process. When cooking vegetables only use sufficient water to avoid burning; never so much that it will be necessary to pour off a quantity when the food is ready to serve. With this water that is poured off, usually goes not only the best flavor of the food, but the vegetable salts also. These saline elements that are a part of all vegetable life, as usually absorbed, or dissolved in this liquid, and a much larger quantity of mineral salts—which many hygienists claim cannot become a part of the body,—are required to give the food the proper flavor.

Fried foods, too, are almost universally condemned by hygienic experts, and though the theory on which they base their conclusions appears sound, I have never in my experience found that wholesome foods, when fried, were any more difficult to digest than when cooked in other ways. Of course, batter-cakes, and foods of that character, are not fit for food, and even a dog would not eat them, if made with white flour, as is usual. Batter-cakes can, however, be made from graham or whole wheat flour, and such are quite satisfactory as food.

High seasoning, and elaborate combinations of food are to be condemned. Every means should be adopted to bring out the natural flavor of the food, but it is not at all infrequent to find different articles of food so disguised by seasoning that its character is difficult to determine. Such a practice is, of course, injurious; for, as mentioned in a previous chapter, the appetite cannot be depended upon to indicate the proper quantity, when benumbed by pepper and other stimulating seasoning.

The importance of good cooking can hardly be overestimated, and it is usually considered of about the least importance of anything in life; for, it is often left to the ignorant and unskilful servants, who no doubt swell the income of medical men quite materially by the influence of their dishes upon the household.

Dr. Kellogg states that a poor cook in a family is a worse enemy to the health, the comfort, and even the morals of the household, than would be a swamp generating malaria a half-mile away, a cesspool fever-nest at the back door, small-pox across the street, or a Chinese Joss house in the next block.

CHAPTER XIII.

HEALTH FOODS.

There are numerous preparations on the market that are advertised as health foods, and claims of the most extravagant character in reference to their nourishing, strength-giving qualities, are made by many of their manufacturers. Undoubtedly some of these foods deserve commendation, but according to the statements of the manufacturers, the principal value of the great majority lies in the ease with which they may be digested. They claim that the process of preparing these foods has done a part of the work of digestion, that the nourishment which they contain is more easily appropriated by the absorbent glands because of these special preparations.

The various organs of digestion were made to perform their particular office, and digestion can no more be strengthened by these so-called "health foods," that are usually cooked until a large part of the life-giving qualities are destroyed, than a weak arm can be strengthened by carefully avoiding every opportunity to use it. As a rule the less preparation that these foods have undergone the better they are as foods. In fact, if you were to take the whole grain of most any one of the cereals such as wheat, corn, rye, oats, etc., and grind into a flour for bread or break up like cracked wheat for a breakfast food, they would be far superior to the average "health food" in nourishing and general strengthening qualities. Man may try ever so hard to improve upon Nature, but there is where his efforts will always be marked by failure. The more simple the method in preparing food, the more valuable it will be as food. Of course, simple food of this character is not as appetizing when first placed in the mouth, as when highly seasoned, or put through a prolonged cooking process; but, if mastication is properly done,—that is, continued for a sufficient length of time,—the delicacy of the flavor at the conclusion of mastication, when the food is ready to swallow, will be far superior to that which can be obtained from the same food by high seasoning or prolonged cooking. Furthermore, such a condition of the appetite where it depends upon this character of food is not normal, and it cannot always be depended upon to indicate when sufficient has been eaten. At any rate, the degree of enjoyment that can be secured from any food substance depends altogether upon comparison, and upon how hungry one may be. You may sit down to the most sumptuous meal that ever man tasted, and it will not be enjoyed if the appetite is lacking, but if sufficiently hungry a meal of raw turnips would taste like "food for the gods."

There are some digestive ailments where these partly digested "health foods" may be of value as a temporary aid, but they should never be depended upon as a permanent diet. Where this is done the result in nearly every case will be far from satisfactory. If the stomach is weak and unable to digest more hardy foods, let it rest for a time and it will soon accumulate enough strength to digest whatever is needed to nourish the body. The only true health foods are those furnished by Nature, and if you adhere to them in all their natural simplicity, and refrain from eating beyond your power to digest, there will be no occasion for any one to search for other means of nourishment.

CHAPTER XIV.

FOOD AND OCCUPATION.

Food is used to repair the waste and worn-out elements of the body. The occupation to a very great extent influences the character of these needed elements, and though the food we eat should be determined first by the normal appetite, a diet rich in the elements mostly needed to perform the daily work should always be supplied. One who works hard at manual labor all day will require far more of the muscle-making, and also of the heating foods than a brain worker. The heating foods are the source of all power in the body, just the same as fire is the source of power in an engine, and the nitrogenous, muscle-making foods repair the waste of the muscles which furnish the means by which these heating foods produce their results. Neither would be capable of accomplishing anything without the aid of the other, no more than would an engine if not influenced by heat under its boiler. One would starve to death with just as much certainty and just as speedily, and in some cases more speedily, if furnished exclusively with foods containing only one of these elements, as he would if totally fasting.

If no food is taken, the body feeds upon itself until the skeleton condition is produced and the elements are supplied in proper proportion, but Nature has made no provision for properly nourishing a body fed on a partial food, for the reason that there are no partial foods in Nature. Partial foods are all man-made. Though the chemical constituents of foods furnished by Nature vary quite widely, there are none that do not contain a certain amount of every necessary element, enough at least to sustain life if such a necessity occurred. If being fed on a partial food the body does not seem able to find within itself the element not furnished in the food, and in many cases under such conditions death would ensue as quickly as when totally fasting.

One eminent authority maintains that a

brain worker needs more food than the muscle worker or manual laborer. Such conclusions would be difficult to verify. It is well known that laborers eat and can digest far more than the brain worker, and in consideration of the fact that a manual worker keeps in active use the three-fourths of his body represented by his muscular system, while the brain worker uses only that small portion represented by his brains, it is difficult to see how the brain worker would call for as much energy or break down as much tissue as the muscle worker.

The brain worker's principal needs are fattening foods to keep up the heat of the body, and to furnish the needed mental energy, and muscle-making nitrogenous foods to repair or replace the worn-out brain cells and furnish the digestive fluid. The manual worker's principal needs are fattening foods to maintain the heat of the body and to furnish the needed muscular energy, and a large amount of muscle-making foods to repair the waste of the active muscular system and to furnish the digestive fluids. Therefore it can be readily seen that the manual worker's food should contain a larger percentage of muscle-making foods than that of the brain worker, and as he is undoubtedly exerting more energy than the brain worker he consequently requires a larger supply of fattening foods though the appetite is the only guide as to quantity. In fact the appetite of both the brain and manual worker, if made normal, will always clearly indicate which foods are mostly needed to nourish the body.

It is the deficiency of certain elements in the fluids of the body that creates an appetite and the foods that supply these elements the most liberally are naturally enjoyed the most, if the normal appetite has not been dulled by poisonous liquors or gourmandizing.

Such foods as peas, beans, lentils and lean meats should furnish the muscle worker with the elements needed to nourish his body and repair the waste. While rice, potatoes, whole wheat bread and foods of like nature would be more applicable to the brain worker's needs.

Though a long list of tables might easily be used here to illustrate quality and character of foods needed by different individuals under different circumstances, they would be of but slight and perhaps of no value to the average reader in determining his own daily needs.

As stated before, in a previous chapter, food is of no value, regardless of how nourishing it may be, unless it can be eaten with appetite. Therefore the normal appetite is the guide that can be depended upon in all the varying conditions, both as to elements and as to the quantity needed.

Each reader should carefully study the chemical analysis of various foods and should see that his table is supplied with a variety of those foods which he likes and which contain a liberal supply of the elements that are needed to nourish his body. If this duty is performed his appetite "will do the rest." He can then simply eat what he likes best, and can eat until this appetite is satisfied—not all he can.

If the appetite is not normal, if it does not dictate clearly as to character and quality of food needed, there is but one remedy and that is to fast until it designates by an unmistakable desire just exactly what is needed. That is the only infallible means of developing a normal appetite, and after having taken the trouble to develop this normal appetite, you should keep it normal by abstaining from liquors and other stimulants, and also avoid overeating, or eating without appetite as you would a poison.

Chapter XV.

Food and Temperature.

The needs of the body vary greatly in different temperatures. In the far north all carbonaceous foods, fats, etc., are greatly relished, while in torrid countries, fruits, vegetables, and lighter foods are more in demand. The most delectable morsel to a young Esquimaux is an ordinary tallow candle. He will eat it with joy the most intense. It is to him like candy to the ordinary child. This difference in taste is simply evidence of the varying needs of the body under different climatic conditions. Inhabitants of cold countries need large quantities of fattening foods to maintain the heat of the body; while in the torrid zone, where the temperature of the air is nearly equal to the temperature of the body, the only use for fattening foods is to supply the energy that may be needed in play or work. It would be well, therefore, for

14

those who reside in the temperate zones, where the temperatures of the different seasons vary sometimes more than a hundred degrees Fahrenheit, to give some attention to the necessity for changing the diet with the different seasons.

Many apparently intelligent persons eat exactly the same articles of diet throughout the entire year. The necessity for changing with temperature never seems to be fully realized. Of course, where there is always a large variety of foods to choose from, no particular suffering is entailed if the appetite is entirely normal, but if the needs of the body, required in the different seasons, were understood and supplied, excessive cold or excessive warmth would produce no discomfort worthy of notice.

Not so much suffering is entailed in winter because of this ignorance as in summer. During cold weather, if one is exposed to the cold, very much, the appetite simply demands more carbonaceous foods, and more is eaten. But during the intense heat of the summer, the appetite invariably falls far below par, and the average person sees in this a sign of coming weakness; and, instead of obeying the plain dictates of instinct, he or she usually searches for some means of goading the appetite up to the usual demands, and vastly increases the suffering, not only from the heat, but often from other troubles more serious, all caused by this extra nourishment that the digestive organs cannot properly appropriate.

The diet in warm weather should always be extremely light, unless one is performing hard manual work. It should consist mostly of breads, salads, vegetables and fruit. It would be far better to avoid meat, though the lighter meats, such as chicken and fish, are not so objectionable as beef, mutton, etc. One full meal each day should be sufficient for summer, at least, though if it is impossible to confine yourself to this, let the other meal or meals consist of light lunches, and the lighter the better.

The importance of retaining the keenness and acuteness of taste is nowhere more fittingly emphasized than by the fickleness of the appetite as influenced by temperature. The needs of the body are plainly indicated by this sense, and if it is acquired and retained in all its delicacy and acuteness, the food mostly needed in all conditions of heat or cold will be plainly indicated.

Meats and all food rich in fats and starch can be more easily assimilated in the winter than during the summer. There is not only an increased demand for fattening foods to furnish heat for the body, but usually one expends more energy, and this consumes increased quantities of these same food elements, and, in addition, requires an increase in the elements that supply the waste of the muscular tissue.

Chapter XVI.

Alcoholic Liquors.

Alcohol in any form is not allowable if the diet is to be confined to those foods that build strength. It may stimulate, and does, unquestionably, at times buoy one with a feeling of false strength, but true strength and endurance—the power to continue on and on for any length of time—can never be gained unless alcoholic liquors be avoided absolutely. On one occasion I heard the following excuse for the use of alcohol: "For a number of years I was a sufferer from digestive troubles. I tried everything without benefit. I was in misery half the time. Finally I was advised to make a habit of drinking beer or wine at my meals, and whenever I had that uncomfortable feeling in the region of the stomach I followed this advice and it cured me of my troubles." This man was plainly suffering from overeating. His digestive organs were continually called upon to work beyond their need or capacity. The use of alcoholic drinks under such circumstances will remedy such troubles temporarily for the organs make every possible effort to rid themselves of alcohol immediately upon its introduction into the stomach, and the undigested food that may be there is naturally hurried along because of these extraordinary efforts. If one cannot restrain his appetite, if he will persist in eating more than his stomach can digest, it is really a question whether he is not the gainer for the time being by moderate indulgence in mild alcoholic stimulation to help force the food along, for overeating is by far the greater sin of the two: it kills twenty-five where alcohol kills one person, and its victims can be found in every household.

"The aristocratic toper, who wishes to give an air of respectability to his vice, will claim that alcohol is a food. He will cite, in proof, instances in which persons have lived for weeks by the aid of no other nutriment, taking nothing but alcohol and water. This semblance of argument scarcely needs exposure; for the most that can be claimed is that it proves merely that persons have lived several weeks while taking only alcohol and water. The fact that individuals have in several instances been known to live from thirty to sixty days while taking only water, shows conclusively that those persons who lived a shorter time on brandy and water lived in spite of the alcohol, instead of by the aid of it. A conclusive evidence that alcohol is not a food is found in the fact that when taken into the system it undergoes no change. It is alcohol in the brain, in the liver, in all the tissues, and alcohol in the breath, in the perspiration, and in all the excretions. In short, alcohol is not used in the body, but leaves it, as it enters, a rank poison. I can no more accept them as food than I can chloroform or ether. In experiments made by the writer and reported in a paper read before the American Medical Temperance Association, it was shown that the total strength of a healthy young man was diminished 33 1-3 per cent. as the result of taking four ounces of whisky. The total falling off was diminished in a notable degree. It was noticed that the loss of strength in the legs was much greater in proportion than in other parts of the body."—*J. H. Kellogg, M.D.*

I have never during my entire life had an occasion to use alcohol, and I never expect to have. It is a stimulant and a poison. No one can gain permanent strength from it. It retards the elimination of waste matter from the body, and the tissues are often filled with impurities that are liable at any time to become manifested in some virulent disease.

Dr. Richardson says: "It is assumed by most persons that alcohol gives strength, and we hear feeble persons saying daily that they are being 'kept up by stimulants.' This means actually that they are being kept down; but the sensation they derive from the immediate action of the stimulant deceives them and leads them to atribute passing good to what, in the large majority of cases, is persistent evil. The evidence is all perfect that alcohol gives no potential power to brain or muscle. During the first stage of its action it may enable a wearied or feeble organism to do brisk work for a short time; it may make the mind briefly brilliant; it may excite muscles to quick action; but, it does nothing substantially, and fills up nothing it has destroyed, as it leads to destruction. A fire makes a brilliant sight, but leaves a desolation. It is the same with alcohol."

It dulls the keen sensitiveness of the nervous system. The statement is often made that alcohol brings out a man's animal nature, but they really mean that it brings out all his lowest tendencies, for no lower animal under any circumstances, could become so depraved as one who is under the influence of the poison. A reeling, drunken fool is about the most disgusting object that the human mind can possibly conceive. A hog becomes a decent, clean animal when compared to such vile specimens of humanity.

Prof. Janeway, M.D., professor of materia medica in Bellevue Medical College, stated in a lecture before his class that alcohol does not assist those who use it to endure cold. In proof of the assertion, he related the following incident, which was given to him by the first gentleman mentioned in the account: "A gentleman was appointed by the government to go on a survey in the Eastern States in the depth of a severe winter. He chose for his assistants men who were total abstainers. At the same time, another party set out upon the same business, the members of which were addicted to the use of whisky. Only one of the first party gave out, while nearly every one of the whisky drinkers succumbed to the influence of cold."

Every human being admires strength and desires to acquire all he can, and when this one fact is considered it becomes extremely difficult to understand how any one can continue to burn out his internal organs with these liquid poisons. It has been proven conclusively again and again that alcohol of all kinds lessens the muscular vigor. Did you ever hear of an athlete training for a contest with alcohol of any kind as a part of his diet? Even the most ignorant know enough to avoid it absolutely when they desire to obtain the highest degree of physical health. A man who drinks liquors is only a part of man. He goes through the world not only with his brain clouded and benumbed, but his every physical function is weakened and blunted. He misses entirely the complete powers that might easily have been possessed.

"Close upon the derangement of the stomach, which is certain to come sooner or later with all drinkers, follows nearly every other functional disease possible to the human system. Every organ is disturbed. The whole vital machinery is deranged. Strange noises are heard in the head occasioned by the rushing of the hot torrent of poisoned blood through the distended blood-vessels of the head, which pass near the ear. Black spots and cobweb appearances annoy the sight. Alcoholic amaurosis or amblyopia comes on, and sight becomes impaired; sometimes blindness follows. The dilated blood-vessels of the skin become permanently enlarged, especially in the face and nose, and the drinker gets a rum blossom. Skin diseases of various sorts are likely to appear, particularly eczema of the fingers or toes, or on the shins. An unquenchable thirst seems to be ever consuming the blood, and nothing but alcohol will even temporarily assuage the desire for drink. Notwithstanding, large quantities of fluids will be taken, often amounting to several quarts a day, which overwork the excreting organs. The liver and kidneys are disturbed in their function, one day being almost totally inactive through congestion, and the next rallying to their work and doing double duty. Every organ feels the effect of the abuse through indulgence in alcohol, and no function, through long continuance of the disturbance, induces tissue change. The imperfectly repaired organs suffer more and more in structure until the most extensive and disastrous changes have taken place. Dr. Willard Parker of New York shows from statistics that for every ten temperate persons who die between the ages of twenty-one and thirty, fifty-one intemperate persons die. Notwithstanding the constant protest of both moderate and immoderate drinkers that alcohol does not harm them, that it is a necessary stimulus, a preventive of fevers, colds, consumption, etc., and the assertion of certain scientists that it is a conservative agent, preventing waste and so prolonging life, the distinguished English actuary, Mr.

Neison, has shown from statistical data which cannot be controverted, that while the temperate man has at twenty years of age an average chance of living forty-four and one-fifth years, the drinking man has a prospect of only fifteen and one-half years of life. At thirty years of age the temperate man may expect to live thirty-six and one-half years, while the dram-drinker will be pretty certain to die in less than fourteen years.

James Miller, in his work on Alcohol, says that it is to the working human frame as a pin to the wick of an oil lamp. With this you raise the wick from time to time, and each raising may be followed by a burst of brighter flame; but, while you give neither cotton nor oil, the existing supply of both is, through such pin-work, all the more speedily consumed.

Although you can point to men who have made a success of life notwithstanding their regular indulgence in the liquor habit, such men could have risen to far greater height, could have accomplished far more, had they not been handicapped by such false stimulation.

And you can also point to men who can only do their best, most brilliant work when partly under the influence of a stimulant, but this only proves how much the habit has enslaved them. The same inspiration, made many times more keen and clear, could be produced by normal conditions, by creating that feeling of superb health which awakes every nerve to the full realization of the joy of life and health.

CHAPTER XVII.

THE WHITE-BREAD CURSE.

White bread, the American "staff of life," is the greatest humbug ever foisted upon a civilized people. "Staff of life," indeed! Why, it is more like a staff of death. It is composed largely of the starchy part of the wheat. It is greatly deficient in the constituents essential in feeding the muscles, brain and bones. A large part of these valuable food elements have been removed, with the bran and shorts. But, astounding as it may seem to a reasoning human being, this article of food is consumed from one end of the country to the other, and everywhere is looked upon as "the staff of life."

"What, in heaven's name, are our public schools for? There is, absolutely, no excuse for such depraved ignorance. All scientific investigators agree as to the inferiority of white flour as a food. The teeth fall out, the bones soften and the muscles never develop if it is depended upon to furnish nourishment for the body.

"The gluten of cereal foods is their nitrogenized element, the element on which depends their life-sustaining value, and this element is, in the white and *foolishly fashionable flour,* almost entirely removed, while the starch, the inferior element, is left behind and constitutes the entire bulk and inferior nutriment of such flours. To use flour from which the gluten has been removed, is *almost criminal."—Dr. Cutter of Harvard University in the American Medical Weekly.*

No wonder some children never grow, and are always sick and weak! When fed on such a starvation diet as this nothing else could be expected.

The use of this one article of diet has caused thousands to suffer with digestive troubles. It is especially favorable to constipation, and is frequently the sole cause of this annoying trouble.

A grain of wheat contains the elements necessary to feed the body, in almost perfect proportions, and if food were made of whole-wheat flour the body would be perfectly nourished in every part.

Every man who knows anything of foods and their properties is fully aware of these facts, and why medical men everywhere ignore them in advising their patients is beyond the comprehension of the writer.

Not long ago, an experiment was made with dogs. Some were fed on white bread, others on Graham or entire wheat bread, and still others were given nothing to eat. The dogs that were allowed no food lived about as long as those fed on white bread, while those fed on the entire wheat bread thrived, and were apparently able to maintain life until the end of its natural term. This proves beyond question that whoever is striving to subsist on white bread is starving a part of his body with almost as much certainty as if he were eating nothing at all, and that he will actually die about as soon as if fasting.

It is generally admitted by authorities that the outside covering of the wheat grain which is removed in the refining process of making flour contains, in addition to its valuable nitrogenous elements (muscle-builders), a large amount of waste matter which is of great value, not only in adding bulk to the food, but in assisting the peristaltic action of the bowels. Most persons suffering from constipation find that the trouble immediately disappears when entire wheat bread is substituted for white bread.

The most ignorant athlete usually has intelligence enough to know that white bread is an inferior food, that it will not furnish the elements in propor proportion to feed the body, and any one who has trained or who has followed an occupation requiring great muscular activity, and has had an opportunity to test white flour as a food in comparison with whole or entire wheat, will also immediately indorse this conclusion.

"Superfine flour is distinctly a modern invention. The ancients used unbolted meal altogether, the present disease-producing devices known as bolting machines being then not in use. Indeed, many nations at the present day, as the Germans, Scandinavians, and, in fact, most nations with the exception of the French, English, and American nations, still adhere substantially to the ancient custom in this regard. No doubt the hardihood of the native German peasant is in great part justly attributable to the highly nourishing qualities of his 'Black bread.' "—*J. H. Kellogg, M.D.*

I will never forget the first time in my life that occasion occurred to prove to my own satisfaction by actual personal tests the great inferiority of white-flour bread as a food. When quite young I concluded that life on a farm would strengthen my then greatly weakened body, and I visited a farming section in one of the Western States, and secured a "job" as a farm hand, or rather farmer's boy, as I was not considered equal in strength to be a full-fledged "hand."

Now, in this particular section the previous generation had been mostly "raised" on corn bread and bacon, and they felt somewhat above such a rough fare, so the ignoramuses substituted white for the corn bread. I had a little knowledge of food values, even at that early age, and if milk had not been plentifully supplied, am satisfied that I could not have subsisted on the food furnished. But during this particular time I had the opportunity, far from pleasant, I can assure the reader, of seeing and feeling my muscular strength increase and decrease, as influenced by the diet. As I came there for the particular purpose of acquiring strength, I had naturally formed a habit of almost daily testing my strength in various ways.

About once or twice each week, at the noon meal, they would have baked beans and corn bread, and within an hour after such a meal, following several days wherein white bread was the principal article of diet, I would actually be a third stronger. Not only was I greatly increased in strength, as I found by actual tests, but my energies seemed to vastly increase. While compelled to subsist mostly on the white-bread diet I dragged through my work, —felt listless and half ill all the time. But one meal that contained Nature's true nourishment transformed me into a new being.

Of course, where fresh meats are furnished with white bread, its deficiency is not so greatly noticed, as the meats, to a certain extent, supply the elements that the white bread lacks.

But the most astonishing and incontrovertible proof of the terrible deficiency of white bread as a food was startlingly illustrated by those very people in that section. A poorer lot of men, physically, I never saw before nor since. They had no stamina, vigor, or beauty of body. And the women! Why, at 25 they would begin to fade; at 30 they were old. Before 30 a majority of them had to be supplied with false teeth.

And why?

They were practically living an ideal life, in pure air, with plenty of exercise, and the natural conditions were in every way such that they should have produced the highest types of manhood and womanhood, physically.

The cause of their utter physical ugliness, weakness and general inferiority was unquestionably due largely to the diet of white bread, and at this present moment I believe that white bread, in many parts of this country, is actually starving people to death wholesale. They are eating plentifully, but the tissues necessary to the performance of the vital functions are being slowly starved.

Remember that muscular power is not used solely for locomotion and movements that require the use of hands, arms, and upper parts of the outer muscular system. It is required in every digestive and vital action of the body. The heart is a muscular organ. The stomach is surrounded by muscles that help in the process of digestion. Muscular power is necessary even to turn your eyes; therefore when you starve your muscles by a white-bread diet, every organ or function of the entire body suffers in consequence and it would also be well not to forget that the same food elements which nourish the muscles also constitute the principal part of all the important digestive juices.

The chemical analyses of all foods differ so much that it is difficult to form conclusions accurately in every detail. In order for my readers to see clearly the difference in the analysis of whole wheat and the ordinary white flour, I quote from Dr. Holbrook who gives Blythe's authority for table of analyses showing the difference. It would be well to call the attention to the great difference in the muscle-making elements contained in different kinds of wheat and in wheat grown in different parts of the country. This varies from about ten to twenty-one per cent. I have taken for granted that the whole-wheat flour, which has been here analyzed and compared with the white flour, has been made from the same kind of wheat.

Chemical analysis of whole wheat flour and white flour is as follows:

	Entire Grain Whole Wheat Flour.	Ordinary White Flour.
Water	14.0	16.5
Nitrogenous elements feeding muscles and brain, and furnish digestive juices	21.8	12.0
Fattening, heating and energy producers	60.9	70.8
Woody fibers—waste necessary to assist in digestion	1.7	....
Mineral water	1.6	0.7

CHAPTER XVIII.

ELEMENTS OF FOOD.

The body, as the reader is no doubt aware, is composed of various elements, the exact proportion of which cannot be determined save by a chemical analysis. The bones are composed of lime and other mineral matter; the muscles and brain are composed of nitrogenous elements, while the fat, which is distributed everywhere throughout the body, is composed of elements carbonaceous in nature. Thus the necessity for supplying the exact elements in proper proportion to nourish the body can readily be realized. Here is where the importance of a normal appetite—natural taste—is most thoroughly emphasized. That food which is enjoyed the most keenly by taste is the most needed and, naturally, the most healthful. The sense of taste is located at the extreme end of the tongue and in the back part of the mouth. It is produced by the absorption of the food elements that are being masticated. The faster absorption takes place, provided the food is wholesome and nourishing, the more acute is the enjoyment of taste. Absorption is influenced entirely by the condition of the body. When any element or elements are particularly needed by the body, the blood is naturally deficient in those elements; and those parts of the body—the tip of the tongue and back part of the mouth—which produce taste—are naturally able to absorb those particular elements needed more quickly than other elements, and the result is we always, if in possession of a normal appetite, enjoy eating those foods most keenly which are the most needed. It will be readily noted, therefore, that if your table is supplied with the proper variety of food, containing the various elements necessary for feeding the body, taste will indicate which food element is most needed, by selecting that which tastes most delicious. Taste cannot be relied on to do this, however, if the foods are so highly seasoned as to entirely destroy their original flavor. By studying the various chemical analyses of foods which follow you can secure a fair idea of the value of different foods, and thus be able to select those mostly needed in your own case, keeping in mind continually the dictates of taste in your selection, for, however poor it may be, it is usually far better than any other authority that could possibly be consulted.

I am aware that there are some foods that taste very good, but which nearly always produce baneful effects. They are exceptions to all rules, and where foods seem to disagree to such an extent they should of course be avoided. The manifestation of taste for such a food, however, is indubitable evidence that the food contains elements needed to nourish the body at that time, and other foods containing similar elements should be furnished.

Take the ravenous appetite for candy among some children, for instance. This appetite furnishes ample evidence that the body is not properly nourished in the force-producing and heating foods, and if such children were furnished at the table with a plentiful supply of foods, such as rice, oats (not oatmeal), and honey, served in palatable form, there would be but little desire for candy.

"Experiments upon both animals and human beings show that it is of great importance that the proportion of elements should be such as will best meet the demands of the system, especially in the case of the albuminous and carbonaceous elements (gluten, albumens, fats, starch, and sugar). Many and extended experiments and observations have shown that the proper proportion is about one part of nitrogenous or albuminous elements to seven parts of carbonaceous elements. From this it will at once appear that most articles of food are deficient in one or the other of these classes of elements, requiring that they be supplemented by other substances eaten with them.

"By means of numerous experiments, at the expense of numberless dogs, rabbits, pigeons, cats, and other animals, it has been clearly demonstrated that while the various elements mentioned are food elements, they are not in themselves food, either when taken alone or when artificially mixed. Dogs fed on albumen, fibrine, or gelatine—the constituents of muscle—died in about a month.

The same result followed when they were fed on the constituents of muscle artificially mixed. A goose fed on the white of egg died in twenty-six days. A duck fed on butter starved to death in three weeks, with the butter exuding from every part of its body, its feathers being saturated with fat. Dogs fed on oil, gum, and sugar, died in four to five weeks. A goose fed on gum died in sixteen days; one fed on sugar, in twenty-one days; two that had only starch lived twenty-four and twenty-seven days. Dogs fed on fine flour bread lived but fifty days."—*J. H. Kellogg, M.D.*

The analyses of the various food-products, which I have used, were taken from the bulletins of the U. S. Department of Agriculture.

CHAPTER XIX.

MUSCLE-MAKING ELEMENTS.

Similar elements to those of which the muscles are composed, also form the cells of the brain. Therefore the importance of nitrogenous elements in the food is not confined entirely to manual workers, or those desirous of building all the attainable muscular powers—it is of almost equal importance to the brain worker. All the broken down or decayed tissues in both brain and muscle must be replaced by these nitrogenous elements. A liberal supply of these elements is especially essential in building muscular tissue. No strength of importance can be developed unless the importance of this is recognized.

These nitrogenous elements also perform really the most important part in the vital economy. Though they do not furnish the force, they furnish the means through which the force is manifested. All the important fluids of the body are composed largely of nitrogenous elements. The saliva, gastric juice, and the bile, pancreatic and intestinal juices, which perform such important work in the digestive process, are composed mostly of nitrogenous elements.

"The experiments of Dr. Austin Flint upon the pedestrian Weston, as well as the experiments of Prof. Liebig, Subbotin, and many other distinguished physiologists, show very clearly that the nitrogenous elements are the chief supporters of vital activity, muscular and nervous effort, etc., and that food can only support vital action or give rise to force by being assimilated into living tissue."—*J. H. Kellogg, M.D.*

"The nerves, the muscles and the glands are composed of living matter or protoplasm, and cannot be built up, or the glands furnish their secretions without albuminous matter. Every structure in the body in which any form of force is manifested is mainly built up of these proteids. Muscular tissue is a good example the brain cells are also examples."—*Dr. M. L. Holbrook.*

The principal foods that are richest in

these valuable nitrogenous muscle-making elements are beans, peas, lentils, lean meat and eggs, though if wheat (the whole grain in bread or other food substances), oats and corn are also well supplied, one will not have starved muscles.

Although lean meats are especially rich in nitrogenous elements, they are not by any means essential in a muscle-building diet. The muscles can unquestionably be developed to their highest degree of perfection on a grain, fruit and vegetable diet, if the grain, so rich in these vital building elements, is furnished in palatable forms. Many vigorous farmers in our own country, and whole nations of people such as the Japanese and natives of India, exemplify the truth of this statement.

In the analyses which follow, to all nitrogenous elements I have added the word "muscle," though it would be well to note that all brain cells and important fluids of the body are composed largely of these elements. Do not make the mistake of believing that one can be made strong by merely eating muscle-making foods. The absorption of these muscle-making elements requires that a demand first be made for them by the use of the voluntary muscles, therefore if you wish to develop strength, you must first develop an appetite for strengthening foods by the vigorous use of your muscular system.

In order to emphasize the particular necessity for muscular vigor in the performance of the digestive processes, I would call your attention to some comments by a well known authority on the muscular processes of the organs of digestion:

"Muscular action masticates the food—by the aid of the passive accessory organs, the teeth—and mingles with it the saliva. Muscular contraction draws the alimentary bolus from the mouth down into the stomach. Here, by the action of the muscles, it is churned up with the gastric juice, and finally squeezed through the pylorus into the small intestine, where, by the aid of muscles, it is mixed with the bile and the pancreatic and intestinal juices, and is moved along, constantly coming in contact with fresh secreting and absorbing surfaces, until its digestion is complete. Even absorption is greatly aided by this muscular action, as the circulation in the absorbing parts is thereby quickened, so that larger quantities of fluid are taken up."—*J. H. Kellogg, M.D.*

Chapter XX.

Fattening Elements.

The carbonaceous foods furnish the elements that produce fat. The human body, and in fact, the bodies of all animals, are from one standpoint only storage batteries. In an electric battery the power stored is electricity. The element of power that can be stored in the body is fat. Fat is to an animal body, human or otherwise, what electricity is to a storage battery. It is a storage battery. It is nothing more than stored up power. A person overburdened with fat has no excuse for being hungry for foods of a fattening nature. In fact, it is really doubtful if he has any excuse for being hungry at all, for when a large amount of fat has accumulated, in nearly every case such a person could fast for several weeks with actual benefit to body and mind. The bear accumulates enough fat in the summer to enable him to go without food all winter, and any animal by acquiring similar fasting habits could perform similar feats of fasting.

All fattening foods produce energy and maintain the body at a proper temperature. Whenever these foods are supplied beyond the actual needs of the body, under perfectly normal conditions, a large amount of the surplus is deposited in the form of fat. A certain amount of fat is healthful and is useful to round out to greater symmetry all parts of the body, but when it is allowed to accumulate beyond this, it produces in time a weakened condition that causes the body to become easy prey for all sorts of diseases. Every effort of brain or muscle consumes a certain amount of fat in the blood.

Under the head of "Starch, Fat, Etc.," I have included with fat, all starch, sugar, and food elements of this character. As I consider that the fiber performs an important purpose in assisting towards the proper digestion of foods, I have given a little more importance to this particular element than have the Agriculture Department in the original analyses.

CHAPTER XXI.

MINERAL ELEMENTS.

The importance of mineral matter which has been vitalized by vegetable life, in our food, is about equal to the other elements.

"The principle was established long ago that animals cannot organize or vitalize matter, but simply possess the power to appropriate nourishment in the form of a substance which has already been vitalized by the vegetable kingdom."—*J. H. Kellogg, M.D.*

But a very small percentage of these elements are required, as will be noted by the analysis of wheat, the perfect food; but the effect of this small amount upon the human body seems to be of very great importance, as will be noted by a perusal of the following:

"Professor Forster of Munich has made a large number of experiments to discover the importance of mineral matter in our food. Two pigeons were taken for one experiment and fed on food containing every other requisite: albumen, carbohydrates, etc., but entirely freed from all mineral matter. These pigeons took their food regularly, but soon lost all liveliness and sat dumb and motionless on the bars of their cages. After the tenth day they ate but little and lost in flesh. On the twenty-fourth day one of them had a fit, and both refused to eat. He then fed them by compulsion. One died on the twenty-sixth day by a return of the fit, and the other lived on to the thirty-first day, when it also had a fit from which it did not recover. An examination of the bodies of the pigeons revealed no traces of any disturbance of digestion.

"He then took a dog and fed him in the same manner. He soon showed signs of weariness, lay sad and dull in his corner, had sudden fits as of madness, became weak and uncertain in his motions, trembled and showed signs of nervousness, became weaker and weaker till he could scarcely crawl, and still there was no disturbance in the digestion of his food.

"Another pigeon was taken and fed on food free from mineral matter by compulsion. It died in thirteen days, and yet an examination of its body showed that it had been well nourished and the organs were sound. The food had apparently been well digested. The absence of mineral matter had not prevented digestion until after several days, but had caused death. The animals had all shown muscular weakness and trembling, and in one case a sort of paralysis, as if the spinal cord and brain had been affected. The nervous system suffered most; indeed it was apparent that the nervous weakness was caused by the absence of mineral salts, and we must from this look on them as necessary to excite and enliven the brain and nerves, and especially promote nutrition and secretion. We know that living a long time on pickled meat, salt pork or corned beef causes a sort of scurvy which is only cured by the use of fresh vegetables and fruit. Now, the brine used to preserve the flesh dissolves a considerable part of the mineral constituents of the meat which the fresh vegetables replace.

"Dr. Forster's investigations gave one other result. He found that the animals fed by compulsion on food freed from its mineral matter died sooner than those not fed at all. The explanation he gives for this is, that if no food is given, the body is nourished on itself, and, consequently, a supply of mineral matter is obtained from the decomposed flesh of the body; but when nourished on food free from salts there is no demand from the body for albumen and carbohydrates, and so no mineral matter is received from its decomposition."—*Dr. M. L. Holbrook.*