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Boston : John P. Jewett, 1857.

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THE

LAWS OF HEALTH:

OR,

SEQUEL TO "THE HOUSE I LIVE IN."

BY
WILLIAM A. ALCOTT, M. D.

DESIGNED FOR FAMILIES AND SCHOOLS.

BOSTON:
PUBLISHED BY JOHN P. JEWETT AND COMPANY.
CLEVELAND, OHIO: H. P. B. JEWETT.
NEW YORK: SHELDON, BLAKEMAN AND COMPANY.
1857.

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PREFACE.

THE knowledge of ourselves, physically, until within a comparatively recent period, has been practically overlooked and neglected. But, during the last twenty-five years, a new era has dawned upon our race. Books of anatomy and physiology have been written for families and schools; and the study of "the house we live in" has become, at least in theory, the order of the day.

And yet, in the mean time, experience has shown that it is not anatomy, or the laws of structure, nor physiology, or the curious laws of living organs, which is so much needed by the mass of our citizens, as a knowledge of our relations to the things around us; or, in other words, HYGIENE. It is not so much a particular knowledge of bones, muscles, nerves, skin, etc., as an acquaintance with the laws by which these, and all other parts and organs of our bodies, perform their offices or functions, and a knowledge of the specific penalties which God, in his providence, has annexed to their violation.

Or, if a more thorough and scientific course is needed in some of our colleges and universities, it is only the practical part of the subject which is required by at least nine in ten of our citizens, such as we find them in our academies, public schools, and

families. But this practical knowledge is indispensable to all. The yearly public loss, in health and happiness, — nay, in virtue, too, — which our citizens sustain, for want of such information concerning themselves, is incalculable.

Now, although we have many excellent works of anatomy and physiology, accompanied with occasional and incidental remarks on Hygiene; yet, for this specific purpose, we have nothing which is happily adapted to the immediate wants of schools and families. At least, we have no work of Hygiene which is exactly suitable to be used as a class-book in the district schools. The object of this book is to fill the vacancy. It does, indeed, contain anatomy and physiology; but they are only introduced as a means of explanation, illustration, or argument. My aim is, to take men and women and children AS THEY ARE, and teach them, *first*, how to keep what health they already possess; and, *secondly*, how daily and hourly to manufacture more.

In regard to style and manner, it has been my object to make myself intelligible to every child of ten years of age. How well I have succeeded, they who have urged me to the prosecution and completion of such a work, and the public in general, must decide.

AUBURNDALE, MASS., October, 1856.

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THE

LAWS OF HEALTH.

CHAPTER I.—GROWTH AND RENOVATION.

SECTION I.—ANIMAL GROWTH IN GENERAL.

1. Burckhardt, a natural historian, in speaking of the distinctive attributes of the three great kingdoms of nature, thus remarks: "Stones grow; plants grow and live; animals grow, live, and feel." So general a truth requires a little elucidation.

2. How do stones, or mineral substances, grow? Not as plants, shrubs, or trees. Whenever they grow at all, it is by accretion. It is as if a new layer or coating were added to, or plastered on, to them. They grow, in general, very slowly.

3. Plants, or vegetables, enlarge in a different manner. They, as well as minerals, grow externally; or, at least, spread themselves outward and upward. It is, however, by an internal process. And they not only grow, but live. Some of them grow rapidly; others more slowly.

4. Animals, much more than plants, are developed from within. They are influenced by a power which we call vitality, or the vital force. Plants, it is true, possess vitality, to some extent; but they are neither so curious, nor so complicated in their structure, as animals. The latter, in their growth, expand from the centre towards the circumference, in a manner quite uniform—not unlike the swelling of a part, in the case of inflammation, or disease.

5. The duration of minerals appears to bear no certain or definite proportion to the time taken up in their enlargement, or growth. A stone, which is but five years in growing, may possibly last as long as one which was five thousand years in reaching its full size. Several substances, which belong to the mineral kingdom, may be formed by the chemist in the twinkling of an eye.

6. Nor are the growth and duration of plants and trees quite as well proportioned to each other as those of animals. The oak, or cedar, that attains its full size in fifty or a hundred years, may last a thousand; while the peach may not last as many years as were required to bring it to maturity.

7. But animals, as a general rule — to which I grant there are some exceptions — require about one-fourth or one-fifth as much time to reach maturity as that of their whole duration. In other words, the longer an animal is in reaching maturity, the greater will be its longevity.

8. Let us apply this rule to man — the nobler of the animals. In our climate he is, at present, about twenty-five years in reaching full physical maturity. He ought, therefore, to last from one hundred to one hundred and twenty-five years. If, however, he is hurried on to maturity by hot-house effort, at twenty or eighteen, we lessen his probable duration in about the same proportion.

9. On the other hand, if we can retard his forming stage, so that, in the progress of the coming generations, he may be thirty, or fifty, or a hundred years, in attaining to maturity, his natural duration, or limit of life, will be increased in nearly the same proportion. The antediluvians were longer than we are in reaching maturity.

SECTION II. — MAN CONTINUALLY DYING AND REVIVING.

10. It is said by Dr. Watts, the poet and philosopher, that

> "The moment we begin to live
> We all begin to die."

And there is a sense in which the saying is true. Particles of our bodies, both solid and fluid, begin to perish almost as soon as we are born. This must be so for two or three reasons.

11. (1) There is more or less of "wear and tear" in the living human body. We cannot have motion, such as the incessant internal changes of the body require, without friction. And, however admirably contrived the system may be to pre-

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QUESTIONS. — What has Burckhardt said? How do stones grow? How do plants? How animals? Is there any regular proportion, or agreement, between the period of time taken up in the growth of minerals and their duration? How is it in this respect with vegetables? How with animals? Is this rule particularly applicable to man? What would happen if we could retard our growth from infancy to manhood? Were the antediluvians as long in reaching maturity as we are?

vent the usual results of such attrition, or wearing, there must be more or fewer particles worn out and cast off as foreign matter.

12. (2) The new-born infant grows, if healthy, all the way from birth to maturity. Now, as growth is internal — as new material must be applied to the internal parts of the body — it follows, of necessity, that the old and smaller particles must get loose, and new and larger ones take their place.

13. (3) A single well-known process will illustrate this point. The adult has thirty-two teeth; the infant but twenty. Had the latter been furnished with thirty-two, they must have been very small, in proportion to the full-grown jaw and mouth. As it now is, the twenty teeth, when they begin to be too small, and to stand apart from each other, get loose and are removed; and we have a new set behind them, which, when fully grown, are sufficiently large to fill the whole space.

14. (4) Then we know, by experiments, that the body is continually dying and reviving; — even the bones. Animals have been fed on substances which colored the bones, such as madder; and, after a reasonable time, the color in the bones has disappeared. This is believed to establish the doctrine we are considering, with absolute certainty.

15. Let it then be regarded as an indisputable fact, that, from the time we are born till we die, whether we are sleeping or waking, sick or well, we are — as animal bodies — continually dying and reviving again. Whether this death and renovation by the moment, has any connection, by way of type or otherwise, with the great, or final resurrection, I do not undertake to determine.

SECTION III. — HOW THE DEAD PARTICLES OF OUR BODIES ARE REMOVED.

16. Some of our physiological writers, anxious, no doubt, to make a strong and permanent impression on the youthful mind, assure their readers that there are, in every part of the human system, an almost innumerable host of hungry animals, at every moment eating us up!

QUESTIONS. — What has Dr. Watts said? How is this true, physiologically? What is the first reason for believing this doctrine? What is the second? What illustration is presented? What is the third reason? In thus dying and reviving continually, does physiology point to the final resurrection of mankind?

17. Their meaning is as follows: A set of vessels, found in great numbers all over the body, have their mouths open on the internal surfaces of all the cavities, tubes and membranes, whether large or small, and are continually sucking up, or, as it were, swallowing every dead particle they can lay hold of. They are called absorbents.

18. What a wise provision this is, that, whenever a particle in our bodies is dead and can be of no service, but must otherwise act as foreign matter, and produce irritation, or perhaps putrify, and actually poison us, there is at hand a messenger, ready to take into his possession the worthless substance, and convey it away where it can be no longer injurious!

19. Some of these dead parts or particles of the human body are carried almost immediately out of it. The kidneys, and sundry other organs, have the power of separating them from the current of the blood, into which the absorbents have poured them, and of sending them at once out of the system. Others, however, are used up within the cavities of the body.

20. Perhaps there is no way in which so many of them are removed from the body, as through the skin. Here are from twelve to fifteen square feet of surface, all the while manufacturing from the blood that passes through it, or from the vessels under it, two or three important fluids; and I have not a doubt that this dead matter, of which I have spoken, commingled with the blood, is appropriated to this very purpose.

21. And then it is also highly probable, that a considerable amount of the same waste matter is used up to make certain fluids, which are needful to lubricate the intestinal canal, or, at least, to prevent undue and improper irritation, and, perhaps, to perform the same office for other parts still. Nor is it certain that the refuse contents of the alimentary canal are not, in part, also made up of waste particles.

22. In any event, and in a state of health, we may be assured of one thing; viz., that, if nature, uninterrupted in her efforts, can but have her own way, every dead particle will, by some means or other, be so disposed of as to make no further trouble, either to the owner or to other people. It is not left so exposed that we need to eat or breathe it. It is as certain of sepulture as the very hand of Jehovah can make it.

QUESTIONS. — What curious representation has sometimes been made? What is its meaning? What are these internal vampires called? How is this a wise provision? Into what fluid are these dead particles imme-

SECTION IV. — HOW WE OBTAIN NEW PARTICLES.

23. If we are continually losing particles of our bodies, it follows that we must, in due time, either waste away to mere skeletons, or these particles must be replaced. Sometimes, by reason of abstinence from food a great while, or of sickness, we do grow thin in this very way; but, in general, there is provision made by the Creator for our restoration.

24. Nor is this all. Provision is not only made for replacing the particles which are lost, but, during our younger years, for our enlargement, or growth. In order to our growth, we must receive, in some way, either more living particles than we have lost of dead ones, or the new ones must be larger. The reasons why the latter method is probably adopted, have been already given. (12.)

25. In order to have all things go on healthfully, we must be constantly receiving these new particles, from some source or other, at every moment of our lives. Whether we are one day old, or one hundred years — whether we have come to maturity, or have not — new particles must be constantly at hand, in all parts of the body, and ready for use. Whence, then, do they come?

26. We shall see, in its proper place, that the blood is the source of all nutrition. That this blood, when made from good food, in a proper manner, and properly acted upon by the air in the lungs, furnishes a constant supply of rich particles, exactly adapted to the great work of building again the "old wastes," or, in other words, of renovation; as well as to aid the young in the work of growth.

27. This blood, to the extent of several gallons, is distributed, at a very rapid rate, to every part of the living human system; so that there is no portion of the body in which good and healthy blood, containing an ample supply of building materials, is not present. It is even present in the solid bones — at least to some extent — if not in the very hair and nails.

28. Now, just as certainly as any part of the human system is susceptible of losing a particle by waste, just so certainly that same part has power to cull from the blood, which is at

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diately poured? What, then, is done with them? What use is made of those which are retained in the body? Through what channels are some of them carried out of it? Is Nature, in her provisions, exceedingly wise? Does she thus bury her dead out of sight?

any time passing through it, such particles as are needed to be applied to that part, either for growth or renovation. Thus, bone has power to select particles that will make bone; skin those which will make skin, etc.

29. I do not mean to say that the blood, in its circulation, has no other uses than to furnish a sluice, or channel, through which the old and dead particles may be removed from the body, and a supply of new particles furnished, for building up and renewing it; but only that these are some of its uses, and very important ones, too. Further on, we shall learn more of the uses of this wonderful fluid.

SECTION V. — HOW OFTEN WE ARE RENEWED.

30. It was once said, even by learned men in learned books, that the human frame was wholly renewed every seven years. But it is by no means probable that we are renewed with equal rapidity at every period of our lives. Nor is it more probable that every one, even at the same age, is renewed in exactly the same time. Much must depend on the temperament, and vigor of constitution.

31. Infants, when first born, have a circulation more than twice as active as that of the adult. Besides, their solids are not so rigid as those of older people. Their bones are not yet hard, and many of them are quite soft. It seems to me, therefore, no more than reasonable to believe that they are changed much more rapidly than adults — perhaps three or four times as rapidly.

32. It is indeed true, that they have less of wear and tear from attrition than we, who are older; at least, while they are not able to walk or run about. But, after they are able to go abroad and play, they are almost always in motion. It is quite as likely that they are renewed once in seven months, as once in seven years.

33. The very active, and stirring, and healthy adult, too —

QUESTIONS. — Why do we not, in continually wasting as we do, become reduced to mere skeletons? Is provision made for growth, too, as well as renewal? From what source do the new particles come, which are wanted for growth and renovation? Is it known how the various parts of the system can tell which particles are adapted to their use, and which are not? Can particles be taken out of the blood which will make bones, hair, and nails? Has the blood no other uses than to furnish the materials for building up and renewing the human system?

how much more rapidly must he be renewed than the lazy, stupid, corpulent man, who seldom stirs from his chair; or, if he stirs, it is to mope about, having little more true activity of body or mind than a statue of the same size and shape, or a piece of wax-work which should resemble him?

34. The very aged individual, in whom the parts which were once soft and yielding have become rigid and inelastic, and whose mind has been as inactive and inelastic as his body, is not more likely to be wholly renewed in seventeen or twenty years than the younger man, or woman, in seven.

35. We hence see how foolish it is to talk about the same period of renewal for every individual. The experiments I have mentioned, with madder or other coloring substances, (14) were mostly made on other animals than man; but, had they been made on man only, and had the time required for the disappearance of the coloring matter been just seven years, this would not decide on that exact time for everybody, of every age.

36. But, whether the process requires seven weeks, seven months, seven years, or seventy, the great doctrine of the renewal of the body is well established, and generally admitted. We are never the same; none of us, beyond the merest infancy, have a particle about us, solid or fluid, which was born with us; and some of us may have already been built over many times.

37. We shall see, by-and-by, that this great doctrine of renewal is a most important item in the study of human health. Every living individual should understand it, and at the earliest possible age. Let him know that he is never twice the same person, any more than the river which passes his door is twice the same river.

SECTION VI. — WEARING OUT TOO SOON.

38. It has sometimes been said to be better to wear out than to rust out. No wise man would object to wearing out.

QUESTIONS. — How long was it once said mankind were in being completely renewed or renovated? Is this exactly so? Why can it not be a general rule? What is said of infants? What is said of differing temperaments? What of feebleness, and vigor of constitution? What is said of the active, stirring man? What of the lazy and corpulent man? Can the very aged be renewed as soon as the young? Are we, then, never twice the same person, physiologically? Should this doctrine be early understood? Is it as valuable, at the least, as Latin and Greek and Mathematics?

We are made to wear out. We are to be among mankind as they that serve — as was he, who is at once our great Teacher and Example. We are servants, all of us; having one Master, even Christ.

39. But, to wear out, is one thing; to wear out too soon, quite another. If the former is our duty, the latter, most assuredly, is not. True, circumstances may seem to compel us to it; but it should never be our choice. If we regard ourselves, physically, as machines, we are made to move a definite time, and that time should not be hastened. In the higher capacity of free moral agents, we should live to fulfil our agency.

40. When we work so hard, and wear out the body, by attrition and otherwise, so fast, that the particles, which should go to build the old wastes, are fewer, or feebler, or more loosely applied than they ought to be, are we not wearing out too soon? Most assuredly this is not a very common fault; and yet it is occasionally found.

41. I do not think the great Master of the vineyard will ever justify the conduct of any of his stewards, who, to gratify selfish purposes, have worn themselves out prematurely. He will be apt to say, Who hath required this at your hands? And it will not be easy to frame an excuse that will be satisfactory, even to the accused himself.

42. But there are other ways of wearing out too soon, besides too violent or too protracted physical efforts. Many more wear themselves out too soon by violent pleasures, and even by excess in mental pursuits, than by the former course. There is such a thing as weakening both the powers of growth and renovation; and the young very often do this, and sometimes the old.

43. There should undoubtedly be a proper balance kept up between absorption and nutrition. I have seen those in whom absorption was a great deal too rapid for its opposite; and I have seen others who were so crippled by various errors of conduct, that the powers of absorption were enfeebled. Both these classes of persons must wear out too soon.

QUESTIONS. — Is it not better to wear out than to rust out? Are wearing out and wearing out too soon the same thing? In what circumstances may we wear out too rapidly? Has wearing out too soon ever been required by our Divine Master? May we not wear out too soon in a great many ways? Should there be a proper balance between waste and nutrition? Is it not wrong, then, to disturb this balance?

SECTION VII. — IS LONG LIFE DESIRABLE?

44. If life is desirable at all, the longer it can be made to last the better. If five years are desirable, why not fifty? And if fifty, why not a hundred, or even five hundred? Did those who lived almost a thousand years ever complain of living too long? Were they not as grateful for the whole of their existence as for a part of it?

45. Some among us *say* they do not wish to live to be old. Whether they are sincere in their declarations, remains to be determined. "What are five or ten years of life worth," they ask, "when appended to a miserable old age? No; give us a merry life, though it should be a short one."

46. They who say this, err in several particulars. Let us examine their statements. 1. They assume that they have a right to unsettle what God has settled. 2. That all extensions of life must be at the end of it. 3. That a long life cannot be a merry one. 4. That old age must bring with it such evils as render it, of necessity, miserable.

47. Now, God has represented the wicked as cutting short his days, at least one-half, by his wickedness. Consequently his righteousness — would he but practice righteousness — would prolong his existence. We are told, in the Decalogue, to honor our parents that our days may be long; and Paul has spoken with considerable emphasis of long life as the reward of obedience to parents.

48. But it is assumed that, in lengthening human life five or ten years, we are only protracting its close. Whereas, if life is prolonged by our good conduct of any kind, the years we acquire are added to the middle, no less than to the end, of our existence. Indeed, physiologists teach that it is almost all added to the middle.

49. But why may not our life be a long and merry one, as well as short and merry? Is it meant that, in order to be merry, it is necessary to do wrong? Now, I know of no man who has so good a right to be merry — nay, who is so likely to be merry at all times, — as the truly good man. Some of our longest-lived men have been the most cheerful.

50. It is assumed, finally, that old age must necessarily be wretched. But old age, whenever it is wretched, is made so by sin. Suffering has no necessary connection with old age, any more than with youth or manhood.

51. The lamp of human life, as life now is, must, of course, go out in due time for want of oil; but it need not go out in

agitation. If the lamp burns a little more dimly towards the close, it does not thus follow that it may not burn equably and quietly. It need not have rheumatism, or gout, or any other of those diseases misnamed the infirmities of age.

52. If Methuselah suffered from what we call the infirmities of age, it was his own fault. God, his Creator, never intended it. The very common belief, that old age must necessarily bring with it bodily infirmities, besides being a great mistake, reflects dishonor on God.

53. Of one thing we may be assured, that, if the wicked do not live out half their days, it is because of their wickedness, — their neglect of obedience, physical and moral — and that, if the infirmities of age come upon us, it is because we have disobeyed, either intentionally or ignorantly, the Divine laws.

54. Some people seem to think that, in contemning or finding fault with this life — calling it a mean and unworthy existence, — they magnify the value of the life that is to come. A most sad, not to say fatal, mistake! The longer a good man's life is, the more valuable to him and to others will the future life be. I do not say that the future life will be any longer for it, but only that it will be more glorious.

SECTION VIII. — HOW CAN LONG LIFE BE SECURED?

55. It is one of the plainest inferences which can possibly be made, that, if the wicked shorten their days by their wickedness, they must, in order to secure long life, leave off their wickedness. This, then, is, in general, the first means of securing longevity in this world.

56. But we must not only cease to do evil, we must learn to do well. The wicked man, in leaving off his wickedness, cannot be idle. He must be active in some way. As he has ceased to do evil, it is to be presumed he will now do good. His prospect of long life is therefore greatly increased. This we have already seen (47).

QUESTIONS. — Is life desirable at all? Why, then, is it not more valuable in proportion to its length? Did the patriarchs, before the flood, live too long? What objections are sometimes made to long life? What may be said in reply to the first objection? What to the second? What to the third? What to the fourth? Why should man have gout, or rheumatism, or what are called infirmities of age, any more than the candle or the lamp? How do these infirmities, as they are called, originate? Of what sad and strange mistake are some men among us guilty?

57. We have also seen that long life is promised to obedience to parents. This comes about in two ways. First, They who honor their parents, will be likely to be virtuous in other respects; and their general good conduct will be favorable to long life. But, secondly, it has been thought by Dr. Dwight and other careful observers, that there is a special blessing connected with parental obedience. Dr. Dwight is very confident of this. (47.)

58. Now, if obedience to parents conduces to long life, in both these ways, it is not to be doubted that obedience to God, in all other matters—for obedience to parents is obedience to God also—would be attended with similar results. What, then, has he to do, who wishes to live long in the land, but to learn and practice obedience to all the laws of God?

59. There are properly two sets of the Divine laws. One of these is found in the Decalogue, already alluded to, as well as elsewhere, and is called the *moral* law; the other, though alluded to there, is to be chiefly learned by study, and is called the *physical* law. It is found operating both in us and around us. We cannot, if we would, escape from it. It is everywhere.

60. Some have thought it not so important as the moral law, because God has not particularly revealed it. But such persons would not, as I suppose, disregard the laws by which water and wind and steam are made available to what are deemed useful purposes in life, because God did not particularly reveal them. They would regard them as God's laws, and just as important, in their place, as any of the rest of his laws.

61. In truth, there is one point of view in which it would seem to be more important to know and obey the physical laws of God than the moral ones. There is no known atonement for our transgressions of physical law. As surely as we transgress, we must, sooner or later, suffer the penalty; for a law would be no law without a penalty. If we do it in ignorance, it makes no known difference. The punishment must come on ourselves or our posterity; perhaps on both. For the sins of parents, physically as well as morally, may be visited upon their children to the third and fourth generation, if not to the thousandth.

62. Many who have not been taught to study the relation between cause and effect, nor the existence and nature of physical law, have doubts on this subject. But their scepticism is no new thing. "Because sentence against an evil

work is not (always) executed speedily," said Solomon, in his time, "therefore the heart of the sons of men is fully set in them to do evil."

63. The way to secure long life, then, is a plain way. It may cost us some trouble, but it cannot be mistaken. It is the way of obedience. We have but to obey the laws of God, from the first of our lives to the end thereof, and, as a general rule, long life and good health while we do live, will be our reward.

64. I have said *as a general rule*, because our race has so long sinned, and so many of their iniquities have been visited, or transmitted, that most of us come into the world with a liability, greater or less, to disease. Then, again, we are subject, more or less, to suffer, as members of society, from the sins of others, and especially from accidents. But these exceptions only serve to confirm the general rule.

65. My object, in the present volume, will be, to set forth, in a plain way, the physical laws of our frames — the house we live in — so that mankind may no longer remain in ignorance, and unconsciously commit those errors which render them sickly, and shorten their lives. I would gladly have all mankind live out their appointed time, and be happy while they do live, whether it is one hundred years, or one thousand.

66. We are locomotive beings. The laws which pertain to our muscles and tendons and bones, must be understood and obeyed. This involves, of course, what are called the laws of exercise. It includes business and leisure, labor and amusement. It includes all the modes of communication with each other as social beings.

67. Then there are laws in regard to digestion. To attain to a long and healthy life, we must eat and drink; not as most people, in their ignorance, do — merely to gratify our appetites, or at hap-hazard, like the beasts — but according to law; and this law must be studied and ascertained, before it can be obeyed.

68. Then, again, we are breathing animals; and the law which relates to the subject of pure air and ventilation must be studied and obeyed. This will be a topic of great importance to those who wish to insure health and long life, and escape a certain class of diseases.

69. Finally, there are laws of the skin, laws of the brain and nerves, laws of calorification; and these involve numerous things concerning dress, medicine, taking cold, and other

diseases; and especially the correct physical education of all parts of the body. Prevention, as far as it can be practised, is better than cure.

70. We must not only know these laws, but obey them, and that, too, perseveringly. We must obey early and late, at home and abroad, in sickness and in health, in labor and at study, in business and amusement; and, if the expression should not seem too strong, in life and in death.

SECTION IX. — GETTING RID OF SOME OF OUR DISEASES.

71. It has been seen, incidentally (64), that there is such a thing as inheriting disease from our ancestors. This, at first view, seems a little hard; and not a few have been perplexed to know how to reconcile such a fact with the general ideas they have imbibed concerning the goodness and mercy of the Creator. But still there is a bright side to this view. Few persons are so much affected by inheritance as to render their condition necessarily one of misery. Would we obey the whole physical and moral code, our existence, in nine cases out of ten, if not in ninety-nine out of a hundred, would, on the whole, be a blessing. Our inherited diseases would not kill us, at least, immediately.

72. Nor is this all. Could we be taught to obey all laws, physical and moral, from the very first, we should not only escape premature decline and death; but, under the great law of renovation, we might, in numerous instances, be restored to perfect health. If, under the influence of a bad inheritance, we can live on one year, why not two — ten — twenty — seventy?

QUESTIONS. — What must first be done to secure long life? Must we not only cease to do evil, but learn, also, to do well? What is said of obedience to parents? Why is obedience healthful? Is obedience to God as likely to be healthy as obedience to parents? Are there two classes of the laws of God? Must both be obeyed? Why is obedience to physical law, in one point of view, more important to this life than to moral law? Must all physical transgressions be punished somewhere? Do many people have doubts on this subject? Is this species of scepticism new? What does Solomon say? What is said about inheriting disease?

Is it, then, the object of the present volume to teach physical laws, especially those about our bodies, such as we all ought to know? Are there specific laws about our bones and muscles? Are there laws about digestion? Are there also laws about breathing? Must we obey, as well as know, the physical laws? Is there any time or place in our existence when we are at liberty to disobey them?

And, if some have got rid of their diseased tendencies — and we know they have — why may not others? What man *has* done, man *may* do.

73. We have seen that particles in our bodies are, from the first, continually dying out, and that new particles are put in their place. If the new particles are just as good as the old ones, the vigor of our constitutions, so far as these changes are concerned, remains the same; if they are worse than the old ones, we must gradually deteriorate; if they are habitually better, we must gradually improve. Can anything be clearer?

74. Now, if we can know and obey all the physical laws which God has established within and around us — and all his moral, intellectual, and social laws among the rest — what shall prevent the new additions to our bodies from being more healthy and vigorous than those which were made while we were daily and hourly pursuing the path of disobedience?

75. Nay, more than this. We have seen that, in process of time, longer or shorter, according to circumstances, our whole systems are changed, so that not a particle of the old structure remains. Now, if the new building is made of better materials than the old one, what shall hinder us from getting rid, in due time, of many of our diseased inheritances?

76. More, still, than even all this. If a person, whose inheritance is a diseased one, can live on till he is renovated once, why should he not have an increased chance of living till he is renovated the second time? And so of the third and the fourth renovations — to the twentieth, if so many there are.

77. To apply this to the case of a child, who is affected, by inheritance, with scrofula. Here it is, two or three years old, feeble and puny; and yet no worse, apparently, than when it was born. The parents, having been enlightened with regard to physical law, are determined, henceforth, to treat the child in accordance with it. Now, if it has lived on through one renovation of its body, despite of transgression, what shall hinder its living on during another renewal, under obedience? In truth, what should hinder its improvement during the time?

78. An illustration may be useful. Here is a house, we will suppose, built with bad bricks. Now, if these bricks can be removed one by one, at distant points from each other, and new and better ones substituted, till the whole is changed, without impairing, mechanically, the strength of the pile, what shall hinder the new building from being better than the old one?

79. This reasoning, if correct, not only vindicates the ways of God to man in this particular, but opens to us a glorious prospect. Our existence, even with diseased tendencies, is itself a blessing. And then we may improve it, according to our talents — two, five, or ten — indefinitely. For who can set limits to the measure of health and longevity, which, on this principle, is attainable in the progress of our world, during the coming hundreds of generations?

80. Our reward is not only before us, but *with* us. The moment we enter the path of obedience, we receive a reward, leaving all the future out of consideration. But, to be able, not only to enjoy the present much better than now, but also to remove — far as the east is from the west — a multitude of diseases, who could desire a more exalted situation, here or hereafter?

81. The principal objection to be brought against these views is, that, though they accord with all known truth, or appear to do so, they go too far, and imply that man, in process of time, may become immortal on this earth. Now, this inference is entirely unnecessary, if not incorrect, as will be seen in Section XI.

SECTION X. — DYING BY VIOLENCE.

82. It must, of course, be admitted that, in the present state of things, many deaths occur from violence or accident. Indeed, it has been admitted already. (64.) A wagon, here or there, will be overturned; a railroad car crushed; or a steamboat, or a ship, buried in the great deep. These things, it will be said, are beyond the reach of obedience. The good and obedient fall in this way, as well as the erring and disobedient.

83. I have no doubt it could be shown from facts, as they exist, that, even here, the obedient have the advantage. There are not wanting intelligent men, who maintain that all accidents are the result of carelessness, somewhere. If this is so, individuals themselves, who obey all law, will, so far as their

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QUESTIONS. — Does the idea of inheriting disease seem to conflict with the goodness of God? But is there not a bright side to the picture? What is it? Can the diseased live on? Can they be improved, as well as live? What illustration is given to show how this is? Are the ways of God to man thus vindicated? And, in our attempts to cast off our diseases, is our reward with us, as well as in the distance? Do these views necessarily imply that man was made to live here forever?

isolated influence is concerned, be less liable to death from accident, and less liable to expose or endanger others, than those who persist in disobedience.

84. As to such forms of violence as are comprehended under the idea of personal assault, whether with club, bowie-knife, pistol, or sword, no one will question whether obedience to all law, though it should not save the victim, would prevent a person from becoming the assailant. Now, the aggression will cease, of course, if there is no aggressor.

85. But I wish to speak of other forms of violence. Disease is violence; and so, in many instances, are the means which are made use of to remove it. We transgress law; disease comes as the penalty; we are not willing to pay the penalty; and hence we seek to get rid of it. The physician, as a choice of evils, real or supposed, often inflicts a new act of violence. Perhaps the patient is saved, perhaps he is lost. If he dies, he dies of violence.

86. It is proved by our bills of mortality, that half who are born die under ten years of age! Is here no violence? Did not God make the animal, man, to live? But when children, one half of them, die before their parents — and amid agencies, too, which more than half reveal the fact that the stomach, the lungs, or the brain, or perhaps all these, have been long suffering from abuse — is there no violence?

87. Half mankind are said to die of fevers, of one kind or another. Are fevers natural? Is here no violence? Is even a common cold natural to us? Is consumption natural? and are cholera and yellow fever and the plague? Who believes it? Who ever did believe it? Who is there that can?

88. But if disease is violence, and yet is susceptible of being prevented, shall it be said that other violence cannot be prevented? Can I so live as to prevent colds and cholera and consumption, and yet may I not so perform my duty that no accidents to myself or others shall occur, which are chargeable on my own neglect or folly?

QUESTIONS. — Do not mankind sometimes actually perish from violence? Mention a few examples. May not accidents themselves — acts of violence — be diminished by obedience to all law, moral and physical? Do not some maintain that all accidents are the result of carelessness? In what sense is disease to be regarded as violence? Do not children who are said to die of disease, die of violence? Do not those who die of fevers die of violence? And if disease is violence, and yet is within human control, is it not true that violence itself, at least, to some extent, is susceptible of being removed?

SECTION XI. — DYING OF OLD AGE.

89. This is the proper place to meet an objection already alluded to; viz., that, admitting the principles I have advanced to be true, man would never die. (81).

90. The reasoning, if it is fairly entitled to the name, is as follows: "You say that, by exact and perfect obedience to all law, the physical system may not only be renewed during every passing moment, but indefinitely improved. Now, at this rate, man would never die. For, if every successive renovation made him better, such a thing could not be possible."

91. The objector has mistaken my meaning. In assuming, and, as I supposed, establishing the fact, that man might so live as to be improving his system, in all its parts, at every moment, I did not mean to exclude the idea of progress and of decline. I no more meant to say that the man of one hundred could have the particles which belong to infancy or youth, than that the infant could have the particles which belong to maturity or age.

92. I should deserve ridicule, no less than criticism, were I to assert that a little child, by obedience, might have every new particle incorporated into his system a mature one; so that, after one complete revolution or renovation, say, in three, four, or five years, the infant might leap from infancy to full manhood. And it would be equally ridiculous to suppose that the old man, in being renewed, could again become an infant or a child.

93. My meaning was simply this, and no more. That the infantile particles, *as* infantile particles, could be indefinitely improved; and that the octogenarian particles, *as* octogenarian particles, might just as certainly be improved at every step of the renovating process. But the man of eighty must remain the man of eighty, as much as the child must remain a child till his time comes to "go up higher."

94. I wish here to be understood. I do not affirm that, under no possible phases of renovated humanity, will death be excluded; for I do not know that, on this point, I have any settled opinion. All that is born, under the present constitution of things, at any rate, must die. But this question of immortality on the earth, I leave as I found it.

95. As a reply to my general statements — that disease is violence, and that, under a system of perfect obedience, violence should be excluded, or nearly so — should it be asked how, or in what manner death could take place, my answer would be, what may be gathered, in substance, from Section 7. (51). I sup-

pose a definite quantity of oil is furnished to nature's lamp, and, when that is exhausted, life will, of course, be extinguished.

96. There is, however, one thing more to be said, in passing. When I speak of the results of perfect obedience, as a means of renewing the human constitution and restoring us to "Eden," it is not without the full consciousness that such blissful obedience, in a whole race of free agents, so far departed from the poles of truth as we are, is hardly to be expected for some thousands of years to come. And yet we are bound, by Scripture and reason and good sense, to *aim* at it—to make as close an approximation as we can—and to anticipate, as it were, its arrival.

97. Isaiah has indicated a period in human history when the child shall die a hundred years old. I see no reason at all why we should be required to wait many centuries for the full realization of this blessed promise, would men but follow out the path of pure and perfect obedience, physically and morally.

98. In any event, it might be hoped that, in such a golden period, men would, some of them, attain to a truly natural old age, or, in Scripture language, live out their days. It would be a hopeless task, at the present time, to find an individual who lives out his appointed time, in a physiological sense, and dies because his "oil" is exhausted. In other words, it would hardly be possible to find a well-authenticated instance of dying a natural death from mere old age.

99. "Did not Dr. Holyoke and Dr. Emmons die of old age?" it may be asked. It is true the latter was nearly a century old when he died, and the former exceeded it. But there is the best possible evidence that both these individuals died with cancer in the stomach. Did they, then, die of old age? Nay, did Thomas Parr, who, at the age of 152, was killed by over-stimulus, die of old age?

100. When we decapitate an animal, as a fowl, or any other, we witness its throes, and know them to be the result of violence. But the agitations and contortions and agonies of the human being—so often witnessed—as surely prove violence as in the case of the domestic animal just cited. Who, then, in the present state of things, will dare affirm that such a thing is known among us as natural death, or death from old age? Of one thing, at least, we may be sure, that if it *has* an existence, it would be difficult to prove it.

QUESTIONS.—What objection is sometimes made to the views here presented? Is this objection founded on a mistake? What is the mistake? What would deserve ridicule? What was the author's real mean-

CHAPTER II.—MOTION AND EXERCISE.

SECTION I.—WHY EXERCISE OF THE BODY IS NEEDFUL.

101. Do you see that man, with his arm suspended in a kind of sling? Now he is not an idler. He is, in general, an industrious and faithful laborer; but, by an accident, recently, had his arm broken. A surgeon placed the ends of the broken bone together, in their natural position, bound up the limb carefully, and suspended it in the way you see; and it is, at length, gradually becoming strong and firm, like the other.

102. Now, if you examine that lame arm, and compare it with the sound one, you will find that the latter is the largest and strongest, and its flesh the hardest. And, whenever the broken arm shall be so fully restored that the sling and bandage may be wholly dispensed with, it will require a good deal of time for it to regain its wonted plumpness and strength. How is this to be explained?

103. What we call the flesh of men and other animals—the lean meat—is made up of more or fewer reddish fibres, or threads, collected together in larger or smaller packages, or bundles. These packages are large in the middle, and tapering towards the ends, where they terminate in one or more flat straps, called tendons. Some of them are single, others double, or even triple. They are called muscles.

104. Between these muscles, or packages of flesh, and also between the fibres, or threads, of which they are composed, is a kind of loose, spongy, cottony substance called, in books, a cellular membrane, in which we often find a little fat, or oil. The cells of this membrane communicate with each other.

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ing? When and how is it said man should die? Is full and perfect obedience, by the way, immediately expected? What has the Prophet Isaiah foretold? Is the speedy accomplishment of this prophecy to be expected? Is such a thing as natural death known at the present time? What is said of Dr. Holyoke and Dr. Emmons? What of old Parr? What physiological fact, of every day occurrence, proves that men in general, whatever may be their years, die of violence and not of old age?

105. These muscles, or bundles of lean flesh, have many curious powers, or properties. Among these is a shrinking, or contractile power. Some muscular parts of the body shrink, or contract, without the knowledge or will of the owner; but, in general, they only contract when we wish to exercise our locomotive powers; or, in other words, when we wish to move some portion of our system.

106. Thus, suppose I wish to bring my hand to my head, and proceed to make the usual endeavor to do so. Now, it is quite evident that the hand cannot come of itself to the head, since it possesses no independent, or self-moving power. And yet here it comes in an instant, almost as soon as I determine, or *will*, to have it come. How does it get here?

107. As soon as I determine or will the change, the muscles on my arm, between the shoulder and elbow,—for there are several of them, in this instance, packed together into a broad, flattish bundle—immediately shrink. By laying my other hand on the middle of the arm, I perceive the contraction, and also a corresponding enlargement at the moment the contraction takes place.

108. Now, the muscles of which I am speaking are fastened by their flat tendons to the shoulder above, and to the forearm, a little below the elbow, so that the contraction, in the middle, must either pull my arm and hand towards my head, or the shoulder, head, and trunk towards the hand. And we know, from the nature of the case, which is most likely to happen.

109. As long as the muscles I have mentioned remain contracted, my hand will remain in contact with my head. But, after a little time, they tire; and I feel a degree of anxiety to have the hand go back. But, as it could not come to the head of itself, so it cannot go back of itself. A set of muscles on the back part of the arm, must, in their turn, contract; while those that contracted before, must give way, or relax. And now the arm and hand go back to the condition in which they were at first.

110. In this last condition, that is, when hanging or lying at my side, it will not ache or feel uneasy. It will make no complaint at all, at least directly, if I let it stay there a considerable time; neither would it, if suspended in a sling. Yet, in neither case, will it be so strong or so healthy as if it were frequently moved backward or forward, or in some other direction. Indeed, if kept *entirely still*, there would, in time, be more or less of uneasiness; and, after the lapse of a few

months or years, at most, it would probably dwindle away to mere skin and bone, if it did not actually perish.

111. The muscles are usually found in pairs, one on each side of the body. The whole body contains some four hundred and fifty muscles, or two hundred and twenty-five pairs.

112. Now, every one of these muscles obeys the general law of which I have just spoken. If they are used more or less, that is, if they are alternately contracted and relaxed, they are healthy and strong in proportion; and, if they belong to the frame of a person who is growing, they continue to grow. But, if they are neglected, or are deprived of the power of acting, on the contrary, they become weak and feeble, even if they do not perish.

113. Some of the muscles, it is true, require a much smaller amount of exercise than others; but they all, without a solitary exception, require more or less of it. And, if those that require but little are not allowed that little, they suffer just as soon, and as certainly, in a degree greater or less, as those do which need a greater amount of exercise, whenever that greater amount is withheld.

114. There is, indeed, a second strong reason why we must have exercise. It is derived from the consideration of our structure. Three-fourths of the human body are fluids; and, but for exercise to favor the proper circulation of these fluids, they would, ere long, stagnate, and we should perish in our own putrefaction.

115. For, though the lungs, skin, and liver, as we shall discover more fully hereafter, are great instruments of purification, yet, were it not for exercise, they must fail to accomplish, fully, their mission. The lungs and skin might unite to do their best; yet they could not prevent whole states and territories of the human confederacy from anarchy, dissolution, and death.

116. Even the solids themselves, always dying out, particle by particle, could not be changed, but by exercise. Dr. Darwin has said that "eat or be eaten" is the great law of nature.

117. Of exceptions to the general law, herein proclaimed, I know but few; and some of those are more apparent than real. Men have, for example, lived in exceedingly narrow dungeons many years — in a few instances, almost half a century — without very great diminution of their muscular strength. Mr. Mercier relates the case of a prisoner, for forty-seven years in

the Bastile, who, when Louis XVI. ascended the throne of France, was liberated in tolerable strength. And Dr. Warren, of Boston, and others, have known a few cases of the same general character.

118. But it is highly probable that existence, to these individuals, was, after all, while in prison, little more than mere "vegetation." They acted little, and thought little; consequently there was little waste. Their scanty fare — the smallest pittance, perhaps, of mere bread and water — corresponded to their expenditures; and hence they maintained a good degree of muscularity.

119. If it should be said that not a few, whose amount of exercise is very inconsiderable, become corpulent, the reply is that fatness is neither muscle nor strength. In truth, corpulence, or fatness, beyond a very moderate degree, in man or beast, indicates disease. It may happen, however, that, if the exercise has diminished, and the fat accumulated very gradually, the diseased tendency may not, for some time, be perceptible. Let us never forget the sage remark of Solomon, already quoted. (62.)

120. It may still be objected to the principle I have laid down above; viz., that certain muscular parts, within the body and not under the control of the will, such as those of the ribs, heart, stomach, etc., do actually labor, all the while, without any seasons of rest; and yet do not become either enfeebled or attenuated.

121. But this is, physiologically, a mistake. The intercostals — the muscles between the ribs — do alternately contract and relax. So do those which make up the walls of the heart. But then they rest, in both cases, for an instant, or about as long as they act. And those of the stomach *ought* to have seasons of rest; for, otherwise, the health, as we shall hereafter see, is soon impaired.

122. Should reasons be required for the general law above proclaimed — that is, should it be asked why it was so ordered that muscles, in order to be healthy, must have exercise — the inquirer must, for aught I see, be sent to the Maker of the law, rather than to the mere expounder, or interpreter. It is the law, and this is all we know about it.

123. In one of the closing sections of this chapter, I intend to avail myself of an opportunity to remind those who are sceptical on this subject, of the necessity of avoiding the penalties which every violation of physical law renders inevit-

able; and of the consequent necessity of yielding to every known law, physical as well as moral, their prompt and unconditional obedience. It is as literally true of muscles as it is of all other parts of the human machinery — that, if one member suffer, all the members suffer with it; while it is also true, that, if one member rejoices, all the members rejoice with it. Nor will the fact, that we sin ignorantly, absolve us from the necessity of suffering the penalty God has ever attached to violated law.

SECTION II. — THE MACHINERY OF MOTION.

124. The Creator has made motion, or action, quite indispensable, throughout his whole domain — from earth, through systems on systems, all the way up to his own great and glorious throne. Not only are his worlds in motion, but all their component parts, from the smallest atom to the largest mountain. The granite hills, even, do not remain wholly unchanged. They are perpetually softening, crumbling, and wearing away.

125. As for the atmosphere and the waters, it is well known that these have incessant motion, or we should all soon perish of stagnation or suffocation. Pope says, that "order is Heaven's

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QUESTIONS. — What will happen if an arm, or any other moving part, is long kept inactive, as in a sling? Why? What will be the result when the part is again restored to its liberty? What is the popular name of flesh? Of what is flesh made up? What is a muscle? Are muscles always found single, or are they sometimes double, triple, etc.? Are they ever arranged in pairs? What is their general shape? What is a tendon? Where muscles are found in groups, what is the bond of connection? What is the general structure of cellular membrane?

What is one of the most remarkable properties, or powers, of muscles? How, then, is the hand raised to the head? How may this statement be proved? Can the muscles be kept always in a state of contraction? What would follow, if a hand, or arm, or leg were to remain long motionless? Would the locomotive power of our bodies and limbs ever actually perish, if the latter were not used? Do all muscles require a similar amount, or degree, of exercise?

What is a second strong reason why the muscles must have exercise? What is the first apparent exception to this law? How is it explained? (17). What is said of growing corpulent from inaction? What has Solomon said? What is a third objection to the general law that muscular parts require exercise? Is this founded in mistake? What is the mistake? Can we give reasons, always, for the existence of physical laws? Is obedience the sum total of this matter? What are the consequences of disobedience to physical law? Does our ignorance exempt us from penalty or punishment?

first law"; but one might, very naturally, regard motion as before order. The Spirit of God *moved*, so we are told, upon what was, at first, a mere chaos.

126. But, if the inanimate world is full of motion, the world animate is still more so. Not a vegetable existence, from the spire of grass up to the mightiest oak, but is full of motion in all its parts, unless its fluids are made to stand still by *Arctic* cold. And, as if this were not enough, provision has been made for motion from external forces; not only the stronger winds, but the gentler breezes. Every one of these last fulfils a mission to the whole vegetable kingdom.

127. Although we find the law of motion everywhere operative, throughout the mineral and vegetable world — and, indeed, through all the animal tribes, man himself not excepted — it is not till we come to animals that we discover anything like locomotion. The cedars of Lebanon, the oaks of Bashan, and even the spreading baobab, remain forever on the spot where nature has placed them.

128. Nor do we find full power of self-motion, at our first approach to the confines of the animal kingdom itself. The polypus seldom, if ever, stirs an inch from the place where it originated. The oyster, and many more of the shell-fish, are almost equally powerless. The lobster has a little more locomotive power. The snail is still more advanced, and not only can move himself, but drag after him, with *snail-like* pace, the house he lives in. The turtle carries his house, with its projecting eaves, and with a good deal of rapidity, too, on his back.

129. It is yet a long way from the turtle up to man, in whom we find the greatest variety of locomotive power. For, though the flea and kangaroo can leap further, and the pigeon fly faster, yet what heavy animal, but man, is endowed with the ability to take up his house, with all the appurtenances thereof, and, by dint of his own locomotive powers, dash along terra firma, glide over the congealed surface of the deep, and fly, as it were, through the atmosphere?

130. The manner of performing our various evolutions, whether on land, or in air or water, is a wonder. The fact that we literally and really pry ourselves about, from place to place, by various sets of levers and pullies, were it not an every day occurrence, would almost deserve to be regarded as the eighth wonder of the world.

131. Standing still, itself — paradoxical as the statement

may seem — is little less than a species of locomotion. It is, at least, the power of moving ourselves — for we are continually moving. Could a post, six feet high, or a marble statue, placed upright, support itself against even considerable external force? Would not the very first gust of wind overthrow it? How, then, can a living individual stand?

132. We have seen, incidentally, (111) that we are furnished with two hundred and twenty-five pairs of muscles. These, with the *bones* to which they are attached, are the agents, or instruments, of locomotion. But let us look at these instruments a little more in detail.

133. The bones, some two hundred and forty or more of them, are the framework of the house we live in. But these bones could no more make a house, of themselves, than a set of wooden sills, posts, beams, girts, studs, and spars, when set up together, without any bonds of connection. Even the bones of the artificial skeleton are connected by means of wires, or some other fastenings.

134. The bones of the human body are first held together by *ligaments*. These are short, but very strong straps, inserted by their extremities near the ends of the bones, where they come together in such a manner as to hold them firmly, and yet admit of considerable motion. Sometimes, as at the elbows, the finger, or the knee, they are attached to the sides of the joint; but, in other instances, they entirely surround it, enclosing it, as in a purse or sack.

135. The ends of the bones, where they come in contact with each other, are covered by a smooth, shining substance, called *cartilage*. It is very tough and firm, in order to prevent wearing by friction. For, in using our joints as much as many of us do, the hardest bones — nay, ivory, or even iron itself — would otherwise wear out in a very short time.

136. Nor would even the tough and firm cartilages be sufficient to endure through life, had not the plastic hand of nature herself made ready, within the joint — that is, by means of an apparatus, in close contact with the joint — a substance called *synovia*, which serves the purpose of tar or oil to the wheels of the wagoner, and, in some good degree, secures the grand point.

137. The bones being thus fastened together, it remains to show how it is that the muscles move, or pry them about from place to place. But this, in principle, I have partly done

already (107 and 108). When we *will* motion, certain muscles contract to perform it.

138. These muscles, in order to move the parts to which they are attached, are usually inserted — that is, by the intervention of their straps, or tendons — a little way beyond the joints. To prevent them from starting out when they contract, as the string from a bent bow, they are frequently confined at the joint, by a band, or belt, as at the wrist, elbow, etc.

139. By inserting the tendon, as the Creator has, a little way beyond the joint, the part is more easily moved than it otherwise would be; while, by means of the band at the joint, the symmetry of the frame is preserved. A great deal of motion is also thus effected by a little contraction.

140. Any parts or portions of the system which are made to be bent or flexed, have muscles on two sides of them. Thus, as we have seen, (109) when one set contracts, the others relax; and the contrary. The muscles which seem to straighten or extend a part, are called extensors, while those on the opposite side are called flexors.

141. Let me now explain the mystery of standing erect. You have seen a person on stilts. Now he leans this way, now that. Yet, by skill, he contrives to keep his balance; or, as a philosopher would say, to preserve his centre of gravity. This, in principle, is just what we usually do in standing. We should fall, did we not preserve our upright position in the very way that the man does on stilts; with this single difference — that the base on which we stand, is a little broader than his; and thus our centre of gravity is maintained a little more easily.

142. Now, when, in standing, we lean a little in a certain direction, the mind, somehow conscious of it, *wills* to draw back from the point towards which the body is inclining; and no sooner is the mental determination, or *will*, in actual existence, than the necessary muscles of the lower limbs and, back contract, and pull us slightly in the proper direction. Soon we lean another way, upon which the same process is repeated. Thus, by continual but gentle efforts, we pull ourselves back as frequently as we begin to incline; and thus maintain our centre of gravity for a long time.

143. Some persons will even sleep while standing, at least for a short time; and certain domestic animals, as the horse, will do so for a long time together. I have even known indi-

viduals to walk in their sleep a short distance. I refer not, here, to somnambulism, which seems to be a sort of disease; but to the case of the ordinary traveller while in health.

144. In order to walk, we first contract certain muscles, and pry up, as it were, one of our feet, and, by other muscular contractions, carry it forward a little way. We then relax certain muscles, and let the foot rest on a new spot, and make that spot our centre of gravity for a moment; after which we proceed to pry up the other foot, carry it forward, and make that, in its turn, the centre of gravity, while we proceed to pry up again the first foot; and thus onward, till we choose to rest.

145. Running is the same thing, more rapidly performed. Indeed, when we run swiftly, for a small portion of the time, between each alternate advance of the feet, our bodies are suspended in the air. This is what I intended, in a former paragraph, (129) by flying. In balloons, men do not fly; they are, themselves, passive.

146. Dancing, leaping, and jumping, are performed on the same general principle as walking and running; except that the muscles are obliged to make more violent or sudden exertions in the former case than in the latter. The efforts are sometimes so violent as to rupture the muscles, or their tendons. Even the strong tendon at the heel — the tendo-Achilles — has occasionally been broken, and is with difficulty reunited.

147. Swimming, as a means of locomotion, is somewhat different from the other movements I have mentioned. But the principal difference consists in not having so firm a basis to rest on, while we are pulling, with the muscles, upon our bony levers. It is rather more difficult than locomotion on the land, and includes more of art. All can walk and run, and hop and jump; many can swim, but not all; at least, without long and patient effort.

Questions. — Is there any part of the great universe without motion? What did Pope say was Heaven's first law? Was not motion or action before it? Is motion indispensable in the inanimate world? To which of the kingdoms of nature is locomotion confined? Is it equally perfect in all the animals? In what particular, as regards locomotion, is man superior to all other animals? Does man pry himself about, from place to place, with levers?

Is what we call standing still, really motion? How can this be made to appear? What is about the number of pairs of muscles in the human body? What the number of bones? How are the bones held together in the dry skeleton? How in the living body? With what substance has nature tipped the ends of the bones, where they come together?

SECTION III. — CURIOSITIES OF THE MUSCULAR MACHINERY.

148. One of the greatest curiosities in the human frame, and by far the most remarkable in the whole range of the locomotive machinery, is the joint which connects the head with the neck. Where great firmness and strength are needed, we find such apparent delicacy of structure, that we wonder why the neck is not broken a hundred times as often as we find it to be.

149. Thus, in constructing the bony and muscular part of the neck, provision was to be made, by a single joint, for two kinds of motion, entirely dissimilar. 1. The neck was required to bend, so that we could depress the chin towards the breast, or elevate it, and throw the head back, as when we wish to look at the zenith. 2. It was also needful to make such an arrangement, that the head could be turned half way round, to the right or left.

150. In order to effect this, it was necessary to unite in one, what are called a hinge joint and a tenon and mortise joint. The former would enable us to bend the head backwards and forwards, while the latter would serve for the fulfilment of the rotatory motion. Not a mechanic in the world could have made such a joint; at least, till he had seen one. Yet the plastic hand of nature — or, rather, nature's great Architect — has done it. Examine the skeleton for yourself, and learn to wonder and adore!

151. The spine, or backbone, is also of wonderful formation. It is very firm and strong; and yet, to a certain extent, very flexible. How are strength and flexibility at once secured? The spine, instead of having one or two joints of more extensive motion like the arm or leg, consists of twenty-four strong pieces, resting one upon another, like so many saucers, with their concavity downward. These are united by means of a thick cartilage, which, being at the same time very elastic and compressible, yields when we bend in any given direction,

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What is synovia? Are the muscles fastened, by their tendons, to the ends of the bones they are designed to move, or a little beyond? Then why do they not, when the arm is bent or flexed, stand out like a bow-string from the bow? What is meant by flexors, and what by extensors? Explain, now, the mystery of *standing*. Can some persons sleep while standing? Explain the process of walking. What is running? What are dancing, leaping, and jumping? What is swimming? How does this differ from locomotion on the land? Which is the most difficult?

and allows the spine to bend a little at a great number of its joints, and yet make nowhere any considerable angle.

152. This arrangement is the more striking, when it is considered that the spinal marrow, which runs in a groove or hollow formed in the spine itself, would be otherwise liable to be compressed, and even bruised, by sudden jerks and falls. As it now is, most persons pass through life without any considerable injury to this delicate part of the system.

153. The patella, or knee-pan, is another curiosity of the muscular system; and is, for aught I know, peculiar to man. It serves a highly important purpose in the work of extending the leg; but, like many other curiosities of the human body, is with great difficulty described without exhibiting it in its natural position.

154. The foot is also worthy of our attention. Were it of one solid bone, or even of two or three, how often, when we jump, or fall from a height, would it be liable to fracture! Whereas, now, it is made up of a great number of small bones, so curiously put together as to form two arches, one of which has for its abutments the heel and fore part of the foot, while the other extends across the foot, from the second joint of the great toe to the small toes.

155. When we jump, or fall on our feet, the great elasticity of these two arches prevents them from being broken. They also render our walking much easier than otherwise it would be.

156. The teeth are curiosities. They seem driven into the jaw-bones, like so many nails; and yet, when diseased, they separate easily from the jaw, or, as we say, become loose. Where not naturally exposed, they are mere bone; but, where they can come in contact with air, or anything solid or liquid, they are coated over with a hard substance, more like enamel than bone. Mere bone would soon decay; but this enamel, if well used, is almost incorruptible.

157. All articulate sounds are the result, in greater or less degree, of muscular action. The muscles which contract, or modify the voice, are, many of them, very small; but they have a wonderful degree of activity, and may properly be placed in the list of curiosities in this department.

158. It is said that the distinguished singer, Madame Mara, was able to sound one hundred different intervals between each tone. The compass of her voice was at least three octaves, or twenty-two tones; so that the total number of intervals was

twenty-two hundred. All these were comprised within an extremely slight variation of one-eighth of an inch. So that, it might be said, she was able to determine the contractions of these vocal muscles to the seventeen-thousandth of an inch.

150. Nor is the rapidity of muscular action much less in animated conversation. Speaking is even a sort of singing; and so is good reading. It is an established fact, says Dr. Jarvis, that some persons can pronounce distinctly fifteen hundred letters in a minute. The pronunciation of every one of these letters must require a distinct and double action of the muscles connected with the voice and enunciation; for each action contains both the contraction and the relaxation. There are, therefore, three thousand actions in one minute. Insects strike the air with their wings—so it is believed—many thousand times a minute.

160. Then, in writing, too, the rapidity of motion, in some of the muscles of the fingers which are most used, is truly astonishing; and, were it not for its commonness, could not fail to arrest often our attention. Who can calculate the muscular movements of a day's work in writing, consisting of ten thousand words! Yet this is not a very unusual day's work for some literary men.

161. Who among us has witnessed skilful dancing—especially the rapidity with which the motions of the feet follow and keep time to the music—without astonishment, and without involuntarily exclaiming, What a wonderful performance this would appear to be, were we not used to it!

162. But, perhaps, after all, there is nothing, except the neck-joint, more curious than the hand. No wonder David, the king, could say, when he looked at this little instrument, had he thought of no other part of the system, "I am fearfully and wonderfully made." Quite a large treatise was written on the hand, not many years ago, in England, by Dr. Bell; and a Youth's Book on the hand, for Sabbath-schools, has been recently published in Boston.

163. Among the wonders of this part of the human frame, is its capability of being formed into a drinking cup. It has even been called the cup of Diogenes. By a slight effort, as you know, it may be so shaped, that we may bring with it to our mouths several ounces of fluid. Dr. Lambe, of London, who held that man was not a drinking animal, because, in a pure state of nature, he could not *obtain* any drink, must surely have forgotten the hand!

164. But once more. The hand is so constructed that we can grasp with it bodies of almost any shape — square, cylindrical, or globular. We can hold an egg so closely in one hand as to conceal it from view entirely, and even to exclude from it both air and water.

165. Is there a mechanic in the wide world, who can so construct an artificial hand and fingers that they will hold, or enclose, with nearly the same facility and perfection, bodies of such various shapes? And if design, by the way, proves a designer, have we not here a proof of the existence of Deity, so palpable that "the wayfaring man, though a fool, need not err?"

SECTION IV. — PROPER HOURS FOR EXERCISE.

166. The general rise and fall of our strength — the regular ebbing and flowing of the tide of life — is nearly as follows. At retiring to rest, we are at what is called the bottom of our condition. The machine is run down, though it continues to go very faintly. Sleep winds it up, but not wholly. It is not till near the middle of the forenoon, that we reach the other extreme; viz., the "top" of our condition.

167. From that time, throughout the day, with slight elevations and depressions, there is a slow but steady decline of strength. The pulse shows — perhaps by its very increased frequency — a slight degree of fever; and there is present more or less of nervous excitement. In short, there is what might be called a miniature fever in our systems.

QUESTIONS. — What is the greatest curiosity connected with the muscular machinery of the human system? Why is this so remarkable? What is there peculiar in the construction of the spine? What great and important advantages does this construction secure to us? Is there anything curious about the patella? Why is the foot a curiosity? How many bony arches has this instrument? What good purposes do they subserve? How are the teeth a curiosity? What is there which is wonderful in the construction of the vocal organs? What is said of Madame Mara? What does Dr. Jarvis say of the rapidity of pronunciation? What is said of insects? Is muscular movement rapid in writing? How is it in dancing?

What, next to the neck-joint, is, after all, the most curious part of the human frame? What did David say of himself? Who have written extensively on the hand? What was sometimes called Diogenes' drinking cup? What is said, in the text, of Dr. Lambe? What is the greatest wonder, after all, in this little world of wonders — the hand? Can any known mechanic imitate it? What religious reflection are we prompted to make here?

168. This fever is more or less apparent, in proportion as the system, in general, is more or less vigorous. In very feeble persons, it is sometimes considerable. So it is in those whose conduct has been, during the day, very irregular, or who have set up very late at night, or have eaten very large or very unwholesome suppers.

169. It is a law of the physical world, no less than of the moral, "To him that hath shall more be given." In applying this rule in the case before us, it may be said that, in order to render exercise the most useful to the human locomotive system, it should be taken when that system is most vigorous. In other words, the best hours for exercise, are those in which we are nearest the top of our condition.

170. The first hours after rising, are not, then, the best for this purpose; though many appear to regard it so. They come in somewhat later. True, we are restored, in part, by rest and sleep; but it is a fact well known to physiologists, that, as a general rule, our strength, for several hours after rising, is on the increase, so that we are not at the top of our condition till nine or ten o'clock.

171. The middle of the forenoon is the best for exercise. But then this period is not only the best for exercise of the locomotive system—it is best also for everything we have occasion to do. It is the best for mind and heart, as well as body. Of course, I do not mean by this that no other hours of the day will answer this purpose. Every hour is unspeakably valuable, even for exercise; only some hours are more valuable than others.

172. Observe, also, that by commencing our muscular exercise very early in the morning, and with great moderation, we gradually gain power; so that, when we come to the middle of the forenoon, we are actually stronger than we should have been, had we been idle all the while up to this hour. On the contrary, by laboring violently in the morning, rather than moderately, we not only prevent such increase of vigor, but injure ourselves for the whole day.

173. Those who divide their time between labor, study, and recreation, would do well to labor during the early part of the day; at least, as soon as their personal duties and morning devotions are finished; and attend to recreation in the afternoon. In fact, it is labor or study, except in the case of the *very young*, that makes recreation necessary.

174. What I have said, thus far, refers to exercise which is of the right kind; such, I mean, as, when taken, brings into activity all, or nearly all, the muscles of the body. Agricultural and horticultural exercises, conducted, as they are usually, in the air, do this; and so do many of our mechanical employments. With a few of the latter, however, and with study, it is the reverse.

175. Study, it is true, might be pursued in the open air much more than it is, as well as combined, much more than it is now, with bodily exercise. In the days of Aristotle, it was so, to some extent. His disciples were called *peripatetics*, or *walking students*. In better future periods of the world's history, this union will probably be restored.

176. Until the arrival of this golden period, our students must use bodily exercise at such seasons as they can get it. The 450 muscles, with the 250 bones, and a still more numerous host of tendons and ligaments, require, especially in the young, a much greater amount of exercise than is usually allowed them; and, if they do not have it, they become diseased, as we shall see hereafter.

177. Those individuals, also, whose employments are at once sedentary and secluded, must avail themselves of every opportunity which offers for using exercise in the open air, especially in the early part of the day, and at the forenoon recess. The evening air is, however, unfavorable for this purpose, especially if the dampness is considerable.

178. There is a most excellent arrangement at the factories of some portions of middle Europe, by which the inmates are furnished with a small piece of land, which they are obliged to cultivate a certain number of hours daily. Happy would it be if this custom were imitated in every other country.

QUESTIONS. — What great moral law is applicable in physical matters? What is the best time for exercise? Why is the middle of the forenoon better than the hours next after rising? What is said about a miniature fever? In whom is this fever most apparent? How may we add to our general vigor in the management of our exercise? How may we diminish it? What method of arrangement is recommended in 173? What is said to be the right kind of exercise? Is not exercise at any hour of the day, if of the right kind, better than none? Should our studies and sedentary employments be conducted, much more than they now are, in the open air? Was it so in former times? If we do not have exercise enough, what is the consequence? Is the evening air, if damp, favorable? What excellent custom prevails in middle Europe?

SECTION V.—HEALTHY EMPLOYMENTS.

179. It is a remarkable fact that, as a general rule, those employments which are the most useful to mankind are, at the same time, the most healthful. There may be exceptions to this, as to most general rules; but they are certainly few; and, as in other cases, they serve but to confirm and strengthen the main principle.

180. Agriculture and horticulture, for example, the most necessary employments of mankind, are the most healthful, at least if properly conducted. They afford the greatest variety of exercise—that exercise is performed in the open air, and in the sun's light—and it can be conducted better than many other employments, in moderation, and without that occasional violence to which other employments sometimes necessarily subject us.

181. But agriculture and horticulture, after all, are essentially the same thing. A field is but an extended garden, just as a garden is but a small field. The time will doubtless arrive when we shall combine the two. In other words, no more land will be cultivated than can be attended to with all the care we now bestow on our gardens. It is, indeed, passing strange that it should not be so now.*

182. Next to agriculture and horticulture, in their influence on health, are housebuilding, housekeeping, masonry, tanning, currying, chair and coach making, rope-making, etc. And yet, even in these, the more we trench upon the world of fancy, the more we approach the region of ill health. Fancy—perhaps I ought to say fashionable—housekeeping, is one of the most unhealthy of human employments; and even fancy horticulture is far enough from being as healthy as that which is legitimate.

183. But we must have clothing, you will say; and you say truly. We must have coats and hats, as well as shoes. The manufacture of these necessary articles is, however, more or less healthy, according as it is conducted more or less on the principles of sound science and good sense.

184. Boots and shoes, for example, were once made in very hot rooms. Their manufacture, it was said, rendered

* That "a good garden will half support a family," has become almost a proverb; and yet, instead of cultivating two gardens and thus wholly supporting a family, we nicely cultivate a small — often a very small — spot, and half cultivate some dozens or scores of acres of land beyond it; though, in so doing, we labor harder, and pay heavier taxes, and are not so well supported as we should be in better cultivating a much smaller space.

such a heat indispensable. But they are now often made in cool, airy rooms. Instead of being performed in a bad position, much of the work, not done by machinery, is now performed by the workmen while standing.

185. Many of our employments, in their influence on health, are of a mixed character. Such are iron and brass working, paper-making, stone-making, pottery, and grinding. These are certainly more or less useful; but they are also more or less unhealthy, too, according to circumstances. Some of them might be so managed as to be but little objectionable. And all of them might be so alternated with exercise in the open air, during certain hours of the day, as to be far less detrimental to health and happiness than has usually been supposed.

186. As for distillers, snuff and cigar makers, maltsters, gilders, lead and copper workers, painters, druggists, butchers, and grocers, they are, many of them, not only useless in society, but an absolute incumbrance. For distilling, snuff and cigar making, and malting, there can hardly be an apology.

187. Thousands, who have lost their health by attempting to pursue, too long, some of the more doubtful, not to say injurious, employments, have not only been restored, but, as it were, rejuvenated, by moderate labor on the farm, or in the garden. But if the remedial influence of agricultural and horticultural exercise is so salutary, why should not their sanitary or preventive influences be at least equally so?

188. One employment—if, indeed, it can be called by this name—remains to be mentioned as having, always, a health-giving tendency. I refer to going about doing good, as did our Saviour, Paul, Howard, and others. It is true that Howard lost his health *while* doing good, but it was not as a consequence of it. There is nothing known, which, for a tendency to promote health, can exceed or even equal it.

189. Why it is that doing good exerts such a salutary influence on the body, it may not be easy to say; but the fact is undisputed. Walking to do good, is, indeed, more healthy than riding, which is readily accounted for. But, even if we ride, it is healthy. Doing good keeps our minds from preying upon ourselves; which is one important advantage. Observe, also, that it causes a determination of the fluids of the body to the surface; which, in moderation, is always healthful.

190. Should it be said that going about to do mischief is also healthy, I reply, that this remains to be proved. The doer of mischief usually has inherited, from less fallen ancestors, a large

stock of health to begin with; for we seldom, if ever, find the puny and feeble employed in walking up and down the earth, seeking whom they may devour. I do not think it can be shown that malevolence itself, when acted out, ever made its possessors more healthy. If healthy at all, they are so in spite of their malevolence. But that benevolence produces such effects, under all circumstances, is undeniable.

SECTION VI.—HEALTHY AND UNHEALTHY AMUSEMENTS.

191. It is not always easy to draw the line of demarcation between such exercises as are properly labor, and those which better deserve the name of amusement. The reason is, that labor, with some persons, is always an amusement, and, with the most of us, occasionally so. And yet there is, as I think, a clear and obvious distinction.

192. That is always amusement, for example, which has for its end—its only end—the present gratification of ourselves or others. Its results may be, in some respects, useful; but this does not make it labor. The good results are not *aimed* at; they are only accidental. On the other hand, that is truly and properly called labor, which is performed solely, or chiefly, from a sense of duty to ourselves or to others. It may be pleasurable; but the pleasure, in such cases, is incidental, not sought after.

193. If an individual is fond of his employment, and finds it healthful, and if he pursues it moderately, little other amusement will be necessary. Or if any, it will consist of what is called passive exercise; such as sailing, riding in a canal-boat or railroad car, or in a very easy carriage, or playing at chess, or at geographical or conversational cards, or reading newspapers, or free and light conversation.

194. But if his employment, though healthful and moder-

QUESTIONS.—Are the most useful employments those which are the most healthful? Are there no exceptions to this rule? Which are among the most healthy employments? Why are they so? What are next, in point of healthfulness, to farming and gardening? What is said of boot and shoe making? What is said (185) of "mixed" employments? Name some of the employments which are decidedly bad for health. How have some of our invalids been restored? What natural inference is here made? (187.) What employment is pre-eminently healthy? What particular effect has doing good on the mind? What on the body? If going about to do good is healthy, why is not going about to do evil?

ately pursued, is pursued amid bad air, or in an unnatural or unhealthful posture, amusements which are more active will be demanded—such as more free and extended conversation, exercise on horseback, or in an ordinary carriage, walking, shuttlecock, vocal and instrumental music, and the like.

195. If the employments of an individual are within doors,—in air mingled with dust, fumes of poisonous metals, bad gases, or injurious exhalations, animal or vegetable,—as much active amusement will become necessary as he has strength for, and frequently much more than his inclination would prompt him to take. For the oppression which his nervous system has received through the lungs, in these cases, will be apt to indispose him to amusement, unless it is of a passive kind. His exercise should also be taken in the purest air.

196. And then, if, in addition to all the other evils to which I have referred, your employments are sedentary, not only will much exercise in the open air become necessary, but it must be such as will call into special activity the lower limbs. We should never forget that, all other things being equal, they are the best amusements which call into exercise those parts which, in our ordinary duties, labors, or exercises, are unemployed.

197. This last case includes students at school, no less than tailors, milliners, boot and shoe makers, etc. Those who are in the schoolroom six hours a day, five or six days of each week, for the greater part of the year, must have a large amount of active amusement, or they must perish. All their amusements, moreover, should be as active as possible, provided they are not too violent.

198. Here, did my plan permit, I should like to particularize. But I will only say, in this section, that ball-playing, leaping, running, jumping, &c., are among the needfuls; and that dancing, fencing, and swimming, are the nearest approach to the world of passive amusements which the nature of the case will possibly admit.

199. I would also observe that, for those whose minds are necessarily occupied with their employments, such amusements will be most salutary as take their thoughts, for the time, quite away from their business, studies, or perplexities; and that the lighter, so to call them, their new thoughts are, the better. Nothing is more common than the mistake of thinking we amuse ourselves, while the mind reverts more or less to its old channels; or, as we say, to its mill-horse track.

200. I must protest, here, against all amusements which

savor of cruelty. They have their advocates, it is true, as well as their opponents; and this, too, among the philosophers, the physiologists, the chemists, and the theologians, no less than among the naturalists and the poets. For hunting, fishing, trapping, etc., it is perfectly easy to substitute botanical, geological, and mineralogical excursions.

201. And, after all, amusement may be had — doubtless will be had, in the world's best days — which will combine duty, usefulness, and pleasure. It is, to say the least, very doubtful whether many persons have been more amused than Howard was while laboring in behalf of the suffering. Can anybody seriously look upon such men and women as Paul, Luther, Whitfield, Brainard, Fox, and Dix, as needing amusement beyond the gratification of their own impulses to do good? And would children, who were imbued with the same spirit, need it much more?

202. Above all, who can think of the Man of Nazareth, either in his boyhood and youth, or at Capernaum or Jerusalem, or in making the tour of Galilee, as needing what is commonly called amusement? And would *he* need it — whether man, woman, or child — who, with a heart as full of benevolence as Christ's, should like him go about, feeding the hungry, clothing the naked, instructing the ignorant, reclaiming the vicious, curing the sick, exorcising those who were possessed with evil spirits, and raising to life the dead?

203. On this point, however, I must confess I speak with some diffidence. It may be true, despite of all I have said, that the Man of Nazareth, in order to be a *perfect* man, should now and then join the ranks of the ball-players, kite-flyers, skaters, and coasters. But of one thing at least I am sure, that he would not need, for health's sake, to forego anything which is of an upward or heavenly tendency, for the sake of mere selfish or animal gratification.

QUESTIONS. — What is the difference between labor and amusement? If an individual loves his employment, does he need amusement? Which kind — active or passive? What are some of the passive exercises? What are active exercises? Who need these? What is said (195) of those who are much confined in bad air? And if, in addition, their employments are sedentary, what shall be done? Who require much exercise of the lower limbs? What is said, in particular, of those who attend school?

What is said of the thoughts, during amusement? Should these be changed, or should the mind keep on in a mill-horse track? Are we to avoid those amusements which savor of cruelty? Name some of them. What can be used as substitutes?

SECTION VII. — AMUSEMENTS ADAPTED TO MALES.

204. There can be little doubt that boys and young men require, for amusement, as a general rule, more active and vigorous — at least more exposed and more violent — exercises than females; though we shall see, in another section, that not a few have, in the details of practical life, carried this principle very much too far.

205. Every boy, of suitable age to go abroad, after having been properly protected by suitable clothing, should not only be permitted but required to go abroad daily, in the open air, and occasionally to face a "stiff northwest wind." By a proper protection, I do not mean muffling or wrapping up to excess, but only such clothing as is reasonable.

206. Boys, who are ten years of age, require amusements in the open air, of some sort, and exposure to nearly every variety of weather, daily. Few can be found, at this age, who do not need to be out of doors at least four or five hours a day; and six or eight, or even ten, would doubtless be preferable, except in the severer storms.

207. A great mistake was made, by a teacher of eminence, in one of the interior towns of Massachusetts, many years ago, in a place where boot and shoe making was the order of the day. Believing in the necessity of change, but not understanding the principle, he sent all his male pupils, who were old enough, for several hours a day, to the low, old-fashioned shoe-bench; and this, too, in rooms entirely unventilated!

208. Who has not heard of "jumping out of the frying-pan into the fire"? This last came as near to it, as anything of which I have heard. Those who are confined to the school-bench six hours or more, might, it is true, often adventure for exercise into the garden or field; but they should seldom be employed in the mechanic's shop or the factory.

209. It is not a very great violation of nature's laws for the young, who have been confined six hours in the schoolroom, to make a good deal of noise when they are out of it. This, of itself, is a species of recreation or amusement. Moreover, it exercises the vocal organs and the lungs. I know well, that it

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In the best days of the world, will much amusement, properly so called, be required? Did Howard probably need it? Did Paul, and other doers of good? Would people now-a-days who were trained in the same spirit? What is said of the Man of Nazareth? On points like this, should we speak with diffidence? Of what one thing, in regard to our Saviour, may we be sure?

is sometimes very annoying to us, their seniors; but it ought not so to be.

210. I may not be able to explain how it is that out-of-door exercise is so much superior to that within doors; but the fact itself is unquestionable. No person of much observation can be found, who has not experienced its superior benefits a thousand times over. But, in saying this, I do not mean to undervalue athletic sports, or gymnastic exercises — when nothing better can be had — in air which is not quite so good, and in space which is somewhat contracted. Athletic exercises, for males, are good everywhere.

211. It is on this account, that running, leaping, jumping, fencing, hunting, and even wrestling, have, in many parts of the world, and in various ages, obtained so wide a reputation. Even now, we find they have many advocates; and, were it not for the cruelty of one or two of them, and the danger of breaking limbs and necks which is consequent upon at least one of the others, they would have a greater number still. To the first three, at least, I believe there can be little objection.

212. Skating, sliding, and coasting, as it is called, are to be commended, on the same general principles. So of swimming. It is not to be denied that danger is incurred, even here. And yet, with due precaution against what are called breathing-holes in the ice, and against plunging into cold water and remaining in it too long, when over-heated or over-fatigued, they can hardly be regarded as objectionable.

213. Climbing is also an excellent amusement, provided always that due caution is observed and maintained. For want of this, I have known many collar bones broken, and many shoulders dislocated, to say nothing of severer injuries. And what is more common than for a somewhat decayed limb to give way, and leave the individual hanging by his shoulders, or precipitate him on a fence, or on the rough ground? Several young men with whom I set out in early life, were injured in this very way.

214. You will ask, perhaps, what I think of the gymnasium. I have already alluded to it (210). Under proper direction, and for some of the young, such as are so situated that they cannot do better than resort to it, I am much inclined to speak of it favorably. And yet, in a vast majority of cases, the farm, the blacksmith's or carpenter's shop, the mill-pond, or the saw-horse, is preferable.

215. It is, on the whole, advantageous for boys to be early

introduced to manual labor of some sort, especially to that which is conducted in the open air. It was a custom among the Jews — I believe it is so among the Mohammedans — for even the wealthiest parents to train up their sons, every one of them, to some handicraft or other. The great Paul, as you know, was a tent-maker. Nay, our Saviour himself worked in his early life at the trade of a carpenter.

SECTION VIII. — AMUSEMENTS AND EMPLOYMENTS FOR FEMALES.

216. The propriety of having our young females go forth into the fields, roads, woods, and waters, for the purpose of amusement, in company with the other sex, at least without the presence and guidance of their parents or teachers, may very properly be questioned. Amusements designed for the sexes, indiscriminately, should be under the parental eye, and at the domestic fireside; and should usually be confined to the afternoon, and the earlier hours of the evening.

217. It has been thought, by some, that females do not need active and vigorous muscles, and strong and sturdy frames, quite so much as males. And this doctrine has been defended on the ground that, by nature, their muscles are softer and feebler, and their strength and power of endurance much less, than ours. But who shall determine whether all this is the result of nature, properly so called, or of mis-education?

218. We must doubtless admit that woman is not so strong in her arms and chest as man; and that her shoulders are relatively narrower, and, of course, not so well adapted to exercises which require great physical strength. But then she is much

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QUESTIONS. — Do males require more active and vigorous exercise than females? What should be required of every boy who is over ten years of age? Should he go out carefully wrapped and muffled up? How many hours ought he to be in the open air, if possible, every day?

What mistake was made by a Massachusetts teacher? What might he have done with his pupils? Should schoolboys never be sent into the mechanic's shop or the factory? What is said of noisy pupils out of school? Can we account for the vast advantages derived from out-of-door exercises beyond those which are within? Are athletic exercises good everywhere? Wha is said of hunting and wrestling as amusements?

Are skating, coasting, and sliding, to be regarded as healthful and proper amusements? Is swimming recommended? Under what cautions should it be resorted to? What are the cautions to be observed in climbing? What is said about the gymnasium? What in general are preferable? Should every boy be brought up to manual labor of some sort? What eminent examples have we, in history, of such bringing up?

more the subject — nearly in the proportion of two to one — of heart and lung and nervous diseases, than our sex. Does not this indicate a necessity of developing the lungs and upper extremities, and the whole muscular and bony system, to the fullest practicable extent?

219. It is true, I would not assume the responsibility of employing young women to dig canals, or build roads, or work in mines; or of sending them to the public works with spade, pick-axe, or crow-bar; either as a recreation, or as a duty. Nor do I think they should engage in the coarser athletic sports. But they might saw wood with a light saw; and, perhaps, occasionally use a light hoe and spade.

220. Far better exercises for young women are found in pruning vines, and watering plants and flowers; weeding or gathering strawberries; collecting fruits of every kind; budding, and grafting, and setting out trees. The latter duty — that of setting out and taking care of those things which are expected to last many years, like shrubs and trees — are initiatory to higher and nobler offices; and therefore have a good moral bearing, no less than physical.

221. Young women should also be trained, from the first, to the habit of doing errands of kindness and mercy. Such errands would at once expose them to light, pure air, and exercise; would greatly diminish the necessity of other and more doubtful amusements; and would form them to habits of benevolence, if not to those of practical Christianity. It is difficult to say whether they would conduce most to the well-being of the soul or the body,

222. Travelers tell us it is no uncommon thing for the women of England to walk fifteen or twenty miles a day, without much fatigue. Now, very few American women can walk half that distance, daily, without great suffering. Dr. Jarvis even tells us of a New England mother, who, though she labored tolerably hard, and was counted moderately healthy, had never felt able, for forty years, to walk as far as the church she attended — a distance of only about a mile.

223. This story, if true — and it probably is so — is sufficient to show that there is something radically wrong in our female education. A woman who is able to superintend her domestic concerns habitually, and who is worthy of being regarded healthy, should be able to walk many miles a day. If she counts herself healthy now, such walks would make her still *more* healthy.

224. Is there not, however, great reason to fear that a regard to fashion had more to do, in the case I have just mentioned, than we are aware? Had it been as respectable to walk to church as to ride, is it not quite possible this mother would have found herself equal to the task? The more we walk, the more we may; and the more we use our muscles and bones in walking, the more firm and vigorous do they become for other purposes. This is so, I mean, if our exercises are not too violent or too protracted.

225. Woman, in fact, engaged as she is much of the time within doors, needs out-of-door employments, and even muscular ones, far more than man; especially the farmer, laborer, or mechanic. To him, sedentary labors, and even sedentary or passive amusements, may sometimes be a luxury; but, with woman, the reverse is true.

226. Of course, I would not have women amuse themselves in climbing, jumping, or other violent exercises; nor, above all, in fencing, wrestling, gunning, and fishing. But I would have them dance, among other things, as an amusement; not, of course, in the promiscuous way that many do, nor late at night; but rather in their own family, or that of their own very familiar neighbors.

227. I would have women trained to swim — not, indeed, in an exposed manner, but under those circumstances and with those needful precautions which Christian enterprise and delicacy know how to provide. We waste enough, on woman herself, in mere luxuries, every ten years, to give to all our mothers and daughters the pleasant, agreeable, and healthful privilege of swimming an hour or so a day for six months of the year, in as much retirement as could be desired.

228. Such an exercise, judiciously conducted, with other out-of-door exercises — for the matronly eye must be there — would, in less than two centuries, reduce our deaths from consumption from seventy thousand to fifty thousand annually; and our deaths from heart and nervous diseases in similar proportion. In three centuries the mortality might be reduced one half. Woman would not die with it, in short, much oftener than man.

229. This foe to health and humanity — with many others of the same general character — could never thrive in a world begirt with a belt of air forty-five miles thick, and an abundance of water in the springs and in the clouds, would we but condescend to make a wiser and more grateful use of them.

230. When, O, when shall women be redeemed from conventional bondage to that which, in the Christian comparison, does not profit? When shall come the hour of true and needful emancipation from the body, and from that which tends, at once, to hamper and destroy it? When shall she, in apostolic faith and love, cease to slight the truth and word of God by her slavery to tables, and toilettes, and pots, and kettles?

"Fly swiftly round, ye wheels of time,
And bring the joyful day."

SECTION IX. — VIOLENT EXERCISE.

231. Excessive or violent efforts, either in labor or play, are usually productive of greater or less evil. It is indeed true that the infliction of the penalty, for transgressions of this sort, is not always immediate. The effects of poison — lead, for example — have been first manifested at the distance of many years after inhaling it. So, to some extent, it may be with regard to violent or excessive exercise (62, 119).

232. Thus, for a wager, or even for sport, men will sometimes lift weights and make other muscular efforts, which overstrain their muscles. But as the suffering which follows immediately is not very considerable, and as the act is accompanied by a good deal of exhilaration, they vainly hope they have done

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QUESTIONS. — Should females engage in the coarser out-of-door exercises, in company with the other sex? What should be the place for female amusements? Has it not been usually thought that females do not need strong frames? How far is this view correct? To what fatal diseases are females more subject than males? What, in their treatment, is thus required of us?

Should females ever engage in the coarser labors of the field or of the public works? Should they have aught to do with the coarser athletic sports? Name some of the amusements and employments which are proper for the female sex. What is said of errands of mercy and kindness? Might these often be a substitute for other amusements? Would the moral tendency of this be favorable?

What do travelers say of the English women? Are our American women constitutionally different, or is their inability to walk attributable to other causes? Relate, if you please, the story from Dr. Jarvis. Has not fashion a great deal of sway in this matter? Why does woman really need muscular out-of-door exercises more than man? Should she climb, jump, &c.? What is to be said of dancing? Should she be trained to swim? What would be its advantages? Is such a thing practicable? How does its practicability appear? What effect would this exercise, and other out-of-door employments, have in diminishing the present mortality from consumption, heart diseases, &c.?

themselves no harm. They hope so, I mean, if they have any reflection or thought about them.

233. But by and by — perhaps after the lapse of years — they are troubled with rheumatism. What is the cause of their suffering? They seem to think — at least, many do — that it is incidental to their condition. Man, say they, is a poor, frail creature. They may not mean this as a reflection upon the character of Him who, they suppose, made him so. But is it not such a reflection? Should they not — would they not, were they rightly informed — lay the whole blame upon themselves?

234. To blame the great Creator, directly or indirectly, for these ills, would be about as wise in us, as it would be to blame the machinist who constructed a certain steamboat boiler, because, though it did not burst the first time it was overstrained, it yet gave way after the strain had been ten or twenty times repeated.

235. Now children are constituted to live on. In other words, they are very tenacious of life. Once overstraining the boiler does not appear to do them much injury. The restorative or recuperative powers of the system are very great. But the violence is repeated again and again. Rheumatism or other disease overtakes them in after life, at such a distance that they seldom, if ever, so much as dream of any connection it may have had with the violence which had been inflicted several years before.

236. During the exhilaration which, in many children, accompanies their amusements, they are quite liable to go beyond their strength. One who had not reflected on the subject, might be surprised to know what amazing power the mind has, in this respect, over the body, to render it for the time insensible to fatigue. And though there may be and is a great difference, in this particular, among children, they are all more or less liable to danger.

237. On this account, were it for no other reason, much amusement in large companies is objectionable. Both the stimulus of numbers, and our natural ambition, tend to excite us unduly, and we are generally more liable to go beyond our strength, than when the number of associates is quite limited.

238. This remark is particularly applicable to what might be called extra amusements, as of the gymnasium or the dance. Amusements which are of every-day occurrence, and are imitations or types of nature rather than of art, are not so often pro-

ductive of mischief as those which by being rare are approached with that kind of eagerness which tends to over-indulgence and excess.

239. The same exhilaration affects laborers of every age, especially of that class most liable, from the first, to be borne away by excitement. Though it is true that great days' works, performed under the influence of high excitement, may, in virtue of what might be called an iron constitution, be borne awhile, they yet strain the boiler, and, if it does not explode at once, its attraction of cohesion is diminished; or, in other words, it is weakened. The straining is repeated, from time to time, till by and by — perhaps just as we begin to think the "high pressure" perfectly safe — it bursts!

240. Other illustrations of the danger of violent or excessive exertion might be presented in this connection; but a statement of facts, which the reader may find in the concluding section of this chapter, will answer every possible purpose, and save much needless repetition.

SECTION X. — ROUND SHOULDERS.

241. How distressing it is, to a sensitive mind, to see young persons, only eight or ten or twelve years of age, becoming round-shouldered, like their aged parents or grandparents! For to be round-shouldered, is to be deformed; and why should children, at an early age, be deformed like those who are suffering the pains and penalties of fifty or sixty or seventy years of moral and physical transgression?

242. Do you know, reader, what causes round shoulders, particularly in the young? Why is it that we can hardly find a group of twenty or thirty children, in a schoolroom or elsewhere, without finding three, four, five, or ten, who are already, in greater or less degree, bent out of their natural shape?

243. Much depends, no doubt, on sitting a long time — from

QUESTIONS. — Are excessive or violent efforts always followed by more or less of suffering? Is the penalty always immediate? Give an example of long delay. What is sometimes done for a wager? What are the consequences? What is then apt to be said, by the sufferer? Is this to place the blame where it ought to be placed? What example is given to show our folly and weakness? Are children very tenacious of life? Repeat the comparison, borrowed from the steamboat, to illustrate this point. What is said of the exhilaration which often accompanies amusement? Has the mind great power over the body? Why is amusement, in large companies, objectionable? What is said of *great days' works?*

day to day — in a bad position. God has kindly given to each of us a pair of shoulder-braces — I mean, of course, the collar bones. Naturally, we need no artificials of this sort, though many use them. Nature's own are about six inches long in an adult, and as large as one's finger. One end of each of these collar or brace bones is placed against the top or point of the shoulder, and the other rests against the breast bone.

244. In children and youth, both ends of each of these bones are soft. It is not till we come to maturity that these are completely ossified, or changed into bone; nor do they always become perfectly solid, even at this age, especially in those who have feeble or diseased constitutions.

245. If, while we are young, we sit a great portion of our time with the shoulders thrown forward too far, we compress the soft cartilaginous ends of these bones, and the cartilages gradually yield and are absorbed, as it is called, so that the braces become too short, and the shoulders remain too far forward. Thus we are made, at length, round-shouldered.

246. Now, besides giving us the appearance of age or disease, while we are yet in years but children, this deformity is attended or followed by many disadvantages. I will not promise to enumerate them all, but will just advert to some of the more prominent.

247. The first inconvenience which arises from having our shoulders on the fore part of our bodies, instead of having them at our sides, where they naturally belong, is, that we cannot use the arms so freely on account of it. Round-shouldered people lose much of the benefit which the Creator intended to bestow on them.

248. Secondly. While we are becoming round-shouldered, we are compressing and cramping the chest, and preventing free motion of the lungs. No round-shouldered person can take in or dispose of as much air as he could if his shoulders were straight. This, as we shall hereafter see, is no trifling evil.

249. Thirdly. This deformity, when considerable, is an annoyance to the heart, the stomach, the brain, and all the internal machinery. None of these can perform their offices so freely, or with so much energy, when the shoulders have gradually crept round from side to front, as when they have remained in the place which God in nature assigned them.

250. The tendency, moreover, in all this, is from bad to

worse. If we could stop where we are, it would seem less necessary to protest against the conduct which produces such serious results. But I know of no stopping-place. The true course is to avoid the first steps in a road so dangerous, and from which we are so unlikely ever to diverge.

251. I trust I have made myself intelligible. It is not sitting with the shoulders thrown forward too much for a few moments at a time, that does the mischief I have described, but the habit of sitting thus, for a long time together. The young, in their amusements, or even their employments, may bend into all sorts of shapes, if they will remain in them but a minute or so, and then bend back again. This remark is particularly applicable to the habit of bending forward at study.

252. In general, there is no necessity of throwing the shoulders forward, if the benches and desks are as they ought to be. If these are not too near together, it will be sufficient for every purpose, in writing, drawing, &c., to recline the head more or less, the body remaining the same. Provision is made, in the neck, for permitting this to remain slightly bent for a considerable time without injury; but it is not so with the spinal column below it.

253. Or, if to bend the neck is not quite sufficient, you may bend, also, at the hips; that is, you may carry the upper part of your body forward without making any bend at all between the neck and the junction of the body with the hips at the hip joint. This bending will, in general, be sufficient for all ordinary purposes.

254. I have alluded to the condition of the desks and seats. The height of the seat makes comparatively little difference. But the desks in our schoolhouses are almost always too high or too low for the seats; seldom, if ever, just right.

255. Some of them are so much elevated above the seats, that the pupils who sit at them have been sarcastically represented as hanging on by their chins. A far greater number of schoolrooms, however, have desks so low, and the pupils are so careless about sitting upright, that they are continually in danger of becoming round-shouldered.

256. I will only add, just now, that many pupils, when they stand, in the schoolhouse and elsewhere, throw their shoulders forward almost as badly as they do in sitting. Writers on this subject have sometimes applied here, too, the keen edge of rid-

icule, and have compared them to so many turtles or tortoises, with their crouching heads drawn half way into their shells.

257. If they have anything to say, while in this position, they usually make bad work of it; for a bent tube — and the windpipe is a tube — is not so good a medium for the transmission of sound, as every good singer well knows, as a straight one. And bent the windpipe must be, inevitably, when the head and shoulders are pitched forward in the manner I have described.

SECTION XI. — SPINAL DIFFICULTIES.

258. Few things are more common among the young of modern times — especially among the young of the female sex — than spinal complaints. Dr. Warren, of Boston, appears to think that, within the sphere of his own observation, "about one half" the females, at least among those whom he calls the well educated, "are affected with some degree of distortion of the spine." And Lachaise, a French author of eminence, mentions a circle of twenty-two young ladies of his acquaintance, over fifteen years of age, only two of whom were wholly exempt from it.

259. What Dr. Warren calls the "well educated," I should never dare to designate in that way. He should have said, *fashionably* educated. Or he might have said, *intellectually* educated. Their minds are filled with learned lore, as a bottle may be filled with liquid; their fingers are taught to thrum the piano, and their feet to dance; but they are far enough from being as well educated for usefulness as the great majority of those who receive less instruction at the higher schools.

QUESTIONS. — Why do we so much dislike to see the young round-shouldered? What, in general, is the reason for this appearance? Are round shoulders very common? What are nature's shoulder-braces? How do these get shortened? What is the effect when they are thus shortened? How does sitting in a bad position affect these bones?

What is the first inconvenience or evil which results from being round-shouldered? What the second? What the third? Is the tendency, in these cases, usually from bad to worse? Is it sitting badly, for a few moments only, that does the mischief alluded to? What is it said the young may do, in their amusements? Sitting badly at school — what is said of this? Are our pupils generally furnished with good desks and seats? Who may be said to be suspended by their chins? Who may be compared to turtles, with their heads partly drawn into their shells? Why is the voice bad when we bend our heads forward while we read, sing, or speak? Do good singers endeavor to keep their windpipes straight?

260. These last, however, — such as I call well educated, — have, indeed, in very many instances, a degree of spinal distortion; but not as in France, to the extent of *ten-elevenths*, nor as in Boston, to the extent of one-half. Still, it is not easy to find a group of half-a-dozen girls, or older women, without more or fewer crooked spines among them. Nor is the deformity wholly unknown, even among boys.

261. Those of either sex, who have round shoulders, frequently have crooked spines in addition. The very individuals who feel either so weak or so indolent that they can with difficulty support themselves in an upright position, and hence suffer their shoulders, with the super-incumbent head and neck, to pitch forward and compress the collar bone, lungs, heart, etc., are the persons who feel unwilling to sit up straight when they write, draw, etc.

262. You will almost always find them, when at a desk, leaning upon it, with one shoulder — usually the right — more or less elevated than the other. Now, if the right shoulder is higher, the left is of course lower, than the other. And if one shoulder is higher or lower than the other, there must be, at the same time, a curve or twist in the spine, in the same proportion. And then, again, if the spine is curved above, there will be a corresponding curve below.

263. Now, as I have elsewhere said (152), there is a large hollow groove in the spine, which is completely filled by that soft and delicate projection from the brain, which we call the spinal marrow. This delicate spinal marrow or cord will not bear continued pressure; but, in all permanent curvatures, there is more or less of compression. This may have, and I can hardly doubt *does* have, something to do in the production of those spinal complaints which everywhere abound, and which, especially in fashionable life, are greatly increasing.

264. But this is not all. Distorted spines press upon the organs of the chest and abdomen in the wrong place, and thus have some small tendency to derange their functions. I do not know how much evil, in these cases, is the result of direct pressure, and how much results indirectly from pressure on the spinal marrow. The pressure, at all events, is always hazardous, and should be avoided.

265. Young people, of both sexes, like to have symmetrical frames, and perhaps sometimes envy the savages of the forest, and the slaves of our southern plantations, their exceeding great freedom from deformities of this sort. Many would give

almost any sum of money, if they were equally straight. Now, I do not wish to compel them to purchase symmetry by paying the price *they* have to pay.

266. Still I think a symmetrical body highly desirable, were it only for the sake of the mind which inhabits it; and I must think that some, at least, of what we call savage habits, are worthy of imitation. A young woman need not regard herself as a barbarian or a slave, simply because she does a little light work every day in the field, or because she carries burdens on her head, in order to teach the latter to sit gracefully on its pedestal.

267. Do not misunderstand me. I do not mean to recommend sudden and severe efforts at reformation, where physical education has been neglected up to twelve or fifteen years of age. Nor do I think it well, at any time, for even the strongest female to carry trunks weighing eighty or ninety pounds on the head, half a mile at a time. The burden should be in proportion to the strength and other circumstances of the individual.

SECTION XII. — DEFORMITIES IN GENERAL.

268. The employments of human society are becoming so minutely divided, that it is next to impossible for us always to work in a healthy position. How can he who is employed ten, twelve, or fifteen hours a day in sharpening pins, setting types, or dipping candles, or sewing or pegging shoes or boots, be otherwise than deformed?

269. If we stand all day at our employments, especially before the period of maturity, the foot must be deformed almost inevitably. The pressure of the whole weight of the body on its complicated though somewhat strong arches, must slowly, yet certainly, destroy their elasticity and beauty. The possessor, in short, becomes flatfooted; and walks less gracefully, as well as less easily, all the rest of his life.

QUESTIONS. — Are spinal complaints very common? What does Dr. Warren say of their frequency in Boston? What does Lachaise say of them in France? With what class of society are they most frequent? Are boys ever subject to them? Do round shoulders and crooked spines often go together? How are these complaints detected by position at a desk? Does a single spinal curvature ever exist by itself? Will the spinal cord bear much pressure? Do spinal distortions affect injuriously any of the internal organs? Are savages and slaves apt to be symmetrical? Would not a simpler course of life, or, in other words, a better physical education, prevent these diseases? Are they, on the whole, increasing?

270. An inspection and measurement of two thousand children, in a large manufacturing establishment in Great Britain, a few years ago, exhibited the following results: "The children were stunted and pale; their flesh soft and flabby; many had bent limbs; in most the arch of the foot was flattened; and several were pigeon-chested, and had curvatures in the spinal column." It is also added that ninety of the whole number bore the marks of rickets.

271. Here are data which must neither be despised nor neglected. We are becoming, to a very great extent, a manufacturing people, like those of Great Britain; and no power on earth, exterior to ourselves, can prevent, wholly, those terrible results to the human frame — under the same circumstances, I mean — which have followed the minute division of labor in other countries.

272. It is no trifle to have more than one thousand of every two thousand children with flattened — that is, deformed — feet; to have many with bent limbs; many more stunted; and ninety affected by rickets. This last item alone is enough to startle us, and awaken all our zeal and caution to prevent so dreadful an evil.

273. For, suppose that in every fifty thousand young persons employed in our United States factories, twenty-two hundred and fifty — for this is the proportion above — were to be deformed by rickets. This would be nearly one thousand for the single city of Lowell. Who can endure the thought of it? Females, however, suffer much more than males, in our factories; and their sufferings are apt to be much more severe, as well as more protracted.

274. But let us not deceive ourselves. It is not in cotton mills alone, nor yet in other places exclusively, where the operatives are obliged to stand all day long, that deformities are to be found. I have seen boys, only ten years of age, required to sit and peg boot-heels ten hours a day, till the whole bony system was nearly crushed under it; and this, too, in the very heart of New England. And if these things happen in the early stages of our manufacturing operations, what shall be in the end?

275. We should not forget that the bones do not get hard at their extremities, and throughout their whole extent, till about the twenty-fifth year, in males, and the twenty-second, in females. Now what shall prevent the young of both sexes, if they sit or stand ten or even six hours a day, from becoming,

in time, more or less mis-shaped, not only in body but in mind? Nothing, most certainly, short of miracle.

276. They who sit too much with their hands supporting their heads, while they are poring over their books, will, in this way, throw back their shoulder-blades, and cause deformity in that direction. Those who sit too long with their right arm on too high a desk, in writing, drawing, sketching, or anything else, must inevitably have crooked spines. Those, too, who, for any reason whatever, stand habitually twisted, misplace both the shoulders and the hips, by that double distortion of the spine of which I have spoken at 262; besides becoming, in time, flatfooted.

277. It is not severe labor, so much as that which is performed in unnatural positions, which stunts, deforms, or weakens the human frame. The farmer, whose exercise is chiefly in the sunlight and open air, may work hard twelve or fourteen hours a day, all his lifetime, and yet never suffer much from deformities or infirmities, provided all his physical, intellectual, and moral habits are correct.

278. But let it not be supposed that I would recommend — much less tolerate — twelve or fourteen hours of hard labor daily, even on the farm. It may be little more advisable — possibly little more healthy — to deform or stunt the mind, than the body. Yet this mental deformity is not uncommon; and, what is more painful still, with all our boasted cultivation and light, it does not seem to be diminishing.

279. Our increased reading no more increases, of necessity, our health of mind, than our increased facilities for indulging the stomach render us more healthy in body. In truth, it is a fact of ominous import, that in the midst of mental and physical abundance, neither the physical nor the mental stomach of the human being performs its office as well as it did a hundred years ago.

QUESTIONS. — Does the minute division of human employments operate favorably or unfavorably to health? What effect has long standing? What are the evils of having the foot become too flat? Where have large observations been made on the effects of position in factories? Will you mention some of the facts which were developed? Are manufacturers among us liable to the same evils? What number in fifty thousand, at the ratio of Great Britain, would be deformed with rickets? What number in the single city of Lowell? Is female suffering from bad position greater or less than that of males? What evils already exist among us, in the very heart of New England? Up to what ages are the bones soft and yielding, in the two sexes respectively? What are the evils of sit-

SECTION XIII. — ARTIFICIAL AIDS TO EXERCISE.

280. Everywhere in society there is a strong inclination to attempt to aid nature in her efforts; as if the handiwork and common designs of the great Creator were susceptible of human improvement. Yet, when we reflect but for a moment, what is, or can be, more futile? And how often, in these attempts, do we defeat our own purposes?

281. A new-born child, for instance, no sooner uses its tongue a little awkwardly — and why should it not be used awkwardly, prior to any experience how to use it more skilfully? — than we imagine it to be tongue-tied. What tongue-tie may be, most of us hardly know; but it is a deformity we have heard of, and forthwith art must be invoked, and the frenum underneath it must be divided. Now, I do not say that this operation is never required, but only that it is very seldom.

282. I do not know that the custom of making incisions where the teeth are about to appear, should be called an artificial aid to exercise; but it is, to say the least, very doubtful which is the predominant object with mothers, to aid the teeth in getting through for the sake of the child's own comfort, or that we may be comforted ourselves, in seeing him eat solid food better than he could before.

283. Certain it is, however, that in at least nine cases in ten, if a child is healthy, the gums will take care of themselves; and if a child is not healthy, it is difficult to see how our lacerating these parts with a sharp instrument will make him so.

284. Again; a child inclines to walk. And here, above all, as if the great Creator was slow to bring about his own ends, the child must be hurried. We either hold him up, or encourage movements of his own, for which his little joints have not yet sufficient strength. Or he must be taught to walk by means of a go-cart, or some other mechanical contrivance. A thousand crooked legs have been made in these ways; while no living child was ever made healthier, or happier, or better, by them.

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ting at study with the hand supporting the head? What those of sitting long with the right arm on too high a desk? What those of standing in a twisted position? Are severe labors, and those which are long continued, as bad for health as unfavorable positions? What is said of the farmer, who labors in the open air and in free space? Are our errors, in these matters, unfavorable to mind as well as body? What comparison is made between the present period and a century ago?

285. King Edward VI. was of a scrofulous or strumous habit, and consequently had weak joints, especially weak ankles. Now, instead of endeavoring to invigorate the nervous or digestive centre, it was vainly supposed nature could be aided a little, at the weak point. His feeble ankles were therefore furnished with a species of iron boots. But he had not worn them many months before their evil tendency was discovered, and they were abandoned.

286. Perhaps the chest of some over-refined female is found to be weak. This, it is thought, must be supported. Or a delicate boy is becoming round-shouldered, and he must have shoulder braces. The reluctant father may, perhaps, be pointed to the cadets at our military schools — as straight as an arrow — and yet, he is told, they wear shoulder braces. Without stopping to inquire whether their previous strength of body enables them to wear these braces without much injury, or whether it is the shoulder braces that *made* them strong, the feeble young woman must be corsetted, if not the young man braced!

287. It may be thought that a part of these remarks are misplaced — that corsetting, and even tight dressing, are out of fashion. Yet, a young woman in Massachusetts, only a little while since, wore a dress so tight that it required the united strength of two strong female assistants to bring it together so that it could be fastened. And a dressmaker in one of our cities, but a few months ago, told me that the rage for tight dressing was again on the increase.

288. The question may be asked, whether I would reject all artificial assistance to the locomotive system, even in the case of disease. But I am not prescribing for disease. I am teaching those laws which, if obeyed, would tend to prevent it. I have, however, seen cases of clubfeet, squinting, etc., where the application of the surgeon's art, if not of the dressmaker's devices under the surgeon's care, has been useful.

289. As for most persons who are in tolerable health, or who are merely feeble, delicate, or indolent, the application of laces, braces, or straps to them, is wholly and forever wrong. And the greater the delicacy and weakness, general or local, the worse, in the end, the evils which result from applications which are intended to brace or strengthen.

290. To the general truth of this remark, there may be one exception. When a person inclines to stoop, and the tendency has become so strong that there is no way of resisting it, appliances may be made occasionally, for a day or half day, just

long enough to remind those who wear them of the necessity of using nature's own; and of sitting correctly without any support. But other than this — that is, as mere remembrancers or monitors — all such aids are, in the end, incomparably worse than nothing at all. They weaken much more than they strengthen.

291. I must call your attention for a moment to a very different species of artificial aid from any which has yet been mentioned. It has been jocosely said to be one part of the sailor's oath, never to walk when he can ride. We might almost believe that the rest of the world, with the fewest possible exceptions, had taken the same oath. For who is there so vulgar as to walk when he can help it?

292. That, in these days of cheap and rapid travelling, one can hardly afford to walk, may be most true. It may, therefore, in a great majority of instances, become a matter of plain duty to ride. This consideration, of course, must never be excluded from the account. Yet, whenever we can walk just as well, and there is no motive for riding but self-gratification or sheer indolence, we have very high examples of refusing to ride.

293. One of the most remarkable of these, is that of the Apostle Paul. This trait in his character — the disposition to throw himself on his own resources — shines out everywhere, but nowhere more strongly than in his journey from Troas to Assos, after a series of protracted labors, terminated by a restless and wakeful night. But I will not here enlarge.

294. Walking, whenever we have strength for it, is, as a general rule — to which I grant there are a few exceptions — much better for the health than riding. Then, too, it has the additional advantage of imparting and cultivating a spirit of self-dependence, in opposition to a spirit much more frequent, but directly the reverse in its tendency.

295. In most cases, from our earliest years up to manhood and womanhood, walking is regarded as mean and vulgar; and being carried or drawn by some means exterior to ourselves, is thought more respectable. Not one child in ten but thinks a great deal of the pleasure of riding; while not one in a hundred appears to think of its demeaning, effeminating tendencies; to say nothing of the habit which it fosters, of being dependent on other beings for our happiness, as well as of exercising over them a lordship which the Divine Author of our and their being never intended. A human being should no more prefer riding to walking than a lamb or a kitten.

296. This matter is carried so far that few, if they can help it, will walk to see a neighbor, or to church, even if the distance is but a quarter of a mile. The land is as full of the various sorts of machinery which human ingenuity has devised as aids to exercise, as Egypt was of frogs in the days of Pharaoh.

297. The indigent, who sometimes can do no better, will occasionally adventure to ride on horseback, or in a plain open wagon or sleigh. For most, however, the covered vehicle is available; but a plain covered wagon or carryall is deemed hardly sufficient for any who are placed by circumstances at all above mediocrity. For them there must be the more fashionable barouche or coach. We have also the railroad car and the steamboat.

298. What more fashionable aids to exercise will be devised in coming generations, it is not easy to conjecture. As yet, the balloon is hardly available for every-day purposes; and the electro-magnetic wires are still less so.

299. It is not easy to believe the world to be as good or as happy as it was before these aids to exercise were known. Even the labor-saving machinery of our shops and factories is of doubtful utility, as we have partly seen, both to health and virtue. Men and women and children are no healthier, to say the least, than they were when the former were obliged to spade the soil, and when women spun and wove the cloth. And yet, who would go back to those days of less refinement? He could not, if he would.

300. As a whole, things can never go backward in the matter of which we are speaking; nor, indeed, does it seem to me desirable that they should. What is wanted in this matter, is to so regulate the things that *are* as to make the least possible use of substitutes for human effort, and throw mankind, as much as possible, on their own resources.

QUESTIONS. — Is there among us a general and an increasing desire to aid nature in her efforts? Is this a mark of wisdom? What is said of cutting the frenum of the tongue? What of the custom of cutting the gums? Are our efforts to aid children in walking early to be commended? What mistake was made in the physical management of Edward VI.? What is said of shoulder braces? What of supporting the chest? Is the day of tight-lacing gone by? What is the testimony of dressmakers on the snbject?

But are there, then, no instances in which artificial aids to exercise would be admissible? What are some of them? Are artificial aids, in general, worse for us in proportion to our weakness and feebleness? What exception to this rule?

SECTION XIV. — AIR AND EXERCISE.

301. It may not be easy to say, in a few words, why those bones and muscles of the human body which are formed in the open air should be so much more firm than those which are formed within doors, and amid bad gases or foul exhalations; but the fact that it is so is quite undeniable. The phosphate of lime, of which bones so largely partake, is far better balanced in the former case, by those other ingredients of which the bones are made up; and the muscles are far better *oxygenated.* They are, in other words, more alive.

302. True it is — and I have no wish to disguise the fact — that the individual, such as the farmer, or the traveler, or the doer of good among the sick in mind or body, is at the same time obeying many more of the physical laws of God, besides breathing the free and pure air; so that it is not always easy to say exactly how much is or is not the result of the particular influence of which I now speak.

303. One thing, however, we *do* know with the utmost certainty. We know well, that, be the other circumstances of life what they may, if an individual is shut up in a highly heated atmosphere, or in a room filled with bad gases or dust, or unwholesome exhalations, his muscles will never be firm and strong until he exchanges his situation for one more favorable. And this is evidence of the influence of air on the locomotive system which cannot be evaded.

304. Many in our cities, especially literary and professional men, though fully convinced, in a general way, of the importance of exercise, are apt to grudge the time which is needed for going abroad into the open air; and consequently they saw or split wood in their cellars, or perform gymnastic exercises in their chambers or wood-houses. Such a mistake is of almost every-day occurrence.

305. There may be other reasons why such persons do not go abroad more into the open air. I have already said (295) that

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What is said to be the sailor's oath? Do almost all the world appear to have taken it? Is there not a strong temptation to this? Have we not distinguished examples of a preference in the other direction? Is walking generally better for health than riding? How are we usually trained to regard walking? Is this matter carried very far? Are there some who will venture in an open vehicle or on horseback? Is it easy to conjecture what will be the end of all this? Is the world as good and as happy and as healthy as it was when mankind were thrown much more on their own resources? What, then, is to be done? Is it desirable to go backward, if we could?

walking is becoming vulgar, with many; to which I might have added, that garden and field labor are becoming so. Besides, it is by no means unusual to grudge the time which would be required for exchanging our every-day clothing for that which would be thought decent abroad on the one hand, or would be adapted to spading or hoeing on the other. Whereas, an individual who has been sitting in bad air till he feels too lazy to change his clothing, or to spare more than fifteen minutes for exercise, may slip, unobserved, into his cellar or his garret; for which no special preparation will be needed.

306. Thousands of mechanics and merchants, who are pale, thin, and feeble, with soft, flabby muscles and narrow chests, who have never been in the habit of breathing pure air, find a luxury which they know not how to describe, when permitted to take a stroll over some park or common. But a still greater change is felt — one altogether indescribable — when they walk far enough to let the eye rest on something besides brick and stone and wooden walls and buildings.

307. Something doubtless is due, in these cases, to the influence which cultivated fields and gardens have on the eye, and which, being reflected, as it were, on the soul, rouses all the energies of mind and body. Still, a great deal must be owing to the full supply of air surcharged with oxygen, and freed from those emanations and other admixtures which are inseparable, in cities, from the most favored conditions and situations.

308. One-fourth, and sometimes one-third, of our population is well known to be scrofulous. To such, with their soft, inelastic, and inefficient muscles, exercise in the open air is much more indispensable than to those who inherit a good constitution and an exemption from glandular and other obstructions.

309. Hufeland, in his "Art of Prolonging Life," says: "Suffer no day to pass without enjoying the pure, open air, beyond the boundaries of a town or city." Consider your walk

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QUESTIONS. — Do we know why the muscles of those who are much in the open air have so much more elasticity and strength than those of other people? May it not be owing to a variety of causes? Why do so many grudge the time required for exercise in the open and pure air? What classes of persons are most liable to this error? Has indolence nothing to do in the matter? Who find the park or the common — still more the country — so refreshing? Do the cultivated and green fields have an effect on us through the eye? Is a tendency to scrofula very general among us? What effect does pure air have on the scrofulous? What does Hufeland say of the importance of exercise in the open air?

not merely as a means of exercise, but, in a particular manner, as a means of enjoying the purest vital nutriment, — a nutriment, moreover, which is indispensably necessary; above all, to those who are much confined to their apartments.

SECTION XV. — THE STOMACH AND EXERCISE.

310. It was once thought that the work of digestion and muscular exercise did not agree very well; especially at dinner time. There are some old lines, which enforce this idea. They are nearly as follows:

"After breakfast, work and toil;
After dinner, sit awhile;
After supper, walk a mile."

311. These lines go upon the supposition that breakfast and supper, as should always be the case, are lighter than dinner. But is there any necessity of eating a heavy dinner? Most certainly, they who take three meals a day find no necessity of using heavy meals at any time. Our lightest meals are usually quite heavy enough for the strongest. No doubt it is wrong to oppress the stomach and other digestive organs at any time of the day.

312. An opinion has prevailed, time immemorial, that all our meals are followed by a species of fever, usually called the "fever of digestion." A slight chill is first perceived; then an increase of heat and dryness of the skin; and lastly, a degree, greater or less, of perspiration. Hence one reason, no doubt, why it has not been thought best to exercise soon after eating.

313. But it is not true that a fever of digestion is necessary, after all. The snake that forces his brother reptile down his throat, might be injured by exercise immediately afterward. To him, moreover, a digestive fever may be necessary. So it may be to the swine and to the human biped who imitates him. But they who live as abstemiously as they ought, need no fever of digestion; nor are they injured by reasonable exercise immediately after meals.

314. In truth, if we live right, especially if we eat and drink as we ought, moderate exercise soon after a meal is not only innocuous, but positively useful. It agitates the digestive organs just enough to make them act healthfully and vigorously. And he who loads his stomach to such an extent as to be unfitted for immediate labor, mental or bodily, provided still his labors are moderate, has passed the bounds which nature prescribed, and eaten too much.

315. No fact is better known than that active, stirring men, especially farmers and gardeners, have far better digestion than students and sedentary people. Could this be so, if there were a natural incompatibility between incessant bodily activity and the due action of the stomach and other organs concerned in the work of digestion?

316. At the same time, it cannot be denied that violent exercise of any kind, while the stomach is full, is greatly hurtful. Let a person run rapidly, for some time, even just after the best and lightest meal; or let him lift hard, especially in a stooping posture; or let him climb rapidly to a great height; or sing or holloa loudly for a long time, and the consequences will be unfavorable. These violent or rapid exertions will cause a tendency of the blood to the muscles which are called into use; and digestion will be less perfect in proportion.

317. But this brings us to the confines of a train of thought that belongs to another chapter of our subject, viz., that on Digestion; to which, for the present, I must refer those who wish to prosecute their inquiries in this direction any further.

SECTION XVI. — CONNECTION OF EXERCISE WITH MIND AND FEELING.

318. Maria Edgeworth tells us of a father and his little boy, who, having taken a long walk, became quite fatigued, although they had not yet reached their home. The boy thought he could hardly go a step farther. What, now, should be done? "Here," said the father, "ride on my gold-headed cane." The son was soon astride of the cane, and marching homeward with comparative ease and vigor.

319. Your house, we will suppose, to be on fire. In it is an almost helpless invalid that has not been able to cross his room for weeks. But, under the exciting influence of fear, he rises from his bed, and passes, unaided and unsupported, into the street; and, before his strength fails, he even reaches the house

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QUESTIONS. — What was formerly thought about exercise immediately after eating? What old triplet was founded on this belief? Should breakfast and supper be light, as this old triplet presupposes? Should any of our meals be heavy? Is there the least necessity of this, if we take three meals a day? What is said, even in books, about a digestive fever? Should any animal but the snake so eat as to have such a fever? Is not moderate exercise of body and mind useful after eating? Will this account, in part, for the health of farmers and gardeners? May not violent exercises, after all, immediately after eating, be injurious?

of a near neighbor. See, then, what an influence the mind has on the locomotive system!

320. I knew a father, who, with only moderate strength, was obliged to labor as a blacksmith ten or twelve hours a day, and then watch over his sick son at night; and this nearly every day and night for two or three months in succession. Yet he endured the effects much better than he himself or any body else could have expected.

321. More than even this: I have known individuals to take the sole care of very sick friends, day and night together, for a month or more, with no relief during the whole time, except during two nights; and yet, in spite of the trial and a feeble constitution, they have come off with their usual health. But necessity was upon them, and had as effective an influence as love had upon the father just now mentioned.

322. This principle, which we are considering, was well illustrated by the case of the defeated, dispirited French army during its retreat from Russia. When no enemy was near, the soldiers had hardly strength enough to carry their arms; but no sooner did they hear the report of the Russian guns, than new life seemed to pervade them, and they wielded their weapons most manfully, till the foe was dispersed. Then, again, the danger being over, there was a relapse to their former weakness and prostration.

323. A South Carolinian had his leg amputated, some years since, at Philadelphia. In order to be regarded as a brave man, he would not move so much as a muscle of his face during the whole operation. But his bravery was purchased at a rate too dear; for the amputated limb was hardly bound up ere he expired.

324. We have all heard the trite remark that men who labor *by the job*, labor more freely and rapidly than when they labor by the day. Take the case of the sawyer. While he is paid by the day, as we are told, his saw only says: *by — the — day; by — the — day;* at a most drawling rate. But when the mind of the laborer has a more stirring motive before it, that is, when he is paid by the job, his saw responds more briskly; and says, *by the job, job, job; by the job, job, job.*

325. One reason why bodily exercise has not done more than it usually has for the diseased, has been the want of mental co-operation. The late Dr. Cogswell told me of a student who, being a sufferer from dyspepsia, he recommended to him to labor every day, more or less, on a farm. But he did it

against his inclination. He went to the field daily, as an ox to the slaughter, or, at least, as a bullock to the yoke; and was not, of course, much benefitted.

326. The next year the doctor took the precaution to advise his patient to bargain for a share in the profits of his labor. The result was just what might have been expected. He had a new motive to exertion; and the stimulus was by no means an unfavorable one. His health improved during the whole summer and autumn; and, by following up his partial victory for a year or two longer, the dyspepsia at length disappeared.

SECTION XVII. — MEDICAL INFLUENCE OF EXERCISE.

327. By the medical influence of exercise, I mean, here, an influence which is favorable to the due performance of all the functions of the body; especially to their gentle and not violent performance. Of those medical influences which are more violent, it is not now my purpose to treat. The whole treatment, even of a cold, requires a wider scope.

328. I have in my possession a curious book of about three hundred pages, entitled "Medicina Gymnastica;" written just 150 years ago. It is a work, in short, on curing diseases, especially chronic diseases — dropsy, hypochondria, consumption, etc. — by means of exercise. It contains, along with some things fanciful, not a little of what the philosopher Locke calls "sound, round-about common sense."

329. But the writer of this work means something different by his terms from what I do, for he says: "By exercise, then, I understand all that motion or agitation of the body, of what kind soever, whether voluntary or involuntary, and all methods whatsoever which, without the use of internals, may suffice to enable nature to expel the enemy which oppresses her; confining myself to the consideration of it only as it may prove curative — not as palliative, or barely preservative."

330. Now, in order to health, there must be, in the living system, a steady centrifugal tendency. I speak, here, not only

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QUESTIONS. — Relate the story by Miss Edgeworth. What is told of the invalid in a house on fire? What gave him this extra power of the muscular system? What is said of the hard-laboring blacksmith? What other anecdote is related of a similar kind? What does history say of the effects of fear and courage, operating alternately, on the retreat of the French army from Russia? Relate the story of the South Carolinian. What is said of the stimulus of working by the job? Relate the story of the dyspeptic patient, and say why it was that he finally recovered.

of the great work of perspiration, which is performed by the skin, but of all other processes by means of which waste matter is brought out of the deep interior of the body, and ejected from it. In such a work, the lungs, kidneys, and some other organs participate.

331. Suppose I have taken cold. During the existence of this disease the centrifugal tendency just now mentioned is greatly diminished, and a centripetal tendency is substituted. This gives rise to feelings of dulness and oppression. In truth, the system is oppressed, throughout, and calls loudly for relief.

332. Now, how is the centrifugal tendency of which I have spoken, and which is so indispensable to life and health, to be restored? There are several ways and means of doing this. One is, by abstaining from the solids and liquids to which we have been accustomed; and using nothing but a very little dry food. Another is by being cheerful. But another, and still more important thing, is moderate exercise, in the open but not too cold air.

333. This last, if not carried too far, always has a centrifugal or outward tendency. No single means can do so much permanent good. But, I repeat, it must not be violent, nor unequal. The more general it is, by which I mean the more it produces a gentle action of the whole surface, the better. Violent efforts, though highly popular, are by no means the best in the end.

334. While writing this very section, my attention has been called to a notice of the recent death of Dr. Chickering of Massachusetts, as published in the Boston Medical and Surgical Journal. He supposed he had taken cold, and from that moment "*kept his room excessively hot.*" Just one week after this "he passed a comfortable day in bed, having a good relish for food, and taking a fair share of it." The next day, we are told, he "wanted plenty to eat;" and, it is to be presumed, he had it. In three or four days he was dead.

335. This forcing nature — or attempting to do it — to resume her centrifugal tendencies, by a whole week in a *heated oven*, and by filling the stomach, even though done by a sensible physician fifty-seven years of age, is little more to be commended than that *steaming*, of which, during late years, we have heard so much.

336. The same principles should govern us, in the case of stomach disease, as in that of cold. There are few persons in whom gentle exercise would not produce that gradual deter-

mination to the surface which would relieve the internal organs. Who does not know how apt the dyspeptic are to have cold hands and feet, and even a cold and shrunk surface in general?

337. Now brisk, and at the same time gentle, exercise, promotes a free circulation and glow of the skin, by sending the blood out to the extremities, and thus produces a gentle and genial warmth, even in the remotest toes and fingers. Such a warmth will wholly or partially relieve the stomach; and if it could be kept up, without too much violence, for a considerable time, would doubtless effect a permanent cure.

338. I know of no better measure, as far as it goes, for removing chronic diarrhœa, than gentle exercise. It has sometimes been a principal means of cure, in a disease of this kind of many years standing. Constipation, which is the opposite of diarrhœa, is often partially relieved in the same way. Indeed, at one period it was deemed sufficient, for the cure of this disease, to knead the abdomen. But if partial or occasional action of the abdominal muscles will do so much for the confirmed dyspeptic, how much more can be done by general exercise, long continued, in the way of prevention?

339. The consumptive person is often sent to the farm or the tannery, or to the woods and mountains, or, perchance, to the Banks of Newfoundland, or to the Pacific Ocean. But I have always found the benefit, even in these cases, to be very nearly in proportion to the average of gentle and cheerful and pleasurable exercise.

340. So with those invalids who go, every year, to "the Springs," or to Europe, for their health. Instead of sitting in tight rooms, over air-tight stoves, breathing bad air, for one-half or three-fourths of the time, with their brain half distracted by study or by business, and at the same time greatly excited, they are using more or less of exercise in that open air, which Heaven has furnished in such abundance for the special use of its intelligent and unintelligent creation.

341. At the present time, a large proportion of our inhabitants, of every age and description, seem doomed to use their lower limbs very little, and their upper extremities and their brains very much. This has a tendency, on the one hand, to divert the blood from the feet and leave them cold, inactive, and perhaps diseased; and, on the other hand, to send an undue proportion of blood to the brain, heart, lungs, and other organs in the upper part of the body, and thus to cause undue heat and excitement.

342. Now, exercise in the open air — and nothing else, perhaps, short of this, except drugs and medicines from the apothecary — will equalize the circulation, and prevent this inconvenient, not to say dangerous, tendency. It is on this account that I contend so strongly for exercise in connection with schools, and especially for those kinds of exercise which will promote a free circulation in the lower limbs.

343. For want of a due attention to this subject, I have seen some of our most excellent youth, of both sexes, go down to a premature grave. They were ambitious of distinction at school, as well as fond of study; and greatly conscientious. And, as no danger was apprehended, they were allowed to be at their books, not only all day, but a part of the night, till Nature, indignant at being cheated out of her rights, would no longer endure it.

344. And then, to add to the danger, as they were considered rather delicate, they were treated with what was supposed to be delicate food. Coarse and plain food did not relish, but they could eat a little of something nice, such as cakes, pies, or pastry; and so they were indulged in them, especially as it was supposed their superior richness would render a very little of them sufficient for their support.

345. No mistake could be greater than this; yet it has been the mistake of thousands; and I fear will be of thousands more. If anybody can bear rich or highly concentrated food, it is the hard-working farmer, mechanic, or sailor; not the studious or the sedentary. The latter must eat coarse or plain food, or perish. There is no other known alternative.

346. It is, nevertheless, true, that the lives of delicate, overnourished young persons, can be prolonged somewhat — especially while they are young, and have great tenacity of life — by exercise in the open air. But how greatly to be regretted the necessity of palliating, in this way, those diseases which, after all, can *only* be palliated; but under the weight of which we must finally be crushed! When will the world begin to believe, practically, that prevention is better than cure?

347. Much is said, in these days, about purifying the blood; most of which is perfect nonsense, to give it a name no worse. I shall have occasion hereafter to set this matter right; or, at least, to attempt it. For the present, I will only say, that one of the most effectual of all blood-purifiers, except good food and drink — and next to these the most universal panacea — is habitual exercise in free and pure air.

348. In directing our friends to the use of exercise as a

remedial agency, nothing is more common than the custom of sending them abroad for this purpose, very early in the morning; as if the morning air had something in it peculiarly salubrious. This is a mistake.

349. True, it is not denied that exercise should be taken by most persons in the morning; and, by a few, very early — even before sunrise. Not, however, because the morning air is, in itself, any better than the evening air; for it is not so good. This, however, must be admitted, that, having just risen, refreshed, most persons are better able to resist the deleterious tendencies of a damp or insalubrious atmosphere in the morning, than at evening.

350. Some few there are, however, I again affirm, who cannot take exercise very early in the morning without suffering for it nearly the whole day. The direction, then, so often heard, to such persons, to go abroad very early, is ill advised, and should be received with great caution, if not with some abatement. Ignorance is usually bold and assuming; and is apt to deal by wholesale, in this as well as all other matters.

QUESTIONS. — What is meant, in the foregoing section, by the medical influence of exercise? What curious ancient book is alluded to? Prevention, then, rather than cure — or, at least, palliation — is all which is here intended, is it not?

What is meant, in philosophy, by a centrifugal force or tendency? What is meant by the term in this work, as applicable to hygiene? What are some of the bodily organs concerned in this result? Is this tendency, in the case of a cold, increased or diminished? When this tendency is lost, and a centripetal one is substituted, how is the former to be restored? Is violence desirable in effecting the change? What striking example is alluded to, as proof of its danger? Must not the idea of forcing nature be abandoned? Is stomach disease to be removed, also, by establishing a centrifugal tendency? Is it so, particularly, with dyspepsia? Do cold hands and cold feet indicate a wrong direction of the general current? What is said about chronic diarrhœa? What about constipation — its opposite? How, as regards exercise, should the consumptive be treated? Why is it that going to the mountains, the springs, and to Europe, appear to do so much good?

To what are most of us, by education, custom, and habit, now doomed? Is exercise the only thing — short of dosing and drugging — which will avert the danger? What is a prominent danger in all our schools? Is the substitution of a rich diet for exercise in the open air, at all safe? Can the delicate youth of our country bear delicate and highly concentrated food? Whose stomachs, alone, can dispose of it with safety? Must the improvement of the delicate youth be wholly despaired of? What must be done for him? What is said about purifying the blood? What is said of exercise very early in the morning? Why is it sometimes objectionable? Is the air, of itself, more damp and insalubrious in the morning than in the evening? Why, then, is morning exercise the best for some persons?

SECTION XVIII. — EDUCATION OF THE LOCOMOTIVE SYSTEM.

351. The education of the bony and muscular system is a work of immense importance; and can hardly be commenced too early. We may so manage as to make a child squint, in the cradle, at a very early age. In other words, we may so place a light, that, in his efforts to look sideways at it, the feeble muscles of the eye will become diseased. But, if a wrong position will thus weaken, a right position will strengthen these parts, in the same proportion. And this, as far as it goes, would be education of the muscular system.

352. This, however, is used merely as an illustration. No wise parent would suffer a very young child to look a long time at a luminous object, even though it were placed directly before him. But there are cases of real and necessary and frequent occurrence which might be mentioned.

353. A child, for example, is nervous, and irritable, and inclined to cry frequently. The mother or nurse, however, generally succeeds in composing him by a hush. But crying strengthens, if it does not develop, the lungs; and perhaps it is the child that cries most, whose respiratory and other muscles most need this species of discipline.

354. Then, again, a child is inclined to laugh. This, also, educates the muscles of the face. Here, however, no arguments are needful; for the parents and friends who discourage laughing, though sometimes found, are few and far between.

355. The child — once more — inclines to talk. Here we are not only ready to let the "education" proceed, but to help it on. We even anticipate. But this is wrong. There should be no anticipation — no hurrying. We should restrain, or hold back, rather than hasten. Only, whenever he *does* speak, we should be anxious to see that he speaks right.

356. It is no uncommon thing, even among those who are most anxious to urge a child forward in the art of talking, to teach him wrong; so that many things are to be afterward unlearned. They even encourage him to continue his baby-talk. Now, although I have no objection to the use of monosyllables by a young child, yet I must say it is greatly desirable that what he says should be spoken plainly. To induce him to do this, would be to educate the muscles concerned in the work of speaking; and would be highly important.

357. Some children, long before they can walk, begin to sing. I would not push them forward, greatly, even in this; yet I would certainly lead them gently on, whenever they man-

ifest a disposition to follow. And what they do, in this matter, they should be taught to do well.

358. Of course, it will not be expected, by any, that I would recommend haste about walking. The same general rule, in practice, already alluded to, will apply here. We should follow nature rather than lead her. Much is to be done with some children, in the way of teaching them, while walking, to use their legs correctly.

359. So in regard to playing on instruments. I knew a family who could play on a piano, several of them, almost as soon as they could walk. Now, were there no other advantages to be derived from vocal and instrumental music, in the case of the very young, it would have an important influence on the education of the muscles concerned in these exercises.

360. If we begin early, we can educate our muscles, both locally and generally, to almost any degree of power required. The old Grecian story of carrying the ox will serve to illustrate this point. Milo of Crotona, the wrestler, when young, took it in his head to carry a calf a short distance every day on his shoulders; and he continued to carry it, so the story says, till it became an ox — his strength increasing daily, as the calf increased in size.

361. One thing must, however, be remembered. If we carry this process of developing and strengthening our muscles to the utmost possible extent, we may, perhaps, deprive other parts of our system of the needful degree of nervous energy. The brain may not act so well for it; or the skin, lungs, stomach, or bowels may lose, gradually, their tone and energy.

362. It was once a very generally received doctrine in physiology, that there is a natural antagonism between the muscular and bony systems and the brain and nerves. Hence the busts of Hercules, who is represented as a mighty man physically, have a comparatively small head. Hence, too, such men as Plato are represented as having very large heads grafted upon a frame of ordinary size, or at most upon one not gigantic.

363. But this doctrine has been carried too far. There is no incompatibility between a good degree of muscular and cerebral development. The only difficulty, as I think, lies in *diseased* development. Let the whole energies of the individual be expended in a particular direction, and the results will be unfavorable. They ever have been so; and we can expect nothing better in time to come.

364. I have spoken, at some length (241, 258) of the general tendency to round shoulders, crooked spines, and the like. A little painstaking would not only prevent all this, but save us a great deal of trouble. The simple custom of carrying burdens on the head, instead of weakening — as some have feared it might — the spinal column, would probably be found the very best means of strengthening it, and of preserving its integrity.

365. Dr. Jarvis relates that he once saw a colored woman in the streets of Louisville, Ky., with a tub of water on her head and a pail of water in each hand. I have myself witnessed similar feats, both at the North and at the South. The same thing, in its essentials, is testified concerning the Spanish peasants, as well as the peasantry of other countries.

366. Now, I do not hesitate to indorse the statement often made with regard to results in these cases, viz., that, when the custom is not carried too far, — so far, I mean, as to overtask the system and stunt it, — the head is more erect and the back more straight for it. I think we may learn a lesson from these facts; and not only learn, but retain it.

367. Then I have a word more to say, in passing, about swimming. I do not know of many items of physical education more important to both sexes than this. Not only is it a most delightful amusement to those who are trained to it, but it does so much for the proper development and just symmetry of our bodies that I can never cease to recommend it, in wise hands, as a most important aid in the cause of physical education and management.

SECTION XIX. — LATE EFFORTS AT IMPROVEMENT.

368. I have seen a man of fifty years of age, or even beyond that, with dumb bells in his hands, swinging them backward

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QUESTIONS. — Is the education of the bony and muscular system a matter of considerable importance? What is said of squinting? What of crying? May crying be a needful discipline of the muscles? What is said of laughing? When a child is old enough to talk, should he be urged forward? Should we encourage baby-talk, — or teach him to speak his little words correctly? Is early singing desirable? Is it desirable to encourage instrumental music? Can we educate our muscles to almost any degree, by beginning sufficiently early? Relate the story of Milo of Crotona. Is there no limit to human strength? Could Milo ever have carried an elephant? May we not cultivate one part of the system at the expense of the other parts? What partially erroneous physiological doctrine was once in vogue? What is said of carrying burdens on the head? May not this custom be carried too far? What is added about swimming?

and forward, for the sake, as he said, of the exercise. And it would have been as much beyond my power as a journey to the moon, to convince him that he was not benefiting himself. He had just eaten a heavy and indigestible dinner, and was endeavoring to avert its supposed evil tendencies.

369. One general object, however, which he had in view in this exercise, was, as he said, to straighten his frame, and especially to keep back his shoulders. In this point of view he seemed to be quite successful. For, though the ossification of his bony system must have been completed twenty years before, yet, some how or other, as facts fully prove, something may be done even at this late period.

370. A still more striking case is related by an individual in Worcester county, Massachusetts, — and by a man of at least common veracity. He says that he once slept on a plank eight years, in part to straighten his frame, although then almost in middle life; and that his efforts succeeded.

371. My own efforts at improvement — begun as they were at nearly thirty years of age — are little less striking; but to relate them, in this place, would be to make the experiments of one single man quite too prominent. I must, therefore, omit them for the present.

372. Although it is much more easy and natural to alter our shape, and make the crooked straight, before the age of twenty-five or thirty, while the bones are not yet completely ossified at the ends and edges, yet we should never despair, at any age, of doing something. If we have become round-shouldered, or one-sided, at even fifty years of age, there is every reason for believing that a partial or entire restoration can be effected.

373. This restoration can be effected in one of two ways. The first consists in simply putting ourselves in proper shape, and keeping ourselves so. This will cause a pressure on certain parts to such an extent that what is called *absorption* will take place in one direction, and *accumulation* in the other. Or, to speak in plain English, nature will take away, gradually, some portion of the solids, which, by their misplacement, cause an unnatural pressure, while she will add something at points where new formations are needed.

374. Or, in the second place. You know something of the law of change and renewal in the human system; and that, as long as we live, old timbers are, as it were, taken from the frame, and new ones put in their place. (15.) Now, in the application of a new brace, or pin, or beam, to support us,

nature will always direct her attention to the very part where it is required; provided, however, she is not thwarted by our abuses.

375. Let those, then, who have passed to the "eleventh hour" of life in ignorance and error, and have but just been roused to a proper apprehension of the existence of God's just and holy laws within them, take courage. It is never too late to reform, physically or mentally.

SECTION XX. — OF THE DISEASES WHICH HAVE THEIR ORIGIN IN ABUSES OF THE MUSCULAR SYSTEM.

376. In several of the preceding sections, I have alluded to certain diseases of the locomotive system; but their great number and the nature of my plan did not admit of many particulars. For these I have reserved the closing section of the chapter.

377. And first, I am to speak of the teeth. These instruments, whose enamel or outer covering occupies a sort of middle ground between the organic and the inorganic world, are exceedingly liable to disease; and this liability, in our own country, at least, is daily and hourly increasing. There are numerous causes for this; but, foremost on the list, is the great fact that we do not use them as we ought.

378. We use them, in the first place, too early. A child no sooner has teeth — if not indeed at a much earlier period — than he is not only permitted to use them in moderation on hard biscuit, bread crusts, and such other firm articles as are proper for them, but he is encouraged in masticating all sorts of food to which the strongest adult teeth are ever subjected. The result is, that the enamel often becomes more or less injured; and this paves the way for decay.

379. As he advances in life, the opposite extreme is still more frequent. Everything to which he has access must be softened, in one way or another, as if it were our leading object to save the teeth from labor. They are not used as much as the purposes of health really require; and hence one prominent

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QUESTIONS. — What is said of swinging dumb bells? What was a secondary object of the exercise? What other striking case of late effort at improvement is mentioned? What is said of ossification? What is absorption, when rendered into plain English? What is the law with regard to change and renewal? Should any one despair, even at the eleventh hour of life?

source, as all medical men and dentists well know, of premature decay.

380. It has long been the opinion of all those whose opinion is worth our attention, that one prominent reason why we have so many throat diseases, of late years, is because we use our vocal organs so much and our lungs so little. Public speakers, as is well known, very often neglect to use their lungs and abdominal muscles sufficiently, and do all, or almost all, their speaking with the top, as it were, of their throats.

381. Another thing closely connected with this, is, the lazy custom of reading written manuscripts instead of speaking extemporaneously. If it is asked what the difference of effect is in reading and speaking, I reply that the latter is more impassioned, and hence naturally induces more action of the abdominal muscles, and comparatively less of the throat. Besides, the wind-pipe, on account of its bent or curved position, is obstructed more in reading than in speaking.

382. We have, in these days, so much sitting that round shoulders and crooked spines are, as we have already seen, quite fashionable. Now, whenever the shoulders are thrown too far forward, there is, as a necessary consequence, compression of the lungs, heart, and other organs contained within the chest and abdomen.

383. This result is particularly unfortunate, while there are so many other causes operating, in this respect, injuriously. Lung diseases, in particular, are becoming more frequent and fatal than almost any other. If half our population die of fevers, of various kinds — and this is the usual estimate — not much less than one-fourth, or about 75,000, die of consumption, and the other kinds of lung diseases which prevail.

384. There is no class of persons among us to whom a large amount of exercise of the locomotive system is so indispensably necessary, as to those who are inclined to lung diseases, especially pulmonary consumption. Nor is there any other class of persons so much injured by long sitting in a crouching posture, — such as restricts the action of the respiratory organs.

385. Then, as to heart diseases, who is there that does not know this class of diseases, already very large, to be fearfully increasing? We lose already, every year, in the United States, some thousands of persons from these troublesome and fatal complaints. And the same neglect of exercise, and, in general, the same abuses that tend so much toward con-

sumption, have also an effect, on particular individuals, to aggravate or to induce diseases of the heart.

386. He who sits too long in a crouching or bent position, whether at school or elsewhere, is liable to have the function of digestion, also, more or less impeded. The consequences of this species of derangement are manifested by flatulence, acidity, chronic disease of the stomach and liver, and by diarrhœa and costiveness. Indeed, there is hardly a complaint of the lungs, heart, stomach, liver, or intestines, to which flesh is heir, that is not made worse, if indeed it is not induced, by this same sitting in a bent position of the upper section of the body.

387. How many an individual has been taken away from us, suddenly, within a few years, by heart disease! But how many more have subjected themselves, by their errors, to what seems to be a much greater evil. They have made themselves, for life, miserable invalids. A worthy shoemaker, near Boston, by sitting badly, became subject to heart diseases, nearly a quarter of a century ago, from which he has ever since been a sufferer.

388. I might even say that I have seldom found an individual whose employment required him to sit much, and who had, by inheritance or otherwise, the slightest predisposition to internal disease, who was not made much worse by a bad posture of body, long continued, especially by a bad position of the head and shoulders.

389. Neglect of exercise involves another sore evil. It prevents the easy and rapid return of blood, by way of the veins, from the feet to the heart. This is at the foundation of much of the complaining which prevails about cold feet. It is also a frequent cause of numbness at the lower extremities, — a sensation often described by saying that the limb is asleep.

390. But this last is not the worst evil to which the lower limbs are made liable by neglect of exercise. The circulation in the veins becomes, in some instances, so much obstructed that the latter are permanently distended to the size of a man's finger or thumb. They are called varicose veins. Occasionally they form knots or sacks of considerable size; and I have known them to result in open ulcers, and to give great trouble. They are, of course, usually incurable.

391. Straining the muscles frequently, as in the case of very hard lifting, is an evil that sometimes brings with it, as the Heaven-appointed penalty of transgression, a great deal of suf-

fering. One stout man, who had been a famous wrestler till he was forty or fifty years of age, hastened on, as well as aggravated, a hereditary chronic rheumatism, which at length became exceedingly severe, so that he lingered in torture twenty years or more; or till Nature was completely exhausted.

392. Our bones and muscles, particularly the former, are liable of course to accidents almost every day we live. They are exceedingly numerous and interesting; but then they can hardly be called diseases.

QUESTIONS. — What part of the teeth is particularly liable to injury? What is a leading or general error into which we fall concerning them? Are they not used too early? Are they not used on too hard substances? Do we not afterward proceed to the opposite extreme, with our children? Is our over-refined cooking a prominent and frequent cause of premature decay in these instruments? Is it a frequent error to use our throats too much in speaking, and our lungs too little? Why is the custom of reading manuscripts and sermons more objectionable than speaking extemporaneously? Is the windpipe apt to be more bent upon itself in reading than in speaking? Do round shoulders and crooked spines bring with them, almost inevitably, much internal disease? Are lung diseases becoming, every year, more frequent and fatal? What number of persons, is it estimated, die yearly in the United States, of lung diseases?

What is said of the increase of heart diseases among us? Do thousands already die of them yearly? Are they induced and aggravated by the same causes that induce and aggravate lung diseases, particularly pulmonary consumption? What other internal diseases may be brought on or aggravated by a habitually bad position of body? Is sudden death often the result of heart disease, induced by a bad position? What anecdote is related of a man near Boston? What is the result of the author's observation? What other sore evil is mentioned in this connection? What are these knots in the veins called? Are they generally incurable? May straining the muscles too much, habitually, do mischief? What forms of mischief? What anecdote is related to illustrate this?

CHAPTER III.—OF REST AND SLEEP.

SECTION I.—NATURE AND USES OF SLEEP.

393. During my whole life I have met with but one man who could dispense, wholly, with sleep. This was a Scotchman, by the name of Robert Gourlay. His story may have been an exaggerated one; for I am not sure it was ever investigated by any competent individual, or board of individuals. And yet, that he had most extraordinary seasons of sleeplessness, there is no doubt.

394. These seasons were of various length, but they sometimes extended to many months. There were, indeed, during these periods of sleeplessness, certain times when he would sit a little while on a sofa, or in an easy chair, in what seemed, to the bystanders, to be a partial slumber. But these exceptions to the general rule of sleeplessness were rare; and the reverie, if it were such, did not continue long. Besides, he would, in these circumstances, answer any question which was put to him, as well as relate, afterwards, all that happened.

395. This condition of the living system was, as I have not a doubt, a diseased condition. What the final results were, I never knew. It came upon him soon after his arrival in this country, and may have disappeared as suddenly on his return to Scotland, or on his becoming accustomed to other climates or circumstances.

396. I have known many who could abstain from sleep for several successive nights, without much apparent injury; and others who could get along for weeks, if not for months, with an hour or so of sleep a night. Some such instances have been alluded to, already, incidentally, in chapter II., section XVI. Other instances remain to be mentioned.

397. Among those who have been distinguished for this partial abstinence from sleep are, a man mentioned by Gooch in his writings; the French general, Pichegru; and certain missionaries, mentioned by Sir Gilbert Blane, in his Medical Logic. More might be named; but these cases must suffice as examples.

398. The man mentioned by Gooch is said to have slept but fifteen minutes a day. Gen. Pichegru, during a whole year's campaign, would allow himself but an hour a night. The missionaries alluded to, by means of a few short, but quickly repeated naps, which, in the aggregate, did not exceed one hour in the whole twenty-four, contrived to satisfy nature's demands; and, as they believed, without impairing their health.

399. This last case was the more remarkable, as they were translating the Bible; and, while they denied themselves sleep, probably, at the same time, denied themselves exercise. But Sir Gilbert does not give us the sequel of their history. Such knowledge would probably affect, in no small degree, our judgment concerning their wisdom, though we cannot doubt the purity of their intentions.

400. But, however it may have been in these particular cases, there can be little doubt that these protracted vigils do, as a general rule, impair health and shorten life. I have made several important experiments, whose results, as far as the experiments of a single individual can go, have the same general bearing. Punishment, though long delayed, must finally come. (62.)

401. Sleep is the opposite, or antipode, of action or exercise. Except in peculiar cases, as of somnambulism — which is believed to be disease — the activity of the voluntary or locomotive powers is completely suspended, while the internal organs, not under the command of the will, go on as usual.

402. The ultimate end of sleep is to rest and restore the brain and nerves, and the locomotive powers. It does, however, resuscitate the whole system, in all its parts. It is more or less profound, according as the system is more or less, either temporarily or permanently, in a normal condition. It may also be more or less protracted by circumstances.

403. One subordinate end of sleep appears to be, to bring back the circulation from that febrile condition to which previous excitement had led; and to produce, throughout the whole animal domain, a state of quiet and equilibrium.

404. As a general rule, the more soundly we sleep the less we dream. Whether, however, the doctrine which some have advanced — among whom is the celebrated Macnish — that, when we are sound asleep we never dream, be true or not, I will not attempt to decide; for I have not facts enough to serve as data. However, it seems to me quite probable.

405. Few things will wear us out faster than too little sleep.

Many there are, so constituted as to be able to subsist with very little exercise, clothing, or food; and with still less of drink. But, as a general rule, whatever is needful of sleep, if long withheld, is productive, sooner or later, of serious and irreparable loss.

SECTION II. — MATERIAL FOR BEDS.

406. Many have said, with Locke, the philosopher, that, if we do but secure the main object of sleep, it makes little difference whether we rest on a hard bed or a soft one. This is probably true. But when it is said by some of the moderns — even of those who call themselves physiologists — that the soft side of a plank is as good as anything else, I am obliged to record my protest.

407. When a person lies on a plank, *hard* or *soft*, the whole weight of his body, especially if he is lean, rests on a few square inches of surface; but, when he rests on a soft, yielding substance, the amount of surface is greatly increased. Is there, then, no difference with regard to the soundness of our sleep, in these very different circumstances?

408. Physicians, I know, often recommend, to their debilitated and nervous patients, a hard bed. But what do they mean by it? Most certainly a hair mattress, or a husk or straw bed. Such hardness, no doubt, is greatly preferable to feathers or down; which, to the healthy, in any condition, at least in this country, can neither be desirable nor salutary. They do not mean a plank, literally; though, as we have seen, even such a bed has, in some few instances, been found useful. (370.)

409. All beds should be sufficiently porous to permit a proper circulation of the air; and of such general character, as

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QUESTIONS. — Can a person subsist, wholly, without sleep? What very remarkable instance of this kind is mentioned? Do we know the final results on his health and character? Will you mention other instances of partial abstinence from sleep? Is the sequel of these cases fully known? About what is it said (400) there can be little doubt? Is the punishment of violated physical law, though long deferred, sure to come? What powers, functions, or faculties, are suspended wholly while we sleep? What, then, is the ultimate end or object of sleep? What is a subordinate end? Do we dream more or less when we sleep soundly? What is said to be the doctrine of Macnish and others about dreaming? Is it probably true? Does abstinence from sleep, as regards the needful amount, wear us out more or less than partial abstinence from food, drink, or clothing? What is the general rule in this case?

to allow of a healthful play of the electric currents. With both these objects, as every one who has studied this subject well knows, feathers are quite incompatible. And yet thousands, as with a death grasp, — being misled by habit, — still cling to them.

410. Hair, husks, straw, wood-shavings, grass, cotton, and various other materials which could be mentioned, have their various excellencies, and some of them their defects also. Yet they all seem to me greatly preferable to feathers. They may be enclosed, loosely, in a tick or cover; or they may be wrought into the usual form of a mattress. The first-named method has, in many particulars, the preference.

411. There is one recent invention, which, while it secures the softness and elasticity of feathers, air, or water, has, so far as I know, none of the objections usually urged against some of these. It consists, essentially, of coiled wires, arranged in the manner of a carriage-seat or sofa. It does not heat the body at the loins, like feathers; neither does it appear to prevent the free play of the electric affinities. Nor does it impart, when heated, those odious effluvia which are sometimes imparted to a room, in a few hours only, by feathers.

412. This kind of bed I have tried most fully in my own family, and have seen much of it abroad; and can, therefore, most cheerfully recommend it to the rich and the poor. It is but moderately expensive; and is, by some, made portable. I do not know that it has any popular name.

413. For covering, Dutch blankets are greatly preferable, were it only on account of their porous character. Comfortables are objectionable on nearly the same grounds with feather beds. They are cheaper, at first, as I am well aware, than blankets, but not necessarily so in the end; especially when we take into the account our bills for medicine and nursing and physicians.

414. Worse still than comfortables, are feather beds for covering, which I have often seen used by a portion of our foreign population. I am happy, however, in believing that such a use of feathers is, as yet, but little known in the United States.

415. A few persons, not only soldiers and sailors, but others, tell us they can sleep on the ground, as well as anywhere else. Habit is certainly almost omnipotent; and, if we were trained to sleep on the ground, I have no doubt it might very well answer our purpose. I have known men who preferred the

ground a part of the year, even in our own highly changeable climate. In general, however, and trained as we are, the use of this primitive bed would be a little hazardous.

SECTION III. — POSITION IN SLEEP.

416. He who is truly sleepy may obtain the blessing he craves in almost any position. He may even sleep while standing or walking. Most persons can sleep while sitting; and not a few will sleep in this condition very comfortably. Such a position is, of course, sometimes the only available one, — it is Hobson's choice; — and nature is wonderfully apt at accommodating herself to circumstances quite untoward, when she cannot help it.

417. In general, however, we are not thus reduced. We may take a recumbent position. But though this is certainly preferable, it is not indispensable. Of course, I speak now of the healthy; for, to certain diseased persons, the sitting or half recumbent position may be the only one which they can take or endure. In paroxysms of asthma, the sufferer cannot, in some instances, lie down at all; and so in the case of certain other chronic diseases.

418. Some sleep on their backs; but this position is not favorable to those who are liable to nightmare. It is oftentimes better, however, for the diseased than for those who are healthy; that is, moderately so. I have known several invalids, with weak or crooked spines (370), who professed to have derived great benefit from sleeping in this position.

419. I have objected to sleeping on the back by those who are only moderately healthy; but, for those who are in very high health, it is not by any means improbable that this posi-

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QUESTIONS. — What did Locke, the philosopher, say about beds? Was there not some good sense in his remarks? What shall we say of sleeping on the soft side of a plank? Why, then, do physicians recommend hard beds to their patients when very feeble? Why should all beds be more or less porous? Why are feather beds objectionable? Why, then, do mankind cling to them so strongly? What are some of the materials which are preferable to feathers for beds? Should they be wrought into the mattress form? What recent invention is recommended? Why is it preferable to feathers? Why preferable, on the whole, to other materials? What is the best material for the covering of beds? What is said of thick comfortables? Who use feather beds themselves, as a covering? What is said of sleeping on the ground? Is not habit almost omnipotent? Trained as we are, and in a climate like ours, is not sleeping on the ground a little hazardous?

tion, at least for a part of the time while in bed, would be admirable. But let me be understood. By persons in high health, I do not mean those who live luxuriously. These are not so near the line of high health as those who live plainly, like the peasants of Middle Europe, and perhaps the slaves of our own country.

420. But, for the mass of mankind, trained as mankind now are, the right side seems to be the most favorable position which can be taken. It is especially adapted to favor late digestion, as it gives freedom to the motion of the stomach, while the work of chymification is going on. Those persons who, from any cause whatever, are feeble, will do well to give heed to this suggestion.

421. Many individuals, from habit and otherwise, *prefer* the left side. I have known a few very feeble persons of this description. I think, however, that even these would do well to make an exchange, and gradually accustom themselves to the right side, as being physiologically the most correct.

422. On the whole, then, my recommendation is about this: While it is desirable and preferable to sleep for the most part on the right side, I would cultivate the power of sleeping on the left, and also on the back. One can soon bring himself to all this. If he cannot lie but five minutes in the new position at the first, let him, at least, do what he can. The next time he can do more, and so on.

423. The young may, in general, dispense with pillows, and sleep on a level or horizontal surface. As they advance in life, the head requires, on physiological principles, to be raised a little; and the older they become, the more it should be elevated. In general, however, a good pillow and a bolster are all that is required by the healthy, in the most advanced years.

424. When, however, a pillow is used at all, the head should lie fairly on it, and not just on its edge; for the latter position obstructs the circulation in the neck. The head ought never to be covered. The body should be slightly, but not too much, bent; and the limbs should rest on each other as little as possible.

425. Whatever, in this world, is worth doing at all, is worth doing well. It is worth some pains. If good and refreshing sleep is desirable and valuable, and if anything we can do by way of preparation, at our lying down, will contribute to an end so desirable, it is worthy of our attention. It may, there-

fore, be a matter of importance to hear the following personal statement.

426. When I lie down, at night, it is always with an intention to sleep, as much as I possibly can, on the right side. To this end, I first place myself on my left side, or on my back. Here I remain as long as I can with safety, without falling asleep in this position. When I am unwilling to run the risk of so doing any longer, I turn upon my right side; and generally fall asleep in this position. Sometimes I continue on my right side nearly all the night; at others I turn from side to side, either intelligently or without any consciousness of movement. I dream most when I change my position most frequently.

SECTION IV. — NIGHT DRESSES AND CLOTHING.

427. Certain travellers with whom I am acquainted, make it an invariable rule, wherever they may be, to have with them a suitable night dress. Were they compelled to relinquish or lose all else, they would cling to this, as an item which could not be dispensed with.

428. They seem to reason thus, — for some of them have a smattering of physiological knowledge. Our clothing, by day, becomes loaded, to a greater or less extent, with foul emanations from our bodies, and when taken off at night is really filthy. Now, is it healthful — is it even decent — to wear this all night? We cannot think so. We think it preferable to remove the whole, hang it up where it will be properly aired and ventilated, and put on, in its place, a night dress — a single garment — which has been airing all day, and which is, at least, comparatively clean and healthy. And do they not reason correctly?

QUESTIONS. — May not he who truly needs sleep, obtain it in almost any position? What cannot nature do in an extremity? What sometimes happens during a paroxysm of asthma? What is said of sleeping on the back? What is said of certain invalids who have been accustomed to sleep in this position? What may be done by those who are in high health? Is high health the lot of those who live luxuriously? For the mass of mankind, what is the best position? Why is sleeping on the right side particularly favorable to digestion? What is said of pillows for the young? What for those in advanced life? Is it injurious to sleep on the edge of a pillow? May the head be covered? Should the body be straight, during sleep, or a little flexed? Is good and valuable sleep worth taking a little pains for? What is said, by way of illustration, of the writer's own experience and habits? What is his experience about dreaming?

429. Nor is this any new-fangled idea. I first learned it in Boston, of some of the old standard families there, a quarter of a century ago. And, you may depend upon it, I shall never regret the day I received my first lesson. And what I prize so highly, I am anxious to teach to others.

430. Most persons sleep under nearly twice the amount of clothing they really need. They are in great haste when they lie down to get warm immediately, and hence pile on a vast quantity of clothing — all, perhaps, that they can get — and they are soon fast asleep. When they wake, they are in great distress — they scarcely know why. Some, who are wise enough to discover the cause of their ill feelings and to remove half the clothing from the bed, may probably rest well the remainder of the night; while others lie sweltering and suffering.

431. It is undoubtedly true that we ought to sleep warm; but the remoter evils of sleeping unnecessarily warm are much greater, as I believe, than those of sleeping a little cool. It is no very serious injury to a person to wake once in two or three hours, with a slight sensation of chilliness, such as may induce him to turn in the bed. He will often rest the more effectually for a few such interruptions, provided, however, the sensation of chill is not so great as to prevent his falling immediately to sleep again.

SECTION V. — TOO MANY OCCUPANTS.

432. The oriental custom in regard to sleep appears to have been entirely different from ours. They had no such narrow sleeping rooms as we; nor had they, as a general rule, any such cumbrous bedsteads. What was called their bed appears to have consisted of a single piece or layer of something, of greater or less thickness, which they could carry with them wherever they went, and in which they were accustomed to wrap themselves, whenever rest was demanded.

433. It must indeed be admitted that such a custom as I have described, though still, to some extent, prevalent in the

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QUESTIONS. — Do some persons, especially travellers, always take care to have a night dress with them? What is the object of such a dress, as stated by themselves? How do you like their reasoning? Is it a new-fangled notion? Do those who have been accustomed to use it highly recommend it to others?

Is it not true that most persons sleep under too much clothing? How does this happen? Is it not an evil to sleep cold? Which is the greater evil of the two — sleeping too warm, or too cold?

East, is better adapted to other climes than to our own stern battle-ground between the frozen North and the burning South. One thing of theirs, however, we may imitate, which is their simplicity.

434. When we lie down for rest, it is by no means in accordance with physiological law, nor even with any known moral law, for two or three, or perhaps a still larger number of individuals, to herd together in the same bed, although it were four cubits in breadth, like that of the ancient king of Bashan. In general, only one person should occupy a bed.

435. This, I say, is the general law, to which, as to other general laws, there are a few exceptions, among which is the case of a mother and her new-born child. These, for a few weeks or months of early infantile life, should not be separated.

436. The reasons why only one person should occupy a bed are numerous. One of them has reference to the purity of the air. In the best possible circumstances, more impure air is breathed in the case of double occupancy, whether that air is generated by respiration or by the skin, or by both. The absorption of oxygen and the disengagement of carbonic acid gas is much more rapid, even by the skin, than most people are aware.

437. The objections to several occupants of the same room, with single or oriental beds, especially if the room is large, high, and airy, or can be well ventilated, are fewer and feebler than to the occupancy of one bed by several persons. But I speak, now, with sole reference to physical considerations, leaving the morality of the subject entirely out of the question.

438. The most objectionable form of occupancy, so far as mere health is concerned, is found in the case of a younger person wedged in between two older and perhaps less healthy individuals. They who sleep together — if sleeping together we must have — as an occasional exception to the general rule, should be in good and perfect health, and of the same or nearly the same age.

439. One curious exception to the force of these remarks is found in the case of the mother and her infant. I have said that these should sleep together for a time. It is true that the air is somewhat impure; but God in his providence has so ordered it that the tender infant will do very well with a little less than the due proportion of oxygen which is contained in atmospheric air. The provision is as wonderful as it is benevolent.

440. It may not be necessary, at the present day, to declaim against the admission of the cat and dog, or either of them, to the sleeping rooms of our children. And yet the latter, in particular, whose breath is superstitiously, but very erroneously, believed to be sanative, still finds its way to the beds (even to the very interior of a few) of our feeble or sickly children. This is all wrong. If the healthy can endure this, the feeble cannot. But this subject will be adverted to in another place.

441. There is still a more sweeping and at the same time not less conclusive argument against this whole system of bed and couch partnership. When man shall have become more assimilated than he now is to the lower orders of being, there will be time enough for him to extend the civilities of social life to that condition of existence, from which, above all others, — that of the swine perhaps excepted, — the chief prerogatives of social life should be excluded!

SECTION VI. — EARLY HOURS.

442. It is a maxim which has come down to us from early antiquity, that one hour of sleep before midnight is worth two afterwards. This maxim, though, like many other old maxims, only partly true, has truth for its foundation.

443. Sir Gilbert Blane, in speaking of the case mentioned at 398, tells us that when the missionaries to whom he alludes were almost worn out with their daily toil, and yet felt a strong necessity of completing their translation at a certain time, they availed themselves of the following device for borrowing a little from the hours usually allotted to repose, and hitherto deemed indispensable.

444. At an early hour for retiring, they placed themselves in a recumbent position, with a bell, or at least a hollow basin,

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QUESTIONS. — What was the oriental custom with regard to sleep, sleeping-rooms, etc.? Is this custom still, to some extent, prevalent? Is it wholly inapplicable to our own country and times? Should more than one person, as a general rule, occupy the same bed? What exception to this rule is mentioned at 439? What are some of the reasons why only one person should occupy a bed? Are there fewer objections to two single beds in a room, than to one double bed? What is the most objectionable part of the custom of sleeping together, so far as mere health is concerned? If two persons must sleep together, what should be the required conditions? What is said against the admission of dogs and cats to our sleeping rooms? Is the breath of a dog healthy? What sweeping argument against this bed and couch partnership with brute animals is alluded to?

before and near them; and at the same time held a weight in one hand directly over it. No sooner were they soundly asleep than the weight would fall on the bell or basin and wake them. The process would thus be repeated several times. After an hour or so spent in this way, they resumed their labors, apparently restored. Nor do I learn that there was any evidence of suffering from it, either sooner or later.

445. It is, indeed, a well known and admitted fact, that the system is restored with astonishing rapidity during the first moments of repose, whether at one time of the day or night or another. It is also well known that Nature, when hard pushed, will make strong efforts everywhere to secure her rights. Still, in spite of this admission, I must confess myself unsatisfied that no penalty followed, more or less remotely, upon this transgression.

446. It is far from being evident that we do not need the recumbent position during a greater number of hours, even if sleep itself could be thus forced into one or two. Hence the two hours for rest after midnight may become as necessary as the one hour before; although the penalty for neglecting to appropriate it may possibly be more remote.

447. In the midst, however, of uncertainties, one thing is quite certain, that it is safest to retire early. No one will doubt that sleep before midnight is at least as good as that which comes after it; so that in going to bed early, we are more sure of gaining the prize. It is a maxim in the business world — one we may safely follow everywhere — never to defer to a future uncertain season that which can as well be done at the present moment.

448. But the safety or prudence of this course is by no means the strongest argument in its favor. Experiments have been repeatedly made which go very far towards proving that sleep in the night is more restorative than that which is taken in the day-time. Different divisions of an army, who were destined to the same place, have been marched at different hours, one in the night and another in the day. Teams heavily loaded have been driven in the same way. The results are always in favor of sleeping and rest in the night, and of having our midnight as near the middle of the night as possible.

449. Is there not a strong presumption, too, in favor of early rest and sleep? Did not He who made the night, and who placed midnight at an equal remove from its beginning and end, thereby intimate that about half of our rest should be taken on each side of it?

450. Finally, however, the great and conclusive argument in favor of early retiring to rest is derived from the consideration that the feverish state of the system which I have shown to exist at night (169), and the accompanying agitation and derangement of the nerves, are best restored in those who get at least two or three hours of sound sleep before midnight.

451. However, I do not regard it as indispensably necessary for those who wish to sleep a given time — say eight hours — to retire at exactly eight o'clock. If the system is *wound up faster* in the early part of the night than in the latter, so that in retiring at nine we practically get more than three hours of sleep before midnight, then why should not three hours of sleep in that part of the night be sufficient; and why should not five hours after midnight make up the required complement?

452. We shall be told, I well know, of distinguished individuals who have set up late in the performance of their literary labors. And I remember well a period in my own life, when I was beguiled by the quietness of the hour, and by that hilarity of spirit, not to say feverish state, which is wont to exist at that time — especially in the case of the consumptive — into the same error.

453. But they who do this — who boast as I have done in former times of being best able to do their work at midnight, should remember what Solomon has said (62) of the certainty of punishment, even though long delayed. Nor can we escape the penalty, merely because our sins are those of ignorance.

454. I have, it is true, known a man who lived to eighty-one years of age, who, for much of his life, sat up till twelve or one o'clock at his studies. But then his other habits were mostly excellent, and he possessed, by inheritance, what I have elsewhere called an iron constitution. Besides, if he lasted with this abuse to eighty-one, who knows that he might not have lasted without it to one hundred, or even to a much more advanced period?

QUESTIONS. — Is one hour of sleep before midnight worth two afterward? What anecdote is related by Sir Gilbert Blane? Is not the system restored with great rapidity during the first moments of our sleep? May not a recumbent position be useful, even if we do not sleep? Is it not *safest* to retire early? What experiments have been made which have a bearing on this question? Is there not a presumptive argument in favor of early rest and sleep? What is it? What is the final and strong argument in the case? Must we sleep exactly half our hours before midnight? What objections will be made against these views? What is the proper reply? What does the author say of his own experience? What have been his conclusions from observation?

SECTION VII. — HOW LONG SHALL WE SLEEP?

455. Few questions concerning physical law are oftener asked, by the truly conscientious, than, How many hours ought a person to sleep? And perhaps there is no question to which a greater variety of answers has been given; and this, too, in all good faith and sincerity.

456. Some present us with a graduated scale, like that of M. Friedlander, which professes to inform us exactly what is required at a particular age — the younger, of course, requiring much more than the older. The reader will find this scale, in connection with more full remarks on the subject, in my large work, entitled "Lectures on Life and Health," p. 438.

457. Others tell us that the feeble require more sleep than the strong. Others, still, assure us that, the more stupid and inactive we are, the more sleep we require, like the bear, marmot, and swine, among the lower animals; while the active and intelligent, like the cat, tiger, and hare, require comparatively little.

458. It is, hence, a very fair conclusion that no given number of hours will answer for all persons. It is in this particular as it is in regard to food, drink, clothing, and temperature. Very much depends, in regard to all these, on age, habit, occupation, state of health and of the weather. Something, too, I have not a doubt, depends on natural constitution, temperament, etc.

459. There is, abroad, another very general and universal conclusion, viz., that we sleep too much. We eat and drink too much, use too much clothing by night and by day, and rely too much on external heat; is it not to be expected, then, that we should incline to sleep too much? Personal gratification is the leading object of pursuit with mankind; and the question, as a general rule, has not been, how little *ought* we to eat, drink, sleep, etc.; but how much *can* we? The former question appears to be reserved for the discussion of a generation to be trained, hereafter, on Christian principles — a generation that will look not only on its own things, but also, as an apostle has well said, on the things and welfare of others.

460. One thing of immense importance, in connection with this subject, is apt to be overlooked. It is the fact that sleep may be extended or contracted, at least to some extent. Or, if the proposition is not true literally, it is as if it were so. I mean to affirm that the sleep which some persons get in eight hours, and for which they really believe eight hours are neces-

sary, may be gradually crowded into six ; and, in like manner, six hours of sound sleep may be gradually expanded into eight. And yet, but for a knowledge of the facts, no difference would perhaps be perceived in its effects.

461. But, if this is so, how few, in the present state of ignorance with regard to hygiene, are competent to determine, from mere experience, what is best for them. And yet, as with one voice, mankind say that "experience is the best schoolmaster." Now, their experience is so graduated and even controlled by their own habits and inclinations, that it cannot safely be relied on. It may be right ; it may be wrong. Were it grounded on benevolence — on the inquiry how little we really need, and not how much we can appropriate and devour — it would be of much more practical value than we now find it.

462. John Wesley, as we are told, endeavored to answer the question before us, from his own experience ; but he put it in the unusual form of how little, rather than how much, he should sleep. He resolved on confining himself to one nap ; and on following out the indications of nature in that way. If the nap was too short for nature's purpose, he wisely concluded she would take care to secure a larger amount the next night.

463. It was a considerable time before he became satisfied with his experiments. At last he settled down on about six hours, as the smallest amount which would answer the purposes of nature. This, in other words, was the longest single nap he could secure.

464. I am not at all sure that a better plan for deciding this great question for ourselves — for decide it for ourselves we must — can be devised than that of Mr. Wesley. For, though by no means a perfect rule, it is, most certainly, a closer approximation to the truth than any which I know. But, in order to apply it in one's own case, he must be honest and persevering.

465. Early rising will depend very largely on early retiring. All our estimates of the value of the time saved by rising two hours or one hour earlier, if in consequence of rising so much earlier we retire so much earlier, or if we are thereby made dull and sleepy all the day long, must necessarily be defective. He lives most who is in deed and truth the longest truly *awake ;* and not he who has his eyes open the greatest number of hours.

466. We have seen (396–400,) that mankind can get along, very comfortably, for a few weeks or months or years, on an amount of sleep, which, at first view, seems wholly insufficient ; and which is probably insufficient for the best accomplishment

of nature's purposes with respect to us. But the great question, how much is really best for us, still remains unsettled. The young certainly need more sleep than the old.

467. As a general rule, about six hours is believed to be the smallest amount of time which healthy adults really require for this purpose; and it is sometimes said, very loosely and carelessly, that no one ought to reproach himself who does not consume over eight. But the practical difference between six hours and eight hours of life, is equal to about one-eighth of the waking hours of a whole life of fourscore years; or ten years of existence! How much may be done in ten years!

468. Should it prove true — what is conjectured by many, and by myself among the rest — that the more our whole nature is cultivated, provided the physical, intellectual, social, and moral powers are cultivated harmoniously, the less sleep we really require, a new motive is presented to us for exertion. For, in making the most of our waking hours, we actually increase their *number* — perhaps, as a race, indefinitely!

469. A most remarkable fact is mentioned in the life of the late Dr. Charles Caldwell, of Kentucky. For six months or so, while a student — say at about twenty years of age, while laboring twenty hours of every twenty-four, at his studies and with his pen — he allowed himself but three and a half hours for sleep! Nor did it appear to hurt him. For sixty or seventy years of his life, he did not probably average more than five hours of sleep in every twenty-four.

SECTION VIII. — FIRES IN SLEEPING ROOMS.

470. In this and one or two of the sections which immediately follow it, I shall be obliged to anticipate a little. So

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QUESTIONS. — How long ought we to sleep? What is said of a graduated scale on this subject? Do the feeble require more sleep than the strong? Do the stupid need more sleep than the active? What comparisons seem to indicate this? Is there any given number of hours which will be right for everybody? Do we not all, or almost all, sleep too much? What is the great question we usually ask in this matter? What should it be?

What point of great importance on this subject is apt to be overlooked? May we, then, often crowd our sleep into six hours a night? Can experience be, in every instance, the best schoolmaster? What is related by John Wesley? Will early rising depend, very largely, on early retiring? What is said about the frequent estimates of the value of time saved by rising early? What is a general rule with regard to the quantity of sleep really needed? To how much of active life are two hours a day equal? What new motive to exertion is presented? (468.) What facts, in the life of Dr. Caldwell, seem to point in that direction?

that they who do not fully understand me will, for aught I see, be under the necessity of turning to chap. VI., and perusing some portions of what is there said about breathing bad air, in general.

471. Fires in sleeping rooms are objectionable, in the first place, because they are unnecessary. Clothing is sufficient, if we have but enough of it, and of the right kind, even in the coldest weather — I mean for the healthy. When, however, I speak of *fires*, I mean artificial heat, whether kept up by fireplaces, stoves, steam, or furnaces.

472. All such fixtures in our sleeping rooms are objectionable, in the second place, because they have a tendency, greater or less, to impoverish the air. They rob it of its oxygen or vital principle, and only make the poor return of giving out an abundance of carbonic acid gas, which is not only wholly unfit for respiration, but in some respects poisonous.

473. But they do more than all this. In proportion as we raise the temperature of the atmosphere, we rarefy and thus expand it; and the quantity we ordinarily inhale at one time, viz., about a pint, will contain far less of oxygen than before, leaving out of the account what is consumed by combustion. Our sleeping rooms, then, which are artificially heated, have thus two sources of atmospheric impurity.

474. That those who have strong constitutions may endure artificial heat in their rooms for a short time, without much injury, or even much inconvenience, I do not deny or even doubt. On the contrary, it is equally true that cases of disease may be found in which a somewhat rarefied atmosphere may be necessary. But my present instructions are chiefly for those that call themselves whole, and not for the sick.

475. It may, however, serve the purpose of illustrating our subject, if I present, for the benefit of the healthy, a sick-room statement. And though the sick may occasionally need artificial heat in their rooms, as I have admitted, yet, even as a remedial influence, it will, as I believe, seldom be necessary.

476. Miss B. was consumptive and was daily bleeding at the lungs; and the prescriptions of her medical advisers were either inefficient, or were not properly heeded. On being called to see her, I found her in a room whose temperature was at least ten or twelve degrees higher than it ought to have been; and sleeping at night in at least 50° or 55° of Fahrenheit.

477. I prescribed and insisted on a cooler atmosphere, especially by night, and then left her. Her physician came the

next day, and indorsed my suggestions. From that time I heard no more of her for several years. I then learned that she had recovered by degrees, and seemed likely, at length, in spite of consumption, to live her "appointed time."

478. Some years since, a fine-looking parlor stove was invented; and great efforts were made to extend its sales. The inventor, who was a man of science, and ought to have understood better the laws of health, in his advertisement concerning the stove, dwelt particularly on its value as a ready instrument of keeping up a temperature of about 50° in our sleeping rooms. The reader may guess, if guessing is needful, what his motives were.

479. It is almost needless for me to repeat that, in general, the cooler the air of our sleeping rooms is, the better for the healthy. And I have known many a protracted case of chronic disease, besides consumption, postponed in its fatal issues — sometimes cured — by compelling the patient to keep his bed the greater part of the time, and breathe an atmosphere cooled down nearly or quite to the freezing point.

SECTION IX. — LIGHTS IN OUR SLEEPING ROOMS.

480. One reason why so many families adhere to the foolish custom of keeping up a light in sleeping rooms, is found in an overweening desire to gratify their children. These last like to have the lamp or the candle to look at, after they retire. In fact, fires are not very infrequently kept up for the very same purpose.

481. Now, the objections to this custom which I have to make, are not wholly grounded on its unhealthiness. It is morally wrong, as well as physically. In the first place, it endangers the house and exposes life. And then, secondly, it has a tendency to render the young timid and irresolute. Accustomed to lights at all times and under all circumstances during the hours of darkness, they are apt to think they cannot do without them.

482. But, in the third place, they are more or less unhealthy.

QUESTIONS. — Are fires in sleeping rooms objectionable? For what principal reasons? Do they rob us of our needful supply of oxygen? Do they supply a poison in its place? How is it, then, that some few do not appear to suffer in such rooms? What story is related as an illustration of the subject? What is to be guessed of human cupidity — in the story about the parlor stove? In general, is it not best to have our sleeping rooms as cool as possible?

No person, as I am persuaded, will sleep as soundly, other things being equal, where a light is kept burning in his room, as in utter darkness. Indeed, it is but reasonable to think so. If the night is appropriated to sleep by its Author, all devices for turning night into day must, almost of course, operate unfavorably.

483. And then, frequently, they rob the air more or less of its oxygen, and substitute a poisonous gas in its stead. All combustion, as is well known, does this, no less than all respiration. The evil just alluded to is not, in itself, very great; yet, along with other evil influences of a kindred character which accompany it, moral as well as physical, its results are neither to be overlooked nor forgotten.

484. Parents fully understand their obligation to furnish their children with the best food for their stomachs, three or four or five times a day. But, during a long night of eight or ten or twelve hours, their children's lungs demand pure air for food, twenty-five or thirty times a minute, just as much; and, if they do not have it, they cannot have pure blood. Should not this subject be fully understood? Who would rob his child some two or three thousand times a night? But is it no robbery to stint him as regards oxygen — the very pabulum of life and health?

SECTION X. — AIR IN SLEEPING ROOMS.

485. I can think of no place in which free agents spend as many successive hours without recess or interruption, and without any material change of air, as in their sleeping rooms. The young are confined to the school-room, without much change, for one, two, or three hours; and to the factory, sometimes, five, six, or seven; but many of our children, and some of our adults, are in their sleeping rooms eight or ten hours in succession.

486. If the air were pure in these rooms, the evil would be far more tolerable than it now is, and the dangers would be greatly diminished. Fewer lives would then be lost, as well as

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QUESTIONS. — Why are people so frequently in the habit of keeping lights burning all night in sleeping rooms? Is this an unhealthy custom? Why is it so? Is it wrong, morally? Does it tend to make children timid? Do we sleep as soundly where lights are kept burning as in darkness? Do they rob the air of its oxygen? Does the parent who, knowing the nature of the evil, still persists in it, rob his children of that which is more valuable than money?

fewer diseases roused into activity, which otherwise might have slumbered. But of this last I shall speak in the closing section of this chapter.

487. For various reasons, it has been customary — time immemorial — to shut up our sleeping rooms with all the apparent carefulness with which we would confine our prisoners of war. Not only do we close and fasten the doors and windows, but the fire-places (if any such exist), unless in use, must be boarded up. Not a breath of air is stirring, or can stir.

488. Now, those who consider well how readily the air is rendered unfit for respiration will hardly wonder that, in a room which is air-tight, and by no means large, there should be more or less of suffering. It could not be otherwise.

489. Provision should be made in every sleeping room, whether large or small, for a free atmospheric circulation. If the door can stand open, and there is, by this means, a free communication with a large and well ventilated hall, or a large, unoccupied room, it may answer the purpose. An open chimney is also of service; but this, without a fire-board, is seldom found.

490. If an open door or window is not available, it may answer nearly the same purpose to open a window. Most persons, I know, are afraid to do so; and indeed I have known very feeble persons, especially infants, to be injured in this way. But such results are not necessary. A little caution at first — a screen placed before the window, to break the force of the current, or the blinds carefully closed — is all that is desirable.

491. I could give the names, were it needful, of a very large number of persons, who have for many years been in the habit of sleeping with their windows open; and who would not, on any account, be willing to have them closed. A very worthy man in Philadelphia, in his eighty-fourth year, says that one cold morning, last winter, his housekeeper carried out of his bed chamber three pailsful of snow that had blown in during the night, for he always sleeps with his windows wide open. Some I have known who have slept on the ground much of the year; but this, though not so bad as to be caged up in bad air, is rather undesirable.

492. The greater part of those who sleep with open windows seem to prefer to lower the upper half of the window, rather than to raise the lower one. Now, I think this is an error. For

myself, I always raise the lower sash, whenever I can. The colder, denser, damper air does not then fall so directly on my person as when it enters first at the top. On the contrary, it gradually diffuses itself through the room and commingles itself with the air found there on its arrival; and its tendencies to produce a chill or a cold are thus partly obviated.

SECTION XI. — THE STOMACH AND SLEEP.

493. The connection between a healthy and well-regulated stomach and sound and healthy sleep is much more close than most people suppose. I do not believe it possible for sleep to be perfect and perfectly unbroken by dreams, incubus, etc., when the stomach is either temporarily or permanently disordered.

494. But, however this may be, it is certainly very common to find dyspeptic people complaining of trouble about their sleep. They cannot fall to sleep easily when they first retire; or they sleep unquietly; or they dream too much; or they have dreams which are peculiarly vexatious and distressing; or they sleep too soundly, as they say, and awake unrefreshed.

495. He who would sleep in such a way as to be thoroughly and perfectly restored should take good care, it is true, to have his body in perfect health throughout. But then he must take special care of his stomach and digestive system; for, let whatever else be right, if this is wrong, all will be wrong.

496. Without opportunity for close observation, and apart from any experience on the subject, the physiologist would be apt to think of the farmer as the most favored individual in the world with regard to sleep. Yet I know, both from observation and experience, that few men have such miserable sleep as our modern cultivators of the soil. Of course I speak generally; for there are many exceptions to the truth of the remark.

497. One error, in particular, is very obvious among these

QUESTIONS. — Is there any other place in which we spend as many consecutive hours as in our sleeping rooms? Do we carefully shut up our bed chambers, as if they were so many prison ships? Need we wonder at all at the suffering which occasionally follows? What are the most easy methods of preventing these sad results? Is it safe to sleep with open windows? Are there many who do this? What anecdote is related of one of these persons in Philadelphia? If we sleep with open windows, where should the fresh air be admitted — at top or at bottom? Why is this preferable?

farmers. They eat too full, or at least too heavy, suppers; and they often take them at too late an hour of the day. They come from their labor, especially in the long days of summer, at an hour which almost warns them to retire. And now, under these circumstances, and at the close perhaps of a day of great fatigue, they partake very freely of heavy and often unhealthy dishes, and retire immediately to their beds.

498. But their slumbers, in such circumstances, are likely soon to be disturbed by unpleasant dreams. The burdened stomach and irritated nerves will not permit of absolute quiet. They toss out the night, and awake with a thousand bad feelings in the morning. They wake, also, with a reluctance to rise; and perhaps feel compelled, from a sense of duty, to force themselves up entirely against their will.

499. In other cases, however, of derangement of the stomach and alimentary canal, there will be, as the result, a species of sleep which has sometimes been called apoplectic. The experience of the individual is expressed by saying: "I slept like a block of wood;" or, "I lay all night just like a log."

500. They who are in the habit of taking four or five meals a day, especially during the long days of summer, — and this is the season, above all, in which this habit is indulged by laborers — and who find their sleep dreamy and unsatisfactory afterward, will often set all things right by merely abstaining a few times from their supper or last meal. This permits the jaded digestive organs to free themselves of their load, at least, in part; and probably, after the lapse of a little time, rest may be restored.

501. In short, there is very great reason for believing that abstinence from the last meal of the day, especially if it comes at a late hour, whether that meal is the third, fourth, or fifth, will do more to insure sound and healthy sleep than all the drugs and medicines which could be taken for this purpose from all the apothecary shops on both sides of the wide Atlantic.

Questions. — Is there an intimate connection between the state of the stomach and digestive system and sound sleep? Has not almost everybody observed this? What must they do, in this respect, who would have perfect sleep? Do farmers and other out-of-door laborers sleep better than all other men? Why not, when all things seem so favorable to such a result? What is their leading error? Do they sometimes have sleep which is almost apoplectic? What is said of the effects of omitting the evening meal in such cases? Would such a course be preferable to anodynes for the purpose?

SECTION XII. — INFLUENCE OF THE MIND AND HEART ON SLEEP.

502. Dr. Franklin, in a very ingenious essay of his, on the art, as he calls it, of procuring pleasant dreams, after giving various directions to this end, takes occasion to close his remarks by saying that all his efforts to instruct on the subject will be wholly useless, unless pains are taken, beforehand, to secure what is necessary above all things else — *a good conscience.*

503. A good conscience is as indispensable to sound sleep as to pleasant dreams, since it is most undoubtedly true that, though pleasant dreams are greatly to be preferred to unpleasant ones, it must be better still to sleep so quietly and soundly, if possible, that no dreams of any kind will take place.

504. The influences of mind and heart — of the passions and affections — on sleep, are but little understood, even by those who have studied most this intricate subject. To many persons they are mere confusion — I might say chaos. They know, indeed, that there is a connection; but in what it consists they are ignorant. The day of dream-books has gone by; but then it has left nothing clear or settled in its stead.

505. It is a common opinion that our dreams have something to do with the subjects that have occupied our minds the preceding day, and especially the closing portion of it, just before we sleep. And there is certainly ground for such an opinion. I have traced my dreams to such a source, a thousand times.

506. It has also been thought, by a few, that our dreams indicate the general bent of our mind and the tone of our feelings. That, if we dream habitually of flying, for example, it indicates a general predominance of hopefulness; if of weeping or in any way enduring pain, it indicates general anxiety, perplexity, or melancholy; if of finding money or something valuable, it indicates what the phrenologists call acquisitiveness, etc.

507. One teacher of eminence carried this matter so far as to encourage his pupils, at stated times, to relate to him their dreams. It is certainly true that he succeeded better than most men whom I have known, in understanding the character of his pupils; but how far this was owing to his studying their dreams is not easily determined.

508. Dr. Caldwell, elsewhere referred to (469), thus states his experience on this subject: "When I retired to my couch, my business was to sleep, not to skim the sky, or build castles in the air. Hence, no sooner was my head on my pillow, than my eyes were closed and consciousness was gone." And this

power over one's sleep, though rather remarkable, may be imitated.

509. The will, moreover, has strong power with reference to awaking. The distinguished individual of whom I have just spoken has told us that he could not only fall asleep the moment he lay down, but also that he could awake exactly at the expiration of his time. One of my ancestors possessed the same power. He would lie down after dinner, sleep instantly, his appointed time — fifteen minutes — and then awake and go to his labor.

510. With regard to the influence of the intellect on sleep, it is perhaps sufficient to add, that those studies which merely excite or interest the imagination are more likely to be followed by disturbed or unsound sleep than those which call into exercise the more sober faculties. The latter have a contrary effect. And yet, if pushed too far, as in the study of mathematics, even these fatigue the mind more in the end, and have a worse influence, than the temporary though higher excitement which is induced by other causes.

511. No person ever slept better, I dare say, than our Saviour. And he who would sleep like him, must wake like him. I mean just this; that he must feel, think, and act like him. He must not only possess a quiet mind, but a benevolent heart; and he must go forth to the world in order to do it good, to the utmost extent of his power.

512. We need not shrink from this allusion to the character of our Saviour, as if it were profane or irrelevant. Godliness has the promise of the life that now is, no less than of that which is to come. Our Saviour is a more perfect, as well as more complete example, than the unreflecting are sometimes ready or willing to acknowledge.

QUESTIONS. — What did Dr. Franklin say? Is a good conscience, then, a means of securing sound sleep? Are the influence of mind and heart on sleep very much understood? What is said to be a very general opinion on this subject? Is it thought by some that, as are a person's dreams, so is his character? What is said of the habits of a certain eminent teacher?

What is related of the habits of Dr. Caldwell, and of his power over himself? Could he go to sleep and wake when he pleased? Is this degree of self-control, in part or in whole, imitable by all? What is the influence of light studies on our sleep? What of the more sober ones? Is it to be presumed that our Saviour slept well? Why so? Must we be like him in order to sleep like him? Is godliness, or likeness to Christ, as profitable for this world as it is for the world to come? Is it profane to refer thus to the physical character and habits of our Saviour? Is he not, to us, a perfect example?

CHAPTER IV. — DIGESTION AND NUTRITION.

SECTION I. — WHAT DIGESTION IS.

513. The common notion of digestion is exceedingly narrow and unworthy. Most persons have a general idea that they live, some how or other, by eating; but, in what way the food which is from time to time taken into the stomach, comes to make a part of them — of their very flesh and bones — they know almost as little as the child did, who, when asked what had become of his dinner, replied that it had gone into his hands and arms and legs and feet.

514. With a very large proportion of the individuals with whom we meet, the word digestion means little more than *to get rid of*. They eat several times a day — some of them as often as they can — and the process is repeated, not only from day to day, but from week to week; and the stomach is still capable of receiving. They suppose, therefore, that their food digests; and, as long as they experience no immediate suffering, they know not but it digests well.

515. Others have a confused idea of a change of some kind; but that this change has anything to do with forming the blood, at least, directly, seems not to have entered their minds. They have, perhaps, seen crude or raw cotton put into a mill, and they know that the object is to have it come out, in the end, as cloth; but by what means the change is effected, or in what essentials it consists, they are totally ignorant.

516. There are others who fully understand that the blood is made from food, or from food and drink and such other admixtures with them as custom seems to require. But how the change is accomplished, it is quite possible — nay, almost certain — they have never thought. In any event, it is obvious they have no adequate or worthy ideas concerning it.

517. The highest knowledge possessed by most persons on this subject, is, that the blood is made from the contents of the stomach by means of a solution of some sort; and that the change takes place chiefly, if not entirely, *in* the stomach. And yet, if we should ask such persons whether blood is actually

made in the stomach, they would be very likely to express doubt!

518. These views are all inadequate and unworthy, inasmuch as they fall short of the truth, in two very important particulars. They take for granted that the work of digestion, whatever it may be, is performed solely in the stomach; and that it consists in a mere solution or dissolution of the food. True, they admit that the food makes the blood; but they do not clearly perceive the connection between the process and the stomach, and still less do they know of its connection with any other organs.

519. Now, it should be distinctly apprehended, as a primary truth, that, though the solution of our food in the stomach really takes place, yet that this is neither the beginning nor the end of the great work of digestion. It involves many important laws and processes, both vital and chemical.

520. It should also be clearly understood, in the outset, and by every individual, that the stomach and its appendages constitute but a very small part of the digestive machinery. The stomach has indeed a work to do, and that a very important one; but it has many co-workers in the fulfilment of its mission.

521. Digestion, in the fullest sense of the term, is the whole process or chain of processes by means of which our food, after having been withdrawn from the external world, is brought into a suitable shape to become a component part of the solids and fluids of the human system.

522. It is first changed mechanically. Next it is formed, by processes partly vital, partly mechanical, and partly chemical, into a substance called chyme. This chyme, by means of processes equally complicated, is formed into chyle. And, lastly, the chyle — at least, a part of it — is formed into blood. The machinery, so to call it, of these processes, is now to be described.

QUESTIONS. — Are the common notions of digestion exceedingly narrow and unworthy? What ideas do many have concerning it? Do not some among us think of the stomach and interior of the system very much as they do of a cotton-mill? What higher ideas do others attain to? What is supposed to be the highest popular view of the subject? In what two particulars are all these views deficient? Does not solution take place in the stomach? And is not this solution one important part of the work of digestion?

What, then, is digestion in reality? Where is the food formed into chyme? Where into chyle? Must all our food pass through these three or four changes?

SECTION II. — THE MACHINERY OF DIGESTION.

523. The machinery concerned in the work of digestion may be considered under five heads. It is intended to effect the various processes of mastication, chymification, chylification, sanguification, and defecation. Some speak of assimilation as a part of the work of digestion; but I have preferred another arrangement.

524. It is almost unnecessary for me to say that the machinery of the *masticatory process* consists, principally, of the *mouth*, *teeth*, and *salivary glands*. The number of adult teeth, when all are present, is thirty-two; but four of these, sometimes called wisdom teeth, make their appearance later in life. The salivary glands are principally three on each side of the face — one at the angle of the lower jaw, and two under the side of the tongue.

525. The machinery of *chymification* consists chiefly of the *stomach* and the apparatus for forming the gastric juice. The stomach is simply an enlargement or bulb of the alimentary canal, about one foot below the back part of the mouth; and is usually said to hold, in an adult, from a quart to three pints. The gastric apparatus it is not easy to describe, except in connection with an account of the chymifying process.

526. In the work of *chylification* the machinery is rather more complicated. It consists of *the liver*, a large, dark-colored gland, with the vessels it contains, that form the bile; and the *pancreas*, or sweet-bread. The pancreas is about six inches long and as large as a man's thumb, and lies partly behind the stomach.

527. The whole length of the alimentary canal, in an adult, is generally estimated at about thirty feet. The chyme, after receiving the bile from the liver, and the pancreatic juice from the pancreas, is spread along through nearly the whole length of this canal.

528. The machinery of *sanguification*, by which term I mean the formation of blood, — in other words, blood-making, is not so easily described, since we neither know exactly where the work begins nor where it ends. It is, however, generally considered as beginning with the lacteals and ending with the lungs.

529. The lacteals are the numerous vessels in the coats of the intestines which take up the chyle after it is formed, and perhaps also exert changes upon it. Hence the chyle passes through the mesenteric glands, which may also, by possibility, have power to affect or influence it. Thence it goes into what

is called the receptacle of the chyle, in the back part of the abdomen. The thoracic duct conveys it thence into a large vein near the top of the left shoulder, where it mingles with the blood as it returns to the lungs through the heart. All these parts — the lungs of course included — may be regarded as having an agency in the work of sanguification.

530. The machinery of defecation is chiefly, if not wholly, the alimentary canal. This, as I have told you (527), is about thirty feet in length. Its size is not uniform, and the different divisions of it have different names. Some twelve inches or so beyond the stomach are called the duodenem. Beyond that is the jejunum, which is much longer. The ilium is next. The cœcum, colon, and rectum are still farther on. The last three are usually called the large intestines; the others, the small ones.

531. There are other instrumentalities or agencies in the work of digestion, especially certain little glands in different places, which furnish an abundance of mucus, whose object is no doubt to facilitate the digestive process, directly or indirectly. Especially does it facilitate the process of defecation.

SECTION III. — THE PREPARATORY PROCESS OF DIGESTION.

532. We have seen, in the preceding section, that the mouth and teeth, assisted by the salivary glands, are the chief instruments or agents in effecting the first change in the condition of the food which is submitted to them. They effect, in short, the preparatory process.

533. It is said, by some who lay claim to a profound knowledge of the subject of physiology, that the admixture of our food with the saliva should be so very intimate as to have every particle of the former come in contact with a particle of the latter. This may be refining a little too much for a people brought up in almost utter ignorance on this great subject; and yet, is it not very near the truth, after all? Is it possible for the admixture to be too perfect?

534. For a few months after birth no teeth are furnished; though the salivary glands perform their office with great care

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QUESTIONS. — Under how many subdivisions may the machinery of digestion be considered? What is the machinery of mastication? What can you say of the second class of machinery? What of that of chylification? What of that which is concerned in the formation of blood? What of that of defecation? What are some of the divisions of the intestines? What is the whole length of the intestinal canal?

and faithfulness. Soon after they make their appearance it is customary to employ them. They are even employed quite too early by fond and over-indulgent mothers. It is not till the large or double teeth begin to show themselves that we should give the young such food as requires much mastication.

535. Nor are the first teeth sufficiently strong, as a whole, to be tasked with the hard work which is usually imposed on them. Many physiological writers have entirely interdicted some of the hardest substances commonly used for food. The hardest thing admissible is the crust of good and well-baked bread.

536. On this point, however, I wish to be understood. Because parents are willing and sometimes anxious to have their children eat all sorts of things which they themselves eat, even though hard enough to irritate their gums and break the enamel of their teeth, it does not follow that we should go to the other extreme, and give them nothing but pap, or toast, or some half liquid substance; or, what is worse still, chew it for them with a mouthful of half-decayed teeth.

537. It is with this, as with many other things, that truth lies somewhere between extremes. The teeth are made to be used. They are made, moreover, to be used very much, and to be used on hard substances. I will even say that the harder the food the better, provided caution is used not to break or otherwise injure the enamel. If the young were taught to eat slowly enough, the danger of evil results in this line of direction would almost disappear.

538. But, whether we are young or old — whether our food is hard or soft, or cooked or uncooked — mastication and insalivation are required; except in the case of milk, which of course only needs the latter process. The food must be ground more or less, and many kinds must be moistened. Who could swallow crackers, hard biscuits, dry bread, or even lean and dry meats, if his mouth were entirely destitute of any kind of moisture, and if liquids from any other source were unavailable?

539. When we are eating, the saliva flows slowly, from the termination of the tubes which conduct it, into the mouth. Some suppose that this flow is excited by the irritation which our food produces at these extremities of the ducts. And yet it is well known that the saliva is furnished in greater or smaller quantity in proportion to the keenness of our appetites and the intensity of our relish for the particular kinds of food we are masticating. It even flows at the bare thought of food which is highly agreeable.

540. We usually express the latter idea — that of the flow of the saliva at the thought of agreeable food — by saying that "the mouth waters." The flow of saliva is sometimes very great. It may even be excited by nausea, as when, at the commencement of vomiting, we say that water drains from the stomach. The *water*, in these cases, rushes from the salivary glands.

541. When our food is soft and yielding, and full of moisture, as in the case of soft or soaked bread, or succulent fruits, or well prepared vegetables, comparatively little saliva is needed, and consequently but little is furnished. But the contrary is the fact when the food is hard and dry, as in the case of crackers, wafers, bread crusts, etc.

542. It hence follows that soft and succulent food can always be eaten more rapidly than hard and dry food, unless the saliva is furnished in greater abundance to meet the exigencies of the case, or unless fluids are purposely added. Some rely wholly on their own resources; but the vast majority of mankind use drink with their food.

543. If we use no drink with our drier and harder food, the result is, at first, that we must eat slowly. Soon, however, we acquire the habit of manufacturing saliva in such quantity as to supply every reasonable demand. If we use drink, little saliva is furnished, and, the salivary glands becoming indolent, there is a tendency to furnish still less; so that the more we drink with our meals the more we may, and in fact the more we must.

544. When the food in one way or another has been sufficiently moistened, we have the physiological art of gathering the mass together, and of conducting it across the top of the windpipe (which naturally closes while it is passing) into the food pipe, which is funnel-shaped at the top. This conducts it at once to the stomach.

545. The mass which then passes into the stomach does not *fall* in from its specific gravity, as water falls from a height through a tube; but is conducted along slowly. We are assured of this from the fact that we can swallow almost as well — though not quite — with our heads downward, as if they were in their natural position.

546. A small quantity of saliva is always needed in the mouth, especially while we are using our vocal organs. In rapid reading or speaking, the supply is sometimes deficient, and a degree of thirst is induced. Of course this inconvenience is easily prevented by reading or speaking more slowly.

547. Too rapid a flow of saliva, whether induced by highly exciting food, by tobacco-chewing, or in any other manner, is also apt to be followed, in the end, by thirst. Hence one reason why exciting food and tobacco lead to intemperance. The saliva is made to be used within the mouth and alimentary canal, and not to be cast away or thrown out of the body.

SECTION IV. — CHYMIFICATION.

548. All substances received into the stomach, which can possibly be wrought upon by this organ, are subjected to the process of chymification, except liquids. Pure water is absorbed into the circulation at once. So is the water of broths, gruels, soups, thin puddings, etc., after which the sediment is digested. So, even with bread, coffee, milk and water, molasses and water, etc. Milk forms a curd, which is digestible; while the watery parts are absorbed.

549. The stomach is usually said to have a slight resemblance to the Scotch musical instrument called a bagpipe; but it is not easy to describe its shape. Its size has been mentioned (525); but it is necessary to add that the size of this organ varies greatly in different individuals, according to their various training and habits.

550. Thus we occasionally find people who will swallow, in the course of two or three minutes, from one to two gallons of water. Others will consume, in the course of half an hour, of bulky food, such as cooked potatoes and turnips, pudding and milk, apples, etc., nearly as large a quantity. Now it is not possible, in either case, that much absorption takes place in so short a time; hence the stomach must be of sufficient size to receive and retain the whole. All gluttons have enormous stomachs.

551. The covering or walls of the stomach, like those of the

QUESTIONS. — How finely is it said by some that our food should be masticated? Should we have solid food before we have teeth? Is there any danger of breaking the enamel of the first teeth by food which is too hard? Is there not danger of another kind in going to the opposite extreme? What parental follies are alluded to? Is truth often found midway between extremes? Should food, generally, be both masticated and insalivated? What single exception to this rule? What causes the flow of saliva when we eat? Which is best for us, solid or semi-solid food? Why? Why do we drink during the process of eating? Is it or is it not best to drink with meals? Can you give the reason? Does food fall from the mouth to the stomach? How do we know? What is said about reading and speaking? What about tobacco?

alimentary canal generally, are made of several layers or thicknesses, one of which is essentially muscular. There are two sets of the muscular fibres or threads; one of which runs lengthwise of the stomach, and the other in the opposite direction. During the work of chymification these sets of fibres alternately contract, so as to produce a sort of churning motion, which is believed to facilitate very greatly the process of chymification.

552. The lining membrane, or internal layer or coat of this organ, is full of nerves and blood-vessels. When the masticated food has been conducted from the mouth to the stomach, the vessels of this membrane begin to form a fluid of a peculiar kind, quite unlike the saliva in its properties, and yet somewhat resembling it in its appearance. It is called gastric juice.

553. This gastric juice issues forth from the inner surface of this membranous lining, in small drops, not unlike the drops of perspiration on the forehead of a laborer on a hot day. These, in great numbers, unite with each other to form larger ones, which by their union make considerable streams.

554. These collections of gastric juice are immediately mixed with the outer portion of the contents of the stomach, which soon commences that churning motion already alluded to. (551.) The power of the gastric juice to dissolve and change the substances with which it comes in contact, is greatly aided by the motion and heat of the stomach, as well as by the nervous energy which is imparted to it from the cerebral centre. The result is a layer of chyme.

555. The motion of the stomach (551, 554), with other influences, conspires to push the layer of chyme already formed through the pylorus or outlet of the stomach into the small intestines. Another layer of chyme is then prepared in the same way with the former, and propelled into the small intestines through the pylorus in the same manner.

556. This process is repeated and continued till the contents of the stomach are wholly chymified, unless there should be a disproportion between the quantity of food and the amount of gastric juice formed, or unless a part of these contents should be of such a character as to resist nature's efforts and tendencies.

557. The period of time required for the work of chymification is nearly as various as the different circumstances, such as age, temperament, constitutional vigor, and habits of the individual. It will be longer in manhood and old age than in infancy and youth; and longer in those who have such a predominance of the bilious and lymphatic temperament as to render the vital movements sluggish or difficult.

558. It will also vary greatly with the varying character of the food. It has been ascertained that some kinds of food are twice as long — nay, even three or four times — in going through this process, as others. We may say, in general, that the time required by the healthy adult, for chymification, is from two or three to four or five hours.

559. Some substances resist all active efforts at solution, whether made by the stomach or the gastric juice. Such are the stones and seeds of fruits; and, in the feeble, the skins and hulls of fruits and vegetables. Other substances, such as oils and various medicinal agents, though they may be dissolved, cannot blend with the gastric juice; and, after remaining a very long time in the stomach, pass out of it unchanged. Others still, as the potato, are changed in part.

560. Occasionally, too, the gastric juice may be deficient in quantity, or imperfect in quality. When there is not a sufficient quantity, a portion of the food will remain in the stomach for a long time, causing flatulence, acidity, etc. It may even putrefy, and produce a good deal of irritation.

561. The sediment of broths, gruels, soups, and other liquid or semi-liquid substances, not having been submitted to the influences of mastication and insalivation, are, in the feeble, exceedingly difficult, as well as slow, of digestion. There are substances, however, which though slow of digestion are not, after all, very difficult.

QUESTIONS. — Does the stomach act upon all substances received into it? What becomes of water, then, if it is not acted upon? How is milk disposed of? How is it with broths, gravies, soups, jellies, and other semi-liquid things?

What is the general shape of the stomach? What its usual size? Is its size nearly the same in all persons? How may it be educated to double or treble its usual size? What proofs are there that the stomach is sometimes miseducated to such an enormous size? Is any part of this organ muscular? Has the stomach motion? What fluid does it form and furnish, highly essential to the work of chymification? Describe, as well as you can, the curious process of chymification. Does it continue till the whole contents of the stomach have undergone a change? What exceptions to the general rule are mentioned?

How long a time is required to complete this part of the great work of digestion? Do not different kinds of food require different periods? What is a sort of general rule about the length of time required? What substances resist the action of the stomach so that they cannot even be dissolved? Do we sometimes take too much food for the amount of gastric juice? What, then, becomes of the excess? What is said of the sediment of nutritious semi-fluids? Are all substances difficult of digestion merely because they are slow?

SECTION V. — FORMATION OF CHYLE.

562. The general length of the alimentary canal, its principal divisions, and their agency in the work of digestion, have been mentioned. (523–531.) A more particular account remains to be given. The structure and arrangement of the intestines are somewhat peculiar.

563. They are so wrapped on the edge of a membrane called the mesentery, that, when the other edge or back part of this membrane is gathered up, like a plaited shirt-bosom, it brings the whole line of these small intestines, amounting to twenty feet or more, nearly within the compass of a hat-crown. Of course, the canal must be exceedingly crooked.

564. Now the chyle is principally, if not wholly, formed in these small intestines. It is usually milky in its appearance, but sometimes pearl-colored. It is formed from the chyme, with certain additions, among the principal of which are the bile and the pancreatic juice.

565. The bile, or, as it is often called, the gall, is formed in the liver, and carried thence to the intestines in a small duct. It is bitter and acrid; but not so much so as might be supposed by those who only examine that small portion of it which is found in the gall bladder. The latter appears to be a kind of reservoir, in which bile is kept; and, the more watery and fluid parts being continually absorbed, what remains consequently becomes very acrid and strong.

566. The pancreatic juice is formed in the pancreas (524), and, like the bile, carried through its outlet into the intestines. Sometimes the ducts from the liver and pancreas unite just before they enter the intestinal canal. Whether they join it single or in company, they enter but a very little way beyond the stomach, and yet so far from it that their contents do not, in any ordinary circumstances, fall into it.

567. Soon after the chyme has begun to pass out through the pyloric orifice of the stomach, chyle is found in numerous vessels in the coats of the small intestines; but whether it is manufactured while in the intestinal tube, by the mere union with it of the two fluids just mentioned, or whether the vessels themselves, in which it is first discovered, exert some degree of action upon it, greater or less, is not well ascertained.

568. These vessels, in which the chyle is found, are called lacteals or milk vessels; probably on account of the frequent milk-like appearance of their contents. They have, however, in some instances, been called by the general name of absorb-

ents; though it is not positively known that they absorb anything but chyle.

SECTION VI. — FORMATION OF THE BLOOD.

569. The chyle, as found in the lacteals, passes through the mesentery. (563.) In this mesentery are great numbers of little knobs or glands, which, like most other glands, are made up of an incalculable number of vessels of various kinds, intertwined and knotted together, and united by means of cellular substances. The lacteals penetrate these glands; and other vessels, much like lacteals, emerge from them.

570. These last converge to a single point, at the back part of the abdomen, where they enter a large duct, or reservoir, usually called the receptacle of the chyle. Their contents are carried from this receptacle to the top of the left shoulder, or nearly so, where they are poured into a large vein carrying blood back through the heart to the lungs for renewal.

571. Here, in the lungs, mingled with the blood, and spread over the coats of an almost infinite number of air-cells, in close contact, as it is, with atmospheric air, the chyle becomes blood, and is fitted to perform all the offices in the human system which the blood performs. This completes the work of digestion, except what relates to defecation.

572. You thus see how inadequate the vulgar idea is, that digestion is a mere solution of the food in the stomach; or, at most, a solution *in* the stomach, and an evacuation *from* it. Why, this single part of digestion, viz., sanguification or blood-making, is of itself a complicated process, — laying under tribute, for its perfect accomplishment, quite a large number of separate processes.

573. The chyle is, in some measure, endowed with vital or living properties. It is said to have nearly all the characteristics of blood except its red color. But these and a multitude

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Questions. — By what means, or contrivance, is it that some twenty feet or more of the human intestines are brought within the compass of little more than an ordinary hat crown? What is the name of the membrane by which they are thus attached? Where is the chyle formed? What is its general appearance? Of what three ingredients is it principally made? What can you say, particularly, about the bile? How are the bile and pancreatic juice conducted into the intestines? Into what part of the intestinal canal do they enter? Where is the chyle first discovered? Where is it first made? What are the chyle vessels called? Why are they so called? Do they absorb anything else but chyle?

of other learned inquiries are purposely waived, as not indispensably necessary to the student of the laws of life and health. They who wish to know more, must study anatomy and physiology.

SECTION VII. — DEFECATION.

574. It might perhaps be supposed, from what I have said in the preceding sections, and without further explanation, that the whole of the chyme is made into chyle; and, when the former is in very moderate quantity and perfectly healthy, it may sometimes no doubt, be so. Generally, however, in civic life, it is far otherwise.

575. When the stomach has been a considerable time empty, and we are in vigorous health, if we throw into it very moderate quantities of highly nutritious or greatly concentrated substances, such as bread, rice, peas, beans, etc., the whole is very probably converted into chyle, and conducted through the lacteals into the circulation.

576. In the formation of chyle from such chyme as that just mentioned, there is probably no residuum. Pure nutriment becomes pure chyle. And as for water, (which, as I have repeatedly said (548, 574), on being taken into the stomach, whether alone or in combination with something else,) it is not digested, but absorbed. Milk is an example of mere nutriment and water. So are gum, sugar, honey, etc. So, perhaps, new cheese, the yolk of eggs, arrow-root, sago, tapioca, etc.

577. In general, however, there will be a residuum. This may consist of the seeds of small fruits, the skins and seeds of larger ones, or the unmasticated skins of potatoes and other coarse vegetables which have a strong cuticle. Some parts there are, even of our grains, as of Indian corn, for example, which can hardly be received into the lacteals. So, also, certain parts of our meats, such as tendon and cartilage.

578. There may be other accompaniments of our food which are still worse. Some individuals habitually swallow the hard, indigestible interior of the coarser kinds of grapes; and some

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QUESTIONS. — Through what does the chyle first pass, after it leaves the lacteals? Of what do the mesenteric glands seem to be made up? What becomes of the chyle after it reaches the mesenteric glands? Where is the receptacle of the chyle situated? Where are the contents of the latter carried? Through what channel, and by what means, does it reach the lungs? Where does it receive its change of color? Has the chyle, like the blood, living or vital properties?

even the hulls and seeds of the apple, and the skins of green corn. And not a few among us swallow the stones of the cherry. Now, such things as these could never find their way into the lacteals, if they were to remain in the intestines ever so long.

579. Some kinds of food, moreover, which are soluble, are indigestible, (561), at least, by debilitated stomachs. Such are fat meats, butter, and other oily matters, preserved substances of every kind, hard boiled eggs, mince pies, pie crust, rich sauces, hard cooked custards, pancakes, dough nuts, short cake, fritters, and the like. These, not being digested, in whole or in part, refuse to enter the lacteals.

580. And, once more, food of any kind, however soluble or healthy it may intrinsically be, if eaten when we have little or no appetite, or when the digestive apparatus is disordered or in any way greatly debilitated, or eaten in too large quantity, may remain in the intestinal canal till required to be removed in some other way than by a conversion into chyle and blood.

581. Now, the process by means of which this removal is usually effected is called defecation. The intestines or bowels, being excited or stimulated by the substances which remain in them, the latter are conducted by a vermicular motion, which consists in successive contractions of the muscular fibres of their covering, to the extremity of the intestinal tube, whence they are in due time ejected.

582. But the ejected mass consists also, in part, of what is called a secretion from the vessels in the lining of the larger or lower intestines. Much of the carbonaceous portion of the blood, and perhaps other waste matters, which are fit only to be thrown out of the system, are culled out, and commingled with the residuum of the food just mentioned; and with it expelled from the body.

583. The expulsion of these residual substances from the body, as far at least as frequency is concerned, depends very much on habit. For the best purposes of health, in the adult, it should not happen at less frequent intervals than once in twenty-four hours. The most perfect regularity, in this particular, so as to prevent costiveness, hemorrhoids, and a long train of what are called diseases of irritation, has been taught from the days of Galen and Hippocrates to the present hour; and by philosophers as well as physiologists.

584. Nor can it be taught too assiduously. Some of the wisest physicians with whom I am acquainted are wont to press

this point upon the notice of their friends; and several of the healthiest persons whom I know have been in the habit of regarding it with the strictest attention for a quarter of a century, or even during a long life. It may, therefore, be laid down as one of the fundamental laws of health.

585. This habit, in order to accomplish its perfect work, should be established in early infancy. On this subject, Locke the philosopher, in his "Thoughts on Early Education," dwells at considerable length, and with much correctness. And, in later times, Gallaudet and Woodbridge, educators of distinction, have insisted most strenuously on the same point of physical education.

586. Young people, in active occupation or study, or engrossed by amusement, are apt to forget themselves, as regards this item of bodily management. They are not apt to forget that they *have* bodies, and to make them minister to their gratification in a thousand ways; but they are prone to forget that they must pay the needful taxes. They forget, or do not know, that these bodies are under law; and that these laws must be obeyed, or they must sooner or later suffer.

587. But no laws or rules, in this and kindred matters, will be effectual in insuring perfect regularity, unless we can insure perfect regularity with regard to times or seasons of eating. In general, the fewer our meals, the sooner and the earlier we can bring our systems under that diurnal motion which Locke and others have so much commended. And herein, as I may have occasion to say more particularly hereafter, is one reason for eating as few meals a day as possible.

SECTION VIII. — FOOD SHOULD BE AGREEABLE.

588. At the bare thought of agreeable food, the saliva will immediately flow, in greater or less quantity. The salivary glands appear to possess the wonderful power of thus manufac-

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QUESTIONS. — Is everything we eat made into blood? Is it sometimes so? Under what circumstances? Is there generally a residuum? What does it consist of? Is it sometimes formed in part by a secretion from the vessels of the large intestines? What, then, is defecation? Is regular and frequent defecation necessary to health? Is it not greatly influenced by habit? Does not this consideration greatly enhance the importance of early and correct physical education? What important suggestions are here made to the young? Has this subject anything to do with our habits of eating? What is one effect of eating less frequently than we generally do?

turing their appropriate fluid, and sending it almost instantly to its wonted place of destination. (539.)

589. Many have questioned the truth of this principle. But it was because they could not understand how the thing itself could be done. They have conjectured, and some have even strongly believed, that there is, in these circumstances, a considerable quantity of this fluid on hand, as if in a reservoir. But the same notion has prevailed with regard to the bile and the tears; and for similar reasons these fluids may be manufactured at the moment they are wanted, and often are so. They have seldom, if ever, any reservoir.

590. With regard to the saliva, it appears to me that an obvious and well-known fact will render the subject at once clear and intelligible. When a person is just ready to vomit, a mass of saliva flows. Sometimes it is in great quantity, if not of doubtful quality. But whence does it come? The vulgar say it drains from the stomach; but this cannot be. It could not reach the mouth, from the stomach, before we vomit. There is no rational explanation of the phenomenon, except by supposing that it comes from the salivary glands, and is made there almost instantly. There is, moreover, no hollow in the glands which could hold one-fourth or one-tenth of what sometimes flows thus suddenly.

591. It has been said (588) that the saliva will flow at the bare thought of food which is agreeable. So it may, perhaps, at the thought of food which is not very agreeable; but not so readily, nor in so great quantity, nor, as it is believed by many, of so good quality. Analogy, at least, is in favor of this opinion. No one will believe that the saliva which flows so abundantly when we are nauseated, as above mentioned, would be as well adapted to the purpose of moistening our food as that which flows when we think of something very agreeable. But if not, then it must, of course, vary as to quality.

592. If it should be said that according to this view we ought to eat exclusively of that which is agreeable to our taste, smell, and other sensations, as well as to our thoughts and feelings, my reply is that such, to some extent, is the fact; but the statement or principle must be received with a few modifications and qualifications.

593. Some have carried this doctrine very far, and have professed to believe that our instincts, if unperverted, would, like those of the brute animals, always determine what is best for us. Even the late Sylvester Graham, in his work entitled

the "Science of Human Life," appeared to incline to this opinion.

594. But the doctrine is attended with many difficulties. In the first place, the instincts of the brute animals, especially the undomesticated ones, are at once and always the same. In other words, they are their providential guides, from birth to death; and all the education or experience in the world will, as a general rule, give them no other. But the instincts born with man begin to wane as soon as reason is duly developed; and the more we become creatures of reason, the less we are guided by instinct, and the less certainly can we depend upon it.

595. But, in the second place, facts bearing on the case are striking. Two laborers, for example, in mowing, found a plant whose seed, to their eyes, smell, and taste, was very agreeable. They ate of it. They dug, and found the root equally agreeable, of which they also partook freely. In a few hours they both expired; and the jury of inquest brought in a verdict, "Died by poison." Yet the poison was very sweet and agreeable.

596. So are many poisons. Sugar of lead, from the mineral world, is another example; and by being much used to make old sour wines, or other artificial mixtures, into new wines, has doubtless undermined the health, and even destroyed the life, of tens of thousands. Indeed, it is a general and somewhat respectable belief, that most poisons are sweet.

597. Do these facts and considerations favor the idea that man, by his instincts, if unperverted — if still in *Eden* — could determine what is best for him? Admit that he has fallen: has he *so* fallen as in all states of character, whether more or less depraved, to be fond of sweets; and of poisonous sweets just as much as any other?

598. What we eat, as a general rule, should, I repeat, in order to subserve the wants of the system in the best possible manner, be agreeable; but it would not be safe to eat *everything* which is agreeable. Punishment against an evil work, you have already repeatedly heard, is not always immediately executed. Besides, we have it from equally high authority that "there is a way which seemeth right to a man, but the end thereof is death."

599. Some things which are naturally — that is, in very early life — agreeable, become by education, habit, idiosyncrasy, or disease, disagreeable. We know we ought to like

them, and relish them; but to do so at once is as impossible for us as it would be to fly. Are we to yield, on the general principle of eating only that which is agreeable to our inclinations; or are we in some way to combat them?

600. Pythagoras advised his disciples to practice what they knew to be right, and custom or habit would soon render it agreeable. It is with food and drink as it is with manners or etiquette, and everything else. We should fix upon what we know to be best for us, and habit will, ere long, render it tolerable, and in due time agreeable; even though we have, at the first, a disrelish for it.

601. This is not mere idle preaching. What is here taught has been practised, repeatedly. Thus, a friend of mine could at first hardly endure the rye and Indian bread so common in Massachusetts. It scratched his throat, he said; and I have not a doubt it did so. As he disliked it, the saliva would not flow in sufficient quantity to moisten it.

602. But having become convinced, most fully, that it was better for him than fine flour bread, and being compelled to use either the one or the other, he determined to persevere in the use of the coarse bread. To his surprise, it was not three months before he was as fond of it as any native Bostonian; and it scratched his throat as little.

603. I have seen other similar experiments tried, and have tried them myself. The results, too, have been uniformly the same. More than even this is true. It usually happens that where the newly chosen article is really preferable, in its nature, — that is, more healthful, — a stronger attachment to it is acquired than that which existed for the old ones.

604. The mind has far more influence in these things than most of us are aware. Eating what we like, without misgivings, and as I might say in full faith, is far better for us, other things being equal, than eating in fear, and fearing and trembling after we have eaten. "According to your faith be it unto you" is almost as applicable to physical matters as to morals; and to minor morals as well as to any other.

605. We may, indeed, as the result of a strong will on our own part, or of authority or influence exercised by others, change our habits from better to worse. But these changes are not so enduring, nor are we, after all, so well satisfied with them, as a general rule. With few exceptions, our attachments to those things which are best for us, even in this fallen state, are stronger and more permanent — and I might say

more satisfactory to ourselves, — than our attachments to things which are doubtful.

606. We find some persons, for example, never long satisfied with the same article. They are forever desirous of change. If they have eaten turkey to-day, for example, they must have lamb to-morrow; and next day they must have something else; and so on. Whereas, the man of true appetite, if such an one there be, prefers an article to-day simply because he partook of it yesterday. The more he eats it, the better he likes it; and the less disposed he is, except from conviction that it is best for him in the end, to change.

607. The power of changing our preferences, as stated above, is to be regarded as a great favor, — as one of the kindest *smaller* gifts of a Heavenly Father. It paves the way to improvement physically; since, if we are trained wrong, it becomes possible to get right. It also gives encouragement, in very great measure, to the work of training up in the way we should go — aware, as almost all of us are, how difficult it will be, when thus trained in the right road, to depart from it.

SECTION IX. — THOROUGH MASTICATION.

608. If there be a law of our nature that, like the laws of the Medo-Persians of ancient times, "changeth not," it is that our food must be thoroughly masticated. Obey this law, and food which in its nature is somewhat imperfect, or even doubt-

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QUESTIONS. — What happens, physiologically, when we think of agreeable food? Is this wonderful? Have not some doubted the fact? Why do they doubt it? What is said about vomiting as an illustration of the subject. Should we eat anything which is not agreeable to us? What is said about being guided solely by instinct? What great man has advocated and defended this doctrine? Is it not attended with difficulties? What are some of them? What striking anecdote is related to illustrate the subject? What are we led to conclude from such facts as these? Is man a fallen *animal*, or is he only fallen as a *spiritual*?

Because we are to eat that which is agreeable, as a general rule, does it follow that we should eat *every* thing which is agreeable? Are not some things which are naturally best for us, quite disagreeable to our taste and inclination? What is said of Pythagoras? What statements are made by way of illustration? What are related from the author's own observation? Has not the mind great influence over the body? Are results in these matters somewhat according to our faith? Which is easiest, a change of habits from bad to good, or a change from good to bad? What are some of the indications of a good or bad appetite respectively? Ought we not to be grateful for the power we have to modify or change our habits and preferences?

ful, becomes tolerable; — disobey it, and punishment, or penalty, though long deferred, is inevitable.

609. Such a law might almost be inferred from the very nature of the case. There is no period of life when mastication is necessary, for which the goodness of God has not provided teeth. While receiving its food from the mother, the infant, of course, needs no teeth; he could not use them if he had them. And then, while he is young, and does not require the strongest food, his teeth are in entire conformity to his wants. So, when he enters his second childhood, and again needs children's food, his teeth become feeble, or comparatively helpless, or perhaps entirely disappear.

610. If, then, the teeth are made for use, they should be used. This argument is founded, of course, on the law of adaptation, and the obvious designs of a wise and merciful Providence. Then, again, if this is a law, not to use these instruments would be to disobey the law. So it would be to use them less than the Creator intended. To obey him is to act as he intended; — not to obey him is to act in opposition to his plans, wishes, and laws.

611. But we have proof of another kind, which, if not stronger, will, with many, be more direct and palpable. The teeth, like the rest of the bony frame (377–379), are found to require exercise. And dentists and other observing men tell us that a proper amount of exercise will develop and invigorate them, and render them more enduring, just as it will other bones; while neglect or abuse, on the other hand, will insure their premature decay or destruction.

612. They tell us, for example, that when a person habitually masticates his food with the teeth of one side exclusively, and at the same time does not abuse them, they always last better than those on the opposite side, which are not used; — that while the latter often decay prematurely, the former remain sound. My own experience, as far as I have observed, would confirm the statement.

613. The bony basis, or interior of the teeth, wherever it is exposed to the air, is coated with a substance called enamel. It is nearly as hard as porcelain. It is also somewhat brittle; so that, though crusts of bread and other similar substances do not injure it, picking the teeth with pins may, and sometimes does. It is fractured still more readily by cracking nuts with it, and by the process, misnamed biting ten-penny nails in two.

614. For once, however, that the teeth are injured by over-exercise or abuse, they are probably injured ten times — perhaps twenty — in other ways, most of which resolve themselves into neglect of exercise, or abuses operating through the medium of the stomach. It will be necessary to point out some of the leading items in this category of errors.

615. In the first place, we injure our teeth, indirectly, by *bolting* our food, as it is called; by which is simply meant swallowing it in large fragments, with little or no mastication. No abuse is more common. Not only merchants, mechanics, and manufacturers, but almost all mankind, err in this particular. Among seven hundred and fifty-four persons received into one of our curative institutions, in the course of a few years, the average time consumed at meals was *seven minutes!*

616. I have known men, of reputed good sense, who made it their boast that they could eat a full meal at any time in eight minutes; and some really spend but five minutes in the process. But this is hardly eating. A better name by far is that which of late has been usually applied, — I mean bolting.

617. The keen edge of ridicule has sometimes been directed against this custom of bolting our food; with how much effect I can not determine. Horace Mann is accustomed to say that we throw our food into our stomachs. This throwing down food, he says, is a sort of game, in which he is most successful who can throw the food so straight into the stomach as, in its passage, not to hit anything.

618. Our food is *washed* down, however, as well as bolted. In the old days of cider-drinking, in New England, it was customary not only to drink cider at meals and at other times, but to carry it to the field or scene of labor, and drink it freely there. An aged farmer, whom I knew said it was good economy to keep his hired men well filled with cider, since they would not eat so much food as if they drank nothing but water.

619. It was no uncommon thing for workmen, in those days, after drinking rather freely during the forenoon, to swallow a pint or so before they began their dinner. No wonder such men did not eat much! The stomach is not a tub without a bottom. It cannot hold everything. Besides, cider, like coffee, always tends to destroy the appetite.

620. Of one of these laborers of olden times, who drank cider with his dinner, and bolted his food, it was jocosely said that when his large, unmasticated pieces of beef, pork, potatoes, etc., were swallowed, they could be distinctly heard to fall into

the pond of cider, and the cider could be heard to dash against the sides of his stomach!

621. But the days of cider-drinking are chiefly gone by; and so I would fain hope of beer-drinking, — at least, with our meals. Not so, however, the custom of drinking or SIPPING *something* at our meals. If we do not wash down our food with cider or beer, we do with tea or coffee; or, if with nothing else, with the tumbler of water.

622. It would be idle to pretend that tea and coffee, taken with our meals, are as bad as cider. Nor is water, with our food, as bad as tea and coffee. But all drinking with meals is but the substitution of an inferior liquid for nature's own, and in too large quantity. God, in his providence, has set six natural fountains in the face — three on each side — and they furnish, when we make the demand, the right kind of drink, and in the right quantity.

623. All drinking at meals prevents the necessity of mastication; and they who sip from their cups, or even from their tumblers of water, at almost each mouthful, not only substitute an artificial drink for a natural one, and thus defraud the stomach of a natural and healthful stimulus, but rob the blood of a measure of that healthful and vigorous and perfect chyle which should constantly be sent to recruit it.

624. Our food is not only bolted and washed down too frequently, but we defraud the teeth and salivary glands of their just rights, as well as the whole system of the benefits which would result from sympathy with those organs while performing, in a healthful manner, their appropriate functions. There is much more of health depending on the sympathy to which I allude, than most persons are aware.

625. Among the arts of civilized society which stand in the way of thorough mastication, and of the benefits which would follow in its train, are over-cooking; preparing food in too liquid a form; soaking it too much; eating it while hot; buttering it, or otherwise rendering it more easily bolted or swallowed; and using along with it, sauces, gravies, molasses, and the like.

626. Thus, we cook many of our meats and not a few of our vegetables till they scarcely require either mastication or moistening. We use soups, broths, gruels, and hasty puddings. We soak our bread in milk. We eat toasts and hot puddings. We eat hot buckwheat cakes, hot biscuits, short cake, etc. Most of

these have on them milk, melted butter, cream, honey, sauce, gravy, or molasses.

627. In general, the drier we receive our food the better; because it will be so much the better masticated and insalivated. If we wish to use gravies, soups, sauces, butter, milk, molasses, and the like, we should use them by themselves, either before or after other dishes; or, what is vastly to be preferred, *as a separate and occasional meal!* The latter method may be objected to; but, if adopted, would not prevent the mastication and insalivation of other dishes.

628. Let me not be supposed to incline to the doctrines of Dr. Schlemmer, of Europe, who, with his followers, detests and abjures all sorts of cookery. Far enough from that. That a potato — to say nothing of a dozen other articles — is improved by cooking, both for man and beast, is as certain, I suppose, as any axiom in mathematics.

SECTION X. — PREMATURE DECAY OF THE TEETH.

629. It is a very general complaint, in this country, that the teeth decay much earlier in life than formerly; and that the tendency to premature decay is increasing. In many families it has already become hereditary. Indeed, if proof were wanting on this point, we hardly need adduce any other than the great increase of dentists among us.

630. Why this premature decay? Is it, as a few pretend, the climate? Is it some cause inherent in the combination of circumstances which surround us? And if the cause or causes

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QUESTIONS. — What law of health is said to change not? Might such a law be almost inferred from the very nature of the case? How is this made plain, even to the wayfaring? Does the existence of a law imply obligation to obey that law? What do dentists tell us about using the teeth? How is the enamel of the teeth sometimes injured?

What is meant by bolting food, when we sit at table? Is this a very common practice? What boast is sometimes made? How does Horace Mann attempt to turn the edge of ridicule against the custom of bolting our food? Is not our food frequently washed down? What custom once prevailed in New England? What anecdotes are related concerning it? What have taken the place of cider? Are these drinks as bad as cider? Is all drinking with meals wrong? Why so? What are the true fountains for supplying our drink, so far as our meals are concerned?

Does our fashionable cookery stand in the way of the mastication and insalivation of our food? How does this appear? Is our food better the drier it is? What, then, should become of our sauces, gravies, and other additions to our food? Is all cookery objectionable; or is it the abuses of cookery only that stand opposed to the laws of health?

should be found in ourselves, are they, or are they not, susceptible of removal?

631. It has been said by some, as we have just hinted, that the principal cause of the evil we are considering is the climate. But, besides the general fact, that, in other climates not unlike ours, the teeth are not always found to deteriorate in this way, is it not unphilosophical to refer to a more remote or doubtful cause, an effect, which can be readily and fully accounted for in another manner?

632. Nothing seems to me plainer than that the errors to which your attention has been called in the preceding section, are, of themselves, and in their connection, quite sufficient to account for present appearances. The teeth have very little to do; hardly enough to keep them clean. The salivary glands, as the consequence, are also idle. They have not, at the least, enough to do to keep them in healthful activity. Then the unmasticated food, as we shall see hereafter, deranges the stomach; this by sympathy affects the gums, and they become spongy, and the teeth carious.

633. In short, the great leading cause of that premature decay of the teeth which so extensively prevails among us, is the prevailing and increasing disuse of the teeth and salivary glands. There are, indeed, other collateral causes, to some of which I may advert in their respective places; but this lies at the foundation, in this particular, of all our woe.

634. A general prejudice prevails, especially among mothers, against certain medicines, as though they acted injuriously on the teeth. Now, that all medicinal and other substances, when taken by the healthy, by first impairing the tone of the stomach, do injure the teeth, is undeniable. But that they produce this result by mere contact, is probably a mistake. For anything now known, the teeth might be covered with calomel for years, without any more ill effect, so far as mere contact is concerned, than if they were covered with pipe-clay or plaster of Paris.

635. If this prejudice against calomel falls to the ground, it is not likely the prejudice can stand which prevails against sugar. I am by no means defending the use of either; but let us have the truth on this subject. Truth is always a gem; above all, in matters of physiology and hygiene.

Questions. — Is it a general complaint among us, that the teeth decay prematurely? Are not defective teeth beginning to be inherited? Is the cause well ascertained? Is it climate? Why not? Is neglect, or disuse,

SECTION XI. — EATING TOO FREQUENTLY.

636. The question, how often we should eat, has been much agitated, especially within a few years; and with various results. In general, however, there is a belief that we eat too often, and that a deduction from the number of our meals might very profitably be made. Many incline to the opinion that two meals a day for healthy adults are quite sufficient. A few go farther still, and teach that nature's purposes are best answered by only one.

637. This subject, like most others pertaining to a connection with the appetite, has been hitherto approached in a wrong way. For, since nature, perverted as she is, ever tends to excess, the great practical question in all these matters should be, not how much we may gratify ourselves without any evil results, but how little gratification will best accord with our usefulness. Instead of inquiring how near the edge of a precipice we can go without falling from it, we should seek to keep at the greatest practicable distance. The proper question is not, Which is the worst or most dangerous road? but, Which is the best?

638. In the present instance, the true physiological inquiry should be, What is the least number of daily meals which will best answer nature's purposes? What number will preserve us in the most healthy condition, and at the same time give us the firmest appetite, and, in the aggregate, the most pleasure? The true question is not, How often can we eat and not get sick immediately? And yet, more than this, I say, is very seldom asked.

639. Although it should be our first and highest aim to do what is best and most according to truth in all things which concern our appetites, yet we can never keep pleasure entirely out of sight; nor is it the Divine intention that we should. God has kindly united duty, interest, and pleasure; and what he has joined together should not be sundered.

640. There can be little doubt that, the more frequently we eat, the less, as a general rule, we enjoy. At present, it is customary to eat so often that we seldom, if ever, reach the point of having a good appetite; and what of appetite we have, at first, is soon spoiled. The less frequently we eat, on the con-

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the principal cause? What is said of the prevailing prejudice, in this respect, against active medicine? What of that against sugar? Is it maintained, on the contrary, that such things *ought to* be used?

trary, even to the comparatively narrow limits of once a day, the more we enjoy.

641. But observe, if you please, I do not say God has united with our duty the highest possible degrees of *immediate* pleasure, but only the greatest amount in the end. There is room enough left for self-denial, or what is usually called by that name; by which I mean, a denial of present pleasure, at least in part, for the sake of pleasure in the distance, which is greater in the aggregate.

642. There are certain physiological considerations which aid us in determining how often we should eat; or, rather, in determining how often we should *not* eat. We have seen (551) that the process of chymification is forwarded, in no small degree, by a species of muscular motion which has a slight resemblance to the churning process among dairy-women.

643. This churning muscular motion generally continues till the stomach is cleared of its contents; *i. e.*, till all, or nearly all, has passed out at its pyloric orifice. The time required for this varies, in the adult, from two or three to four or five hours. (558.) In children, the process, like those of breathing and circulation, is more rapid.*

644. Now, it is a law with all voluntary or willing muscular parts of the body, that they shall have their seasons of rest. But the heart is muscular, and there are muscles in the walls of the thorax to aid in moving the lungs; and then, as we have seen, the stomach is muscular. None of these, it is true, are voluntary or willing muscles. Their motion takes place without our having much to do with it, directly.

645. Still, it is true, most undeniably true, that these parts need rest. The muscular parts of the heart and lungs have their intervals of rest, though they are short; and is not this the plainest proof that they need it? The muscular parts of the stomach, in all probability, come under the same necessity. Sometimes they obtain this rest; at others they do not. But I have spoken on this subject before. (120–122.)

646. When we breakfast at six, take a lunch at nine or ten, dine at twelve, take another lunch at three, and eat a heavy supper at six, the stomach probably has no rest during the day, and, in consequence, is so much fatigued at night, that the load which is imposed on it at six is not wholly cast off during the

* Some, I know, have denied this; among whom is Dr. Coles, late of Boston.

night, and we rise in the morning to go again the same round, and with similar results.

647. Then, again, when we rise at seven, breakfast at eight, take a lunch at eleven or twelve, as in fashionable life, dine at two, take tea at five, and a heavy lunch of the most heavy of all indigestibles at nine or ten, we come to the hour of rest, as before, with a jaded stomach; and in due preparation for a restless and distempered night.

648. And the reward we have so richly earned is sure to be received. Our sleep is too sound on the one hand, or too much disturbed on the other. The latter result is most frequent. We toss out the night in distressing dreams, and wake the next morning to a bad taste in the mouth, a dryness of the throat, a dull headache and loss of appetite, and an unwillingness to rise, except from the most pressing necessity.

649. Such a course of life, persisted in for weeks, months, or years, will bring about, in most persons, a bad state of things in the alimentary canal, which, in its sympathies or effects, sometimes extends to other parts of the system. Many a tooth-ache, ear-ache, head-ache, and neuralgic attack, and not a few cold feet and sour stomachs, may be fairly charged to the errors of which I have here spoken.

650. Children, no doubt, should eat much more frequently than adults. True, their stomachs are not so strong, nor their digestive powers, though they are generally more active. But even our children eat too often, in most instances. They are trained to it from the very first. Some of them seem to be almost always eating, from morning to night. Little infants, in most instances, are even nursed or fed in the night. And the penalty is but too well known. Half of them, or nearly half, die under ten years of age; and this is one of the causes.

561. The healthy adult who eats but three times a day, and this at regular intervals of about six hours, gives his stomach a little time for rest; and may hope to proceed on in the journey of life, at least a short time, without disease. He may indulge this hope, I mean, if other things are as they should be.

652. But three meals a day for an adult, whatever may be his habits or circumstances, — except in the rare case of some peculiar disease, — is the maximum number which is admissible. It is running as much risk as we can with safety. It is going as near the edge of the precipice as we can and not fall from it, instead of taking the highest and safest and best road!

653. They who take but two meals a day, especially during the short days of winter, not only give their digestive powers —

their stomachs in particular — more time for rest, but actually enjoy more, and find themselves in better general health. Of this habit we have many eminent living examples. In this case the first meal might be profitably taken at ten o'clock in the forenoon, and the second at four in the afternoon.

654. And there are men to be found who take but one meal a day, and yet remain quite healthy. The elder Fowler, the phrenologist, is one of them. Such, too, in past years, were Talleyrand of France, and Mr. Taliaferro of Virginia. It is even stated that some of the old Romans ate but one meal a day. Seneca, though worth an estate of $15,000,000, taught the doctrine, and, as it is said, practised it.

655. It is even told of, Mr. Taliaferro, that he went still farther. When by any unavoidable circumstance he was unable to dine at his usual hour of the day, he deferred it to the next day. This was to eat only once in two days. But this course I think an error. Once a day is the minimum or smallest needful number of our meals.

656. On this point, however, I wish to be understood. I do not say, positively, that three meals a day are incompatible with the maintenance of tolerable health; nor that one a day is sufficient. But I do say that more than three are injurious; that two would for most persons be preferable to three; and that one for most people may after all be found adequate to every purpose. Indeed, I am inclined to think it would be so.

657. They who take but one meal a day secure at least one important point, that of having always a good appetite. At least they gain this point provided they do not eat too much at this one meal. Most persons, as we have seen, eat so often that they never know what a good appetite is. They always eat before they are truly hungry, in a physiological sense; and hence know neither the blessing of a good appetite or of true gustatory enjoyment.

658. They remind me of a half-idiot, whom I knew in early life, who was always pressing the question, "Don't you wish to know the art of never being dry?" that is, thirsty. "Always mind to drink before you are dry," he added, "and you will never be dry." We have most of us already made a faithful application of the fool's rule to our eating. We eat always before we are hungry, and hence are never hungry.

QUESTIONS. — Is there not a general belief abroad that we eat too often? Have we arrived, as yet, at a settled opinion on this subject?

SECTION XII. — EATING BETWEEN MEALS.

659. In the last section I was obliged to encroach a little on the topic assigned to this. I was obliged to allude to the evils of eating too often; and this of course involved the subject of eating between our meals, or, as it is called, of taking lunches or luncheons. But I have not yet said all that the case requires. Eating between our regular meals is a dietetic transgression of no ordinary magnitude.

660. Whether we eat once, twice, thrice, or ten times a day, we should stop with our regular meals, Nothing containing nutriment, whether in a solid or liquid condition, should go down our throats between our meals, except water. To this rule, so far as the healthy are concerned, I know of no exception.

661. May we not eat an apple, it will be asked, or a little fruit, of such kinds as we happen to meet with, or a few nuts? Must we go without all these things, which the kind hand of the great Creator has scattered all along our path — probably not in vain? Would we not be even ungrateful to him, did we do so?

662. No doubt that these things, for the most part, are made to be eaten, either by us or the other animals, or both. But they should be brought to our tables, and, without exception, made a regular part of our meals. Not indeed at the end, after we have eaten enough of something else; nor yet at the beginning, merely to excite an appetite for other food. They should be eaten, as the potato usually is, as a part of our meal.

Have we not studied the subject in a wrong manner? What is a better way? What should be the true inquiry in prosecuting the study of hygiene? In our inquiries is pleasure to be overlooked, entirely so? Why not? Is our enjoyment in eating in proportion always to the number of our meals? Is he the greatest gainer in point of mere pleasure in eating, who gets the most pleasure immediately?

What are we to infer, in this particular, from the muscular character of the stomach? How may we eat so as to give the stomach and other digestive organs no rest? What are the frequent evidences of abuse during the previous day? What diseases may ensue? Should children eat oftener than adults? What is said, in particular, of the effects of eating three meals a day? What of eating two only? What of eating but one? Are there some eminent examples in both these latter kinds? To what extreme did Mr. Taliaferro go? Who are they that always have a good appetite? What anecdote is related of a certain idiot? What is the application?

663. It may perhaps be said that our ancestors — puritannical though they were — accustomed themselves not only to lunches in the forenoon and afternoon, but to nuts and cider or apples and cider in the evening, and yet were a healthier people, by far, than their more squeamish descendants; and there will be no want of truth as the basis of the remark.

664. But, remember, that if *they* were more healthy than *we*, then *we*, of course, are *less* healthy than *they*. How came we thus? Is it a matter of chance, or hap-hazard? Do these things spring out of the ground? Is there not a cause for every effect? Do we not inherit a deteriorated and deteriorating constitution?

665. Besides, our fathers and grandfathers set out with better constitutions than we, so that, whatever may have been the cause of their better or our inferior stamina, they could most certainly bear up longer under violations of physical law than we, their descendants. It does not then follow, as a necessary inference, that we may eat lunches because they did.

666. May we not take nourishing drinks between our regular meals, such as milk and water, molasses and water, and bread coffee? some will ask. Not a drop. Better, by far, to eat a piece of dry bread; for that will be masticated. But you do not want either. The sediment of nutritious drinks (561) is one of the hardest ordinary things the stomach has to contend with. It is, moreover, a curious fact that a piece of dry bread, well chewed, will often quench thirst better than any liquid, even water. But, I repeat, I do not recommend even that.

667. Anything that contains nutriment must, of course, set the stomach and other digestive organs at work, more or less; even if it is nothing but a strawberry, or a lump of gum or sugar, or some aromatic seeds. I do not say or believe that it takes as long, or tasks the digestive machinery as severely, to work up a lump of sugar or a strawberry into chyle, as a full meal; but I *do* say that the whole process of digestion, complicated as it is, must be gone through with.

668. Many, who have listened patiently to remarks like these, have at length exclaimed, with some surprise: "But what is the laboring man to do, especially in the long hot days of haying and harvesting, without something to sustain him between his meals? You proscribe stimulating drink, and very properly; but what will you propose as a substitute? He would faint away without something. Or, if he should not

faint, there would often be a gnawing at the stomach, which would be insupportable."

669. It should be distinctly known to everybody, that neither the faintness nor the gnawing here spoken of, indicate any real hunger. They are mere nervous sensations. They indicate, moreover, a diseased condition of the nerves. If any one doubts, let him but make the following experiment. The writer has made it for himself, and that repeatedly.

670. While your fellow-laborers are removing, for the time, their gnawing and faintness by a lunch, just seat yourself at their side, and, instead of adding a new load to the already overloaded and sympathizing stomach, drink slowly a small quantity of pure water, tell a story or hear one, and, if you can, excite a little the risible faculties; and when they return to their labor, join them, as before. Pursue this course a few days, or a few weeks, and see who endures it best, and complains most of gnawing and faintness.

671. It is no uncommon thing to hear farmers telling how glad they are to be through with their haying and harvesting. But it is they who use lunches, or take other means beyond their regular meals for restoring themselves temporarily at the expense of the future, who complain most. He who eats of plain food twice or three times a day, and drinks nothing but water, endures best the heat and fatigue, and suffers least from gnawing and faintness.

672. Young men in groceries, eating-houses, and inns, as well as clerks in public offices, and in shops and factories, often injure their health very much by a foolish acquired habit of tasting various things which are constantly before them, such as fruits, nuts, confectionery, sugar, dried fish, cordials, etc. Clerks, in addition to all this, sometimes eat wafers.

673. It is but a few days since I saw a young man about thirty years of age, of giant constitution by inheritance, who was suffering severely in his digestive machinery from the very cause, by his own voluntary confession, of which I am now speaking. And I have before my mind's eye the painful history of a young man whom I twice cured of dyspepsia from this same cause, but who afterwards went beyond my reach, and fell a victim to it.

674. Perhaps the worst violation of the law which forbids eating between meals, is found in the wretched habit of the young, of eating what are called oyster suppers, at late hours and at improper places. Our cities, and sometimes our large

towns, abound with places of resort for those who will not deny their appetites; and it is not surprising that they so often prove, not only a pathway to the grave, but as Solomon says, to hell.

SECTION XIII. — REGULARITY IN EATING.

675. There are to be found, among us, a few strong men and women — the remnant of a by-gone generation, much healthier than our own — who can eat at random, as the savages do, and yet last on, as here and there a savage does, to very advanced years. But these random-shot eaters are, at most, but exceptions to the general rule, which requires regularity.

676. For very few things, I am quite sure, can be more obvious to the most careless observer, than that those individuals who are most regular in regard to eating, other things and circumstances being equal, are the most healthy. And, what is of very great importance, too, any one who will take the trouble may soon satisfy himself that it is these regular men and women whose children inherit the best constitutions.

677. I have, indeed, admitted that we are so far the creatures of habit that we can accustom ourselves to almost any hours for eating, and to one, two, three, or more meals a day, as well as to many other things which are generally regarded as objectionable; and yet not suffer much, immediately. But I have also shown and insisted that this does not prove we are wise in forming these habits. We must look a little way into the future, and have regard to the good of the race, as well as to our own present gratification or happiness.

678. It is often said that since the conditions of civic life require occasional irregularities, it is desirable to accustom ourselves to such irregularities, betimes. For, if we do not, it is

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QUESTIONS. — Is eating between our meals a light transgression? Should nothing which contains nutriment be swallowed between meals? May we not eat fruits? Why not, if the fruits are made to be eaten? Our ancestors ate lunches; why may not we? What is said of milk and water, molasses and water, etc., between meals? Must the whole work of digestion be gone through with, when we eat but a single nut, or a strawberry? May not the hard laborer have lunches? What then shall we do, when gnawing and faintness arise? Have these sensations nothing to do with real hunger? What experiment is proposed? To what dangers are young men sometimes exposed in groceries, shops, eating-houses, public offices, etc.? Are they apt to yield to the temptations? What case is related by the author? What still more striking case came under his observation? What is the worst violation of the rule for infrequent eating?

still insisted, we shall be liable, at times, to such derangement and disturbance in our systems, from unavoidable changes, as might subject us to a long and perhaps severe fit of sickness.

679. This reasoning, by way of objection to the doctrine of regularity in our habits, is certainly specious. The great difficulty with it is, that it is practically untrue. For few things can be more easily shown than that they whose digestive systems hold out best, are precisely those who are most regular in their habits of eating, drinking, etc.

680. It is indeed true that such persons, when subjected to the supposed necessary irregularities of civic life, above alluded to, may be subjected, at times, to a little temporary disturbance, but it quickly passes away. Does not this prove the general integrity of the digestive function? No condition of the human stomach is more to be dreaded than that unresisting state which permits us to make it a complete scavenger for the time; while the abuse awakens slowly, in some remoter part of the human confederacy, a terrible insurrection, and still more terrible retribution.

681. I knew a physician who, at home and abroad, with others, and especially with himself, passed for a wise man. Yet, unable to resist the temptations incident to the life of a country medical practitioner, he gradually fell into the utmost irregularities about his meals. For his morning meal he had no appetite; at the dinner hour he was among his patients, eating at any hour convenient; or, oftener still, refusing to eat at all.

682. On returning to his family, — often late at evening, — his faithful wife, who knew his habits and expectations, was accustomed to prepare for him as rich and as abundant a meal as possible, of which he almost always partook in excess. But the penalty of his trangression was fearful. Disease, painful and harassing, early followed; and, though blessed with an "iron constitution" by birthright, he sunk into the grave at sixty-five.

683. The history of this man is, in substance, that of thousands. I have myself witnessed twenty years of the most intense anguish, ended by a premature and terrible death, which was the obvious result of physical disobedience. The penalty, it has repeatedly been said, does not always fall directly on the suffering organ or function, but sometimes on a part in sympathy with it.

684. It may, to many, seem strange, but it is nevertheless a fact, that they who are most regular with regard to their habits

of eating, — whether as it regards times of eating, quality of the food, or quantity, — are the very persons who suffer least, as a permanent thing, when compelled to occasional changes or interruptions of their accustomed habits. Or, if they suffer, the suffering is but temporary. Their stomachs are stomachs of integrity, and their promptitude in meting out justice, and putting to rights injurious tendencies, is as striking as their integrity.

685. Locke, the philosopher, has somewhere told us that when a child asks for food at any other time than at his regular meals, plain bread should be given him — no pastry, no delicacies, but simply plain bread. If the child is really hungry, he says, plain bread will go down; if not, let him go without till he is so.

686. But why give him anything at all between his regular meals? These, to be sure, should be somewhat more frequent than our own; but this is not to make concessions to irregularity. Is it not truly marvellous to find the best of men — those who in many things have thought for themselves — still yielding to authority when arrayed against the plainest good sense?

687. It is very unfortunate for human health and happiness that the young should be trained from the very first — and to a most lamentable extent — in the way in which they should not go. They are very tenacious of life, — are *made to live*, — and yet, presuming on their known tenacity of life, we only make them the greater sufferers on account of it. I have known many a child, swept away by summer and autumnal diseases, who, but for his past irregularities in eating, might very probably have escaped.

688. That to train up a child in the way he should go, in every particular, is exceedingly difficult, every parent, master, or guardian well knows. Forbidden trees, on which hang curses, beset everywhere the path of human life, especially that broader division of it which, alas! so many of us travel. How to have our children escape all pitfalls and dangers, — how, even, to escape them ourselves, — is a question not by any means easy of solution; but its importance is at the least equal to its difficulties.

689. I wish the young could fully understand that every time they depart from their accustomed usages, and, during the intervals of their meals (be the latter few or many), venture on a little fruit, a little candy, a little confectionery, etc., they are not only impairing their appetite, and contaminating their blood,

but impairing the tone of their digestive system, and deranging the action, more or less, of the whole alimentary canal.

690. Every well-directed effort to invigorate the alimentary canal, and increase the tone of that and the greater internal surface of the lungs, is richly repaid in future hardihood and health; while every neglect, or disregard — everything disloyal to the calls and demands of Nature's conservator — is repaid in near or remote suffering, and perhaps transmitted to yet unborn generations.

SECTION XIV. — EXCESSIVE ALIMENTATION.

691. Nothing is more common than the remark that the greatest dietetic error is with regard to quantity. It is admitted that we often err, as regards quality; that we eat irregularly; and that we eat too fast. And yet the great practical error, after all, we are told, is, that we eat too much.

692. There is truth in the remark, as the subject must necessarily be viewed by those whose standard of hygiene is still low. And yet, bad as excessive alimentation may be, it is but the natural — I had almost said necessary — result of certain errors lying back of it. If the quality of our food, and the modes of preparing and receiving it, and the moral tendencies of our nature, were such, from the very first, as they ought to be, there would be comparatively little among us of excess.

693. The common doctrine of intelligent men is, that we eat about twice as much as nature's best purposes require. Philosophers, physiologists, chemists, pathologists, dietiticians, and even many of the unenlightened, all agree in this. Not of course that every individual eats twice as much as he ought; but that, as a people, here in the United States, this is true.

694. Most persons, it would seem, eat just about as much as they can and not suffer from it immediately. The inquiry with

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QUESTIONS. — What is said of certain random-eaters among us? Are they whose habits of eating are most regular, usually the most healthy? Must we have regard, in the formation of our habits, to the good of our race? What very specious objection is sometimes made to these views and doctrines? Why is it unsound? Relate the anecdote of a medical man, and tell me what it is designed to prove. Is this man's history substantially that of thousands? What has the philosopher Locke said? Wherein is he mistaken? What is there especially unfortunate in an early training? Do all our dietetic errors, especially our irregularities in regard to eating, tend to derange the action and motion of the alimentary canal? What important hints does this afford in the education of the young? What equally important hints does it afford to the self-educated?

most who inquire at all, is not how little is best for them and how much they can save, beyond this measure, for "him who needeth"; but how much they can consume, without loss of health or character as the consequence.

695. In truth, the declaration of eighteen hundred years ago, that all seek their own, not another's (or others') good, covers the whole ground. To get good and apply it to the gratification of our own propensities, whatever may become of others, is fallen nature's great law, As John Foster has well said, this not caring for others is the very essence of human depravity.

696. It is frequently asked how much we *should* eat; and some are unsatisfied till we put in requisition the scales, and tell them exactly how many pounds or ounces they must take, daily. I have even dined, in the city of Boston, with a man otherwise respectable, who had his scales on the table, and proceeded to weigh out, before me, his dinner.

697. Of course I do not intend to question the propriety or the usefulness of weighing out our food, at least, occasionally. Experiments of weighing food, made by scientific or thinking men, for scientific or practical purposes, might be made — no doubt sometimes *are* made — quite useful.

698. Thus, in experiments made in Glasgow, in Scotland, on laborers, who, from their increased expenditure during their exercises, are very naturally supposed to require as large a supply of food as any other class of men, it has been found that two pounds of good bread, daily, or six pounds of good potatoes, (which in point of nutriment are deemed about equal to two pounds of bread,) is the largest quantity demanded or required.

699. President Hitchcock, late of Amherst College, and Mr. Graham, have taught that the average quantity of nutriment which the best development and support of the body require, is somewhat less than this. They, too, have made their conclusions from observation and experiment. The former would reduce the British standard quantity about one-fourth; the latter, nearly one-half.

700. Much allowance, in this matter, must be made for early training, as will be seen in the next section. I once had the pleasure of sustaining, at college, a most deserving young man, who could not get along, as he believed, without two pounds of bread, or its equivalent, daily. But he had been trained to excess; and for the time seemed to demand it. However, he exhausted his physical capital in a few years, and died bankrupt!

701. Are there, then, you may be disposed to ask, no specific rules for the individual, about quantity? Must we gather up, from abstract or general principles and from facts, a code for ourselves? Like the new-fledged arithmetician at school, must we make our own rules? Is experience in dietetics everything, and science nothing?

702. Not quite so fast. I have given you the deductions of science already. It has determined, no less surely than experience, that we eat too much. It has told us what is the maximum quantity required. What the minimum or smallest quantity we really need is, we have not yet inquired. And most persons do not choose to make the inquiry, lest they should have to resist, a little, their propensities.

703. To those who have moral courage enough — in other and better words, enough of Christian philosophy — to dare to make the inquiry, a few rules may be given which will enable them to approximate towards the truth in the case, by seeking an answer to the inquiry: How little can we get along with, and at the same time best discharge all our duties and secure all lawful and proper interests?

704. We have been taught, in time past, to leave off hungry; or, as some express it, with a good appetite. Or, as others still, are wont to say, we have been told never to eat quite enough. The rule is a good one, as far as it goes. I have known a few who partly observed it; and they believe they owe to this partial obedience their health and life.

705. Thus, Grant Thorburn, whose writings, over the signature of Laurie Todd, have interested and delighted many, and who, at the age of ninety, or nearly so, is almost as young in his feelings as ever he was, is accustomed to say to his friends that he never ate enough in his whole life.

706. Early in the year 1852, I called to see a man in Ohio, who was eighty-seven years of age. It was one of the severest days of a most severe winter. He was in the woods, at work, for he was a farmer; but he soon came home. Surprised at his power to labor and endure the cold, I inquired about his habits; and, among other things, asked him about the quantity of his food. His answer included just such a statement as that of Mr. Thorburn.

707. Cases of this kind might be multiplied, not, however, to an indefinite extent; for, most unhappily, the world as yet does not abound with them. I will only add to the list, at

present, John Williams, a Baptist minister of Rhode Island, who died at the age of one hundred years or more, and myself.

708. It is quite possible to err, however, under this rule. A person who bolts his food will eat much more without reaching the point of satiety than one who does not. While, therefore, he who bolts food has not reached the stopping-place, so far as he knows, another who masticates well has reached it with far less food. The former may therefore eat too much and yet leave off hungry.

709. It is a better rule still, to eat no longer than the food appears to refresh us, bodily and mentally. This rule, I grant, is liable to the same difficulties with the preceding, nevertheless, it restricts us more. For even Grant Thorburn, who never eats enough, may possibly sometimes eat so long as to become dull in body or mind as the result. I am not without doubt whether he and my Ohio friend always leave off their meal with feelings of merriment, and with a disposition to dance and sing, like children. Yet such, as I believe, should be the effect of our eating. Its main object, I grant, is to secure nourishment for a future hour; but it has a secondary object, too, which is refreshment and gratification.

710. It is recorded of President Jefferson, that he was accustomed to remark that no man, when he comes to die, ever repents of having eaten so little. This remark would be worth more if it were true that men are apt to repent of eating *too much*. But the truth is, we seldom exercise any genuine repentance at all when we come to die, unless we have begun the work before. Death-beds are not the very honest places some have supposed. Men generally die as they live.

711. The early travellers among the Japanese tell us that a native of that country, especially of the interior, will work all day long on a mere handful of rice and a little fruit. Yet the Japanese are among the stoutest and strongest men of Asia; and for size and strength almost resemble the German, the Swiss, and the Yankee. Can it be that they suffer for want of food?

712. We come back, then, from our reasonings and facts to the point whence we started, viz., to the affirmation that we generally eat twice as much as we ought, and that retrenchment is loudly and imperiously demanded. Few err on the other side. Inclination, habit, refined cookery, and the customs of society are all against it.

713. I have admitted that the laborer, as a general rule,

requires more food than other men, because his expenditure is greater. Yet it does not thence follow, that he who performs two days' work in one, and who consequently overworks himself, should eat in the same proportion, that is, twice as much. Generally speaking, if he really overworks, he should eat somewhat less, since the same causes which have overtasked and crippled his general system must have reduced the energies of his digestive system in the same proportion.

SECTION XV. — DIETETIC ERRORS IN TRAINING THE YOUNG.

714. One of the more frequent errors of early education has been repeatedly — though only casually — mentioned. It is that of enlarging the stomach quite beyond its natural size, till it comes to demand a most unreasonable quantity in order to be satisfied. This error, in various degrees, almost everywhere prevails.

715. Thus, there is a tolerably healthy laborer near New Bedford, in Massachusetts, who, owing to the faults of early education and to his own mismanagement, has arrived at the seeming necessity of drinking many gallons of water daily, and, what is very remarkable, he will drink several quarts at a time. He must of course have a stomach almost as capacious as that of the ox. A case of this kind now exists in Boston.

716. A man at Mansfield, in the same State, for a wager, once ate ten pounds of beefsteak and much other food, besides

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QUESTIONS. — What is mentioned as a very common saying? Is there some truth in it? What is the general opinion of intelligent men in regard to the quantity of our food? What do most persons do, as regards quantity? What ought they to do? Is it our chief object to consume as much as we can? Is this depravity? What is said of the custom of weighing food? May not food be sometimes weighed with advantage? What experiments have been made in Glasgow? What do Hitchcock and Graham tell us about the quantity of our food? Must considerable allowance be made, in particular cases, for wrong training? State the facts concerning the young man at college. Are there, then, no specific rules with regard to quantity, which are applicable to all?

What might be done, had we sufficient moral courage? Was it an old rule to leave off our meals hungry? Was the rule a good one? What is said of the habits of Grant Thorburn? What other interesting facts are mentioned? How is this rule affected by the bolting process of eating?

What is probably the highest and best rule on this subject? What saying is attributed to President Jefferson? How far is it correct? Do not men generally die as they live? What is related of the Japanese of some centuries ago? To what, on the whole, do facts loudly call us? What is said of the peculiar necessities of hard laborers? Should he who overworks eat more, or less, as the immediate consequence?

drinking a quantity of tea, at the same meal. Such a man's stomach could not be limited to the usual capacity of a quart or three pints. It is true that he was a considerable time in eating, but, with every reasonable abatement, he must have been gluttonously trained and disposed.

717. I have myself been an eye-witness to several cases of eating or drinking quantities which no stomach of ordinary capacity could possibly have received. Indeed, multitudes of old and young people distend their stomachs too much every day they live, though few proceed to the extent of the man at New Bedford.

718. All these cases have their origin in small beginnings. The river does not ordinarily burst out a river at once. It is fed by numerous tributaries, which, in their turn, have their small sources. The Mississippi of physical error has its sources among the circumstances of earlier and later education.

719. Our mothers and housekeepers have something to answer for in relation to this matter. Children, from the very first, are trained to be gluttonous. Not that all mothers and educators are equally unfortunate in the early management of the young, nor that all children are made gluttons. All I assert, is, that the error is exceedingly prevalent, and admits of no apology.

720. It is usual to begin by lessons of gluttony at the very tenderest age. If a child cries, or even whimpers, he is at once attended to, and it is strongly believed he needs food. No matter if he has filled his little stomach but ten minutes before — nursing is the cure-all for his woes, and the remedy must be applied as often as he whimpers. Sometimes he gets so full as to vomit — literally to run over. Could better lessons in gluttony be possibly given?

721. There is a story told of the Surinam mothers, which may or may not be true, but which, if true, is very much in point. It is said that when the little infant there has nursed to the full, and can hold no more, the mother takes it on her knee, and by hard trotting endeavors to shake down its food, as farmers shake down apples or ears of corn in a bag, so that it can hold more!

722. Our United States mothers and educators may not yet go so far as the mothers of Surinam, in this matter, but too many of them go far enough to render the child's stomach unnaturally large; and, if they do not really become deformed, like some of our pet pigs and puppies, the fault is not that of

those who take the kind care of them. They certainly pursue the most effectual course to make them so.

723. And what they have made them by the wrong practices of the first year of their lives, they continue to maintain in them. Instead of feeding them regularly, once in a certain number of hours, — two, three, or four, as the case may require, — they are suffered to take their food, both native and artificial, just when they please, if it do not interfere with the mother's convenience, till their claims to gluttony are fully established.

724. If to the errors of the nursery we did not superadd the errors of the family table, all might yet, peradventure, come out well; for nature, in her wise efforts to produce the best results, might still set things right. But, being seated with his seniors at his post, — usually a conspicuous one, — the child must needs eat and drink, it is thought, as *they* do. Instead of a small addition to his natural rations in plain bread, or at most, plain bread and milk, he is not only expected but urged to eat and drink of every kind, or nearly every kind, of which those around him partake, and sometimes, too, in no very stinted quantity.

725. In short, by dint of variety of food and kind attention, and a natural curiosity and love of novelty, he is stuffed, — literally stuffed, as truly as the skin of a rabbit ever was, — and the stuffing practice is continued, at least until he gets sick, which, thanks to this and other wrong practices, frequently happens very soon. Nearly one-half of all who are born die under ten years of age (650), and at some seasons of the year and in some places, more than one-half. Did God intend it should be so?

726. The worst, however, is not yet told. They who survive the early stuffing process, and pass on to manhood, are stuffed still. They not only eat at the regular meals, but oftentimes between them. And when they have taken their usual quantum of milk and other plain things, with tea or coffee in addition, and ought to adjourn, they are still plied with cakes, pies, preserves, and every delicacy — not to say every poison — on the table, till they are surfeited.

727. And then, too, the habit of over-feeding, thus early begun, has expanded the stomach till it is not only unnaturally large, but at the same time, and in the same degree, weakened. Its walls are thinner, and its action more feeble. And if dyspepsia has not already begun to make its appearance, it is only because human nature is tough, and life's tendencies are onward and upward.

728. Finally, the family custom of so ordering or contriving things as to induce people to eat as much as possible, without regard to its ultimate influences, is extended to all who come within the range of its supposed hospitalities. The great end of life, — "the chief end of man," as we find him, — whatever may be said to the contrary, either in sincerity or whining hypocrisy, is self-gratification; and hence, as one means to this great final end of human existence, everything is done at the table, as a general rule, to make us gluttons for life.

729. The mother or housekeeper, who, in her fear of impending evil, should cease her custom of saying, "Do take a little more of this," and should for once in her life utter a Christian caution, such as, "Are you not taking a little too much of this?" or, "Will it not hurt you?" would be laughed at.

SECTION XVI. — CONCENTRATED FOOD.

730. It seems to be thought, by many, that the more concentrated our food is, the better. Hence, in part, at least, our efforts to refine our sugar, bolt and sift our meal, refine into cheese our milk, extract our farinas, etc. Hence, in truth, one half the toil and slavery of pots and kettles and the whole paraphernalia of modern over-refined cookery.

731. Now, any one who reflects on the subject, but for a single moment, must see that every analogy is against the healthfulness of such a practice. The horse, sheep, cow, and other domestic animals require bulk in their food, as well as nutriment. The exclusive use, even of grain, though its bran or skin contains something more than mere nutriment, is yet too concentrated for health. For if the horse could be made to thrive on it for a short time, it would be for a short time only.

732. We may say, in general, that every domestic animal requires, in his daily food, a considerable amount of innutritious substance. It was, indeed, formerly supposed this innutritious

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QUESTIONS. — Can the stomach be educated to a most unnatural size? Is such mis-education common? What two anecdotes are related to prove this? Do not all these abuses have their origin in small beginnings? Have mothers and housekeepers much to answer for in this matter? Do our lessons of gluttony begin very early? What is told of the mothers in Surinam? Are not we, of the United States, almost equally erroneous in our customs? And is not all our education — especially our habits at table, from infancy upward — of such a character as to induce or increase gluttony? Can the stomach be weakened by stuffing? What is, in practice, the chief end of man? What Christian act of kindness would, as things are, excite ridicule?

matter was only needed to distend the stomach; but it is now believed to have other uses. A portion of that which is wholly innutritious, so far as the formation of blood is concerned, is as useful in the daily economy of the system as pure nutriment. A part of what we receive is needed for combustion in the lungs, as the chemists call it.

733. Thus, we give cut straw to our cattle, in times of scarcity of other fodder, for the three-fold purpose of furnishing to the system one species of nutriment, of distending the stomach, and of supplying the needful innutritious substance. I have even heard that very fine shavings of wood, in great emergencies, have been fed to horses for this purpose.

734. Numerous experiments have been made, during the last half-century, which go far towards proving that nearly every animal thrives better on mixed substances than on pure nutriment. Dogs and other animals have perished, in a very short time, in the attempt by certain physiologists and chemists to sustain them on pure sugar, starch, gum, etc.

735. And, then, as a matter of fact, leaving all analogies out of the question, do we not see that those who eat plain, coarse food, last much longer, and have better health while they *do* last, than they who live on what are deemed more luxurious, because more refined, dishes? They would, indeed, often eat more refined food, if they could afford it; but is it not a mercy to them and to the world that they are denied it?

736. If these views are correct, we see one reason why much sugar should, in all ages, have been deemed unwholesome.* And it is partly from the fact that they are nearly all pure nutriment, that peas, beans, rice, fine flour, and many other highly concentrated substances, as an exclusive diet, are, by all scientific men, regarded as of doubtful tendency. I admit that there are other objections to these substances, but this is among the more prominent.

737. Oil and fat, which general terms include fat meat, butter, cream, etc., have frequently been objected to for similar reasons. We shall see other reasons still, as we pass on, for excluding these articles from a reformed and truly Christian diet. Besides, late experiments seem to prove that they are not, strictly speaking, pure nutriment; but rather, for the most

* The fact that the negroes in the West Indies grow fleshy on the use of sugar, if it be a fact, only serves to confirm the idea of its unhealthy tendency. Sudden fatness is disease.

part, a miserable substitute for that better food, which, in some circumstances, cannot be procured.

SECTION XVII. — FOOD EASY OF DIGESTION.

738. It has been believed, by some, that highly concentrated food, of certain kinds that might be named, was more easily converted into blood and fitted to nourish and sustain the system, because it was more nearly allied to blood, in its original character. Milk is of this description; and eggs, when not over-cooked. So, also, some parts of animals.

739. It is probable, however, that the change which milk, eggs, and even blood itself, have to undergo in our digestive cavities, is just as radical, if not as difficult, as some of those substances which are entirely unlike the tissues they are intended to nourish. Thus, coarse bread, or strawberries, are, it is believed, as easily digested by the adult as flesh or milk.

740. In truth, our suspicions go farther still. It is beginning to be believed that the very class of substances we are now considering, by being generally more concentrated than their opposites, such as bread and fruits, are more difficult of digestion than they; and this consideration might have been added to those of the preceding section as militating against the expediency of their use.

741. Suppose, however, it were not so. Suppose these rich, and often concentrated substances, *were* easy of digestion. Are the things which are easiest of digestion always best for us? We know well that many things are too difficult of digestion; may not some things by parity of reasoning be too easy? And is there not, in this respect, a medium to be found, which is more desirable than either?

742. One thing should be remembered. The whole array of digestive machinery is made to *work*. The teeth and salivary glands, the stomach and gastric apparatus, the liver and pancreas, are all designed to be "working men." There are, in the human economy, no drones or idlers. The digestive ma-

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QUESTIONS. — What is the vulgar or popular idea of concentrated food? What practical evils grow out of this opinion? Is analogy opposed to it? Please to give some examples. Is it the sole object of innutritious substances to distend the stomach? What experiments have been made on dogs and other animals? What is the language of facts on this subject? Do we thus learn why much sugar has always been found hurtful? What is said, in particular, of the oil and fat taken into our system?

chinery depends on a reasonable degree of action or exercise, in order to the maintenance of its own healthy condition.

743. When, therefore, in the progress of the present section or elsewhere, I speak of a substance as being too easy of digestion, I mean that it does not sufficiently task the organs concerned, to maintain them in the best of health. And, what is nearly the same thing, when I say a substance is hard or difficult of digestion, or, as Dr. Dunglison would call it, *rebellious*, I mean that it tasks the digestive machinery more than, in its particular circumstances, that machinery is well able to bear.

744. It follows, of course, that what is easy of digestion, or at least of solution, to one individual, may be difficult to another; and that no rules laid down with regard to the digestibility of food can be alike applicable to all, because there is such a never-ending variety of digestive energy.

745. But it does not thence follow that general information on the subject may not be useful. That which is easy of solution or of digestion in one person, will, *in the same circumstances*, be easy to all; only it will be changed more or less rapidly, according to the nature of the article and the degree of strength in different individuals who partake of it.

746. Thus, while in a strong person potatoes may go through the progress of chymification in three or four hours, five or six hours may be required in the feeble; and yet they are, to both, hard of digestion. Rice, on the other hand, which is rapidly chymified in all persons, may yet be one, two, or more hours in going through the process, according as the strength and other conditions of the stomach are more or less favorable.

747. Much has been said, during the last twenty-five years, of the experiments of Dr. Beaumont, on the gastric juice. They were certainly very curious. Hardly a book has been published, for many years, on physiology or health, that has not availed itself, more or less, of his interesting facts.*

* That I may not be misunderstood by the uninformed, let me briefly state the facts concerning Dr. Beaumont. A young Canadian, by the name of St. Martin, had been badly wounded in the side; and, on his recovery, an external opening had been left, nearly an inch in diameter, into the stomach. Dr. Beaumont made a long series of experiments on him to ascertain the nature and qualities of the gastric juice; which, for that purpose, and for many other scientific purposes, were invaluable. Some of these experiments I had the pleasure of witnessing. The only thing to which I object is the custom of making too much of them. Dr. Beaumont was not so great in hygiene and physiology as he was in his own profession, that of surgery.

748. And yet these facts, curious and interesting as they may be, are more curious than really and practically useful. Too much has been made of them, in one particular, at least. Chymification is, as we have seen (632), only a part of digestion; whereas the public — and even not a few learned men — seem to have inferred that what Dr. Beaumont has found to be rapidly chymified, is rapidly digested; and that the more rapid the digestion, the better for health.

749. There is reason for believing, on the contrary, that the slower of digestion an article is, provided it is not irritating, the better. At all events, while no man shall go before me in praise of Dr. Beaumont for what he has really done, — for facts of this kind are greatly needed, — I must be permitted to caution every inquirer after the true laws of health against supposing that his tables on the solubility of various articles of food, afford a test of their adaptation to the purposes of health, and especially to the final well-being of our race.

750. Let me present, to plain, unsophisticated good sense, an example which will illustrate my meaning. Raw cabbage is put down, in the tables of Dr. Beaumont, as being chymified in two hours and thirty minutes; boiled cabbage, in four hours and thirty minutes. Now, it would require something more than a modern vegetarian — it would require at least the grass-eating king of Babylon — to convince me that raw cabbage is more easy of digestion, taking this term in its true sense, than boiled. And, even if that were proved, I should demur about its superior healthfulness.

SECTION XVIII. — LIQUID ALIMENTS.

751. It has been shown already (548, 576), that liquids are not digested *as* liquids; and pure water, not at all. In order to digestion, the water of liquid or semi-liquid food must be first absorbed, after which the sediment may or may not be digested.

QUESTIONS. — What mistake is made about concentrated food? What is the probable truth on the subject? Is there not reason for believing that the simplest and coarsest food is easiest of digestion? Is that which is easiest of digestion always the best for us? Must not the digestive machinery be kept at work? Is it not possible that what is easy of chymification is slow of digestion, and the contrary? Who has made large experiments on the gastric juice? State the case as detailed in the note. What hasty inferences have been made from his experiments? What plain example is given to show the mistake?

This depends on the condition of the stomach and nerves. In many persons who are not strong, it is gradually removed from the system without yielding any nutriment, and perhaps, too, without much immediate annoyance, except a slight degree of acidity, flatulence, or indigestion.

752. When it is affirmed by physiologists that liquid aliments are not generally so healthy as solid ones, two objections are apt to arise. 1. Why, then, is milk so healthy to the infant, as well as to other persons? 2. If liquids are difficult of digestion, why do medical men so often direct their feeble patients to the use of broths, gruels, etc.? These objections deserve a serious consideration.

753. Milk, though a liquid, becomes changed in the stomach (665). Some eighty or ninety per cent of it are water; this is absorbed, in the first place. The remainder is then formed into a species of curd, which renders it susceptible to the action of the gastric juice and to the laws of chymification. Practically, then, it is not a liquid, but a semi-solid. This adapts it to early infancy.

754. With regard to its usefulness beyond the veriest infancy, there is room for doubt. Teeth involve a necessity of mastication and consequent insalivation; but both these processes are defeated by the usual custom of eating milk rapidly, or, above all, drinking it hastily. If used at all by adults in good health, it should be used as children use it. It should be eaten slowly, and with a tea-spoon, or drawn through a very small tube. And the bread we eat with it, instead of being broken or cut into it, should be eaten separately.

755. But even then its usefulness for the strong and healthy adult is very doubtful. Did it not prevent or preclude the proper action of the teeth and salivary glands, it would nevertheless call into activity far too little the muscular powers of the stomach. And then too presumptively, there is an argument against its use. Can it be that a diet adapted to the infant would be well adapted to the adult? Has not the saying, "Milk for babes, stronger meat for adults," a foundation in truth and nature?

756. Facts are stubborn things, and the milk-eater shall have one here. A man at Yarmouth, in Massachusetts, took it into his head to make his horse live on milk; but it was an utter failure. Now, why should not milk be as good for a horse as for a grown man or woman?

757. With regard to gruels, broths, soups, etc., the case is somewhat different. The sediment of these is not solidified in the stomach. It remains not only difficult of chymification, but *very* difficult. Unmasticated and uninsalivated, as it is, its proper and healthful chymification is almost impossible. It would defy powers the most herculean.

758. There is one apparent exception to the force and truth of the last remarks. When a person is recovering from fever or any acute disease, the appetite, though morbid, is sometimes in its demands almost furious. It asks for the worst things — pork, cabbage, cheese, mince-pie, and the like. These, in any considerable quantity, being inadmissible, we endeavor to quiet the clamors of appetite by compelling the raging stomach to busy itself on gruel or some other substance, which, while it keeps it "out of mischief," will, after all, afford it but little nutriment.

759. And thus far, as I believe, the usual routine of medical practice is founded in good sense. But beyond this, and a few similar cases, I think the custom of giving liquids to the sick decidedly wrong. A small quantity of solid food — a crust of bread, or some boiled rice — would be found preferable.

760. Other objections may be brought. If liquid food, as a part of our diet, is poorly adapted to health, why are the soup-eaters of France, and the bread and milk eaters of every country, so healthy? We have even heard of the healthiness of the eater of bean-porridge. And if liquid food is not well adapted to the sick, how is it that so many recover under its use?

761. The people of France are healthy in spite of their soups. Their cheerfulness — or rather their absence of fretfulness — would render them healthy, were there no other reason for their good health. Our ancestors were healthy, by reason of other things, and in spite of their bean-porridge. And with regard to bread and milk eating, it is seldom resorted to by the very strong and robust, though I have known a few such instances. For the feeble, infantile stomach of some adults, it does very well.

762. Besides bread is good, even though soaked in milk and but imperfectly masticated. And this bread accomplishes its perfect work of health in the human domain, the milk to the contrary notwithstanding. Then, again, milk is good with bread in comparison with a diet which is, in general, much worse. For, excellent as our American diet may by some be

considered, an exchange for bread and milk, would, nationally and temporarily, be a great gain.

SECTION XIX. — MIXED ALIMENTS, OR MADE DISHES.

763. It is said by Dr. Dunglison, at p. 283 of his "Elements of Hygiene," that every made dish of food is more or less rebellious. What does he mean by *made dishes?* And what does he mean by *rebellious?* And are his views correct? Or, like many others, is he partly right and partly wrong?

764. His own remarks will furnish us with the best commentary on his own text. He was speaking of the use of eggs, and expressing his regret at the growing tendency to ape French cookery — so much perverted, as he says, that they have 685 dishes of which eggs are deemed an important ingredient. To which he appends, by way of caution, "Every preparation of eggs, and every made dish, is more or less rebellious."

765. From these and other statements it is easy to ascertain his meaning. *Made* dishes, with him, are *mixed* dishes. Even the addition of milk to the farmer's bread is objectionable in a slight degree; but so numerous and so much worse are hundreds of our mixtures, that this last is hardly worth noticing, except for the sake of illustration.

766. Governor Hill, of New Hampshire, in his "Family Visitor" of many years ago, took occasion to say that butter had become quite a staple in the produce of New England, since it had come to form a component part of nearly every dish. A striking remark, and yet not more striking than true.

767. But if it has come to this, that made dishes are the order of the day, and if, as Dr. Dunglison says, they are all more or less *rebellious* — by which term he evidently means difficult of chymification — is it not high time to take up pen and pencil, if not other weapons, against them? But I must particularize.

768. Mince pies, of every form, would, of course, be set down as made dishes. Yet there is variety, even of these. Mrs. Leslie, in her work on Cookery, has a receipt for one which

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QUESTIONS. — Do liquid foods ever cause acidity, flatulence, &c? How is this? What is the first grand objection to the disuse of liquid food by the healthy? What is the second? Are these objections valid? How is the first objection met? Relate the anecdote of a horse fed on milk. How is the second objection disposed of? What other objections are mentioned? What is said of the character of the French? Though bread and milk is not quite the best diet, as a whole, would not a natural exchange of the present for one so much simpler be a great gain?

would include no less than eighteen ingredients! Yet I have known a mince pie which included only four different articles. This, in general, was the mince pie of fifty years ago. So much for the boasted march of mind in the matter of cookery.

769. The potato, that could once be eaten with a little salt—perhaps even without it—is fairly entitled to the name of a simple article. But now, in 1856, who could eat a simply cooked potato without dressings? Even this must be a *made* dish! It must be mashed, buttered, peppered, salted, and I know not what else,—or Mrs. Fastidious cannot relish it!

770. Once, well baked bread, raised with yeast or leaven, and without salt—and occasionally unfermented cakes, with no additions at all—was deemed good and wholesome food. It was at least simple. Now our bread must not only be raised with some transatlantic mixture made in Connecticut, but must be made short with alkali; salt with muriate of soda; and perhaps shorter still, by the addition of lard. To which the farmers add, when they have it, an abundance of milk, and the people of one portion of the United States a quantity of chopped meat. Is not this a made dish?

771. Why is it that people adhere to these mixtures—these made dishes—with so much pertinacity; and not only adhere to them, but add to their number daily? They have a vague idea beforehand that they are wrong. Peter Parley, in his Fireside Education says: "Pies, cakes and sweetmeats should be absolutely interdicted. These things are universally known to be poisonous to children, and those who give them are conscious that they are purchasing the momentary smile of satisfaction at the risk of after sickness, and perhaps of incurable disease."

772. Now, I cannot quite agree with Mr. Goodrich in his statement, that mothers and housekeepers *know* these things to be poisonous, at least clearly. But they do know enough to render them greatly culpable. They know that bread, rice, milk, and other plain articles of food, are *better* for them. By what strange law, then, are they governed, when they give to those whom they love as well, if not better than themselves, what they know is, in relation to their health, at least doubtful?

773. I was to define the term rebellious, as used by Dr. Dunglison; but I have already done it, in part, (767) by way of anticipation. Few things come before us which are not, more or less, of a mixed character; or, in other words, more or less

opposed to the healthful action of the digestive system, and consequently more or less "rebellious."

774. Mixed dishes are not only objectionable, but mixed meals. An ordinary meal, in our over refined society, is but a huge mince pie, when it reaches the stomach. Nothing is wanting but a *crust*, and perhaps in these "temperance" times, a little wine or cider, to render it a rival to the pies of Mrs. Leslie, Mrs. Hale, or any of our modern epicures.

775. None of these views, nor indeed any which have been advanced, stand opposed to variety of food in general; but only, at most, to variety at the same meal. A reasonable variety, at different meals, is believed to be not only compatible with the best health, but even advantageous. It may not be desired by the unperverted appetite, but I think the higher power, the HEAD, would direct it; and that the truly obedient epigastric region would utter no remonstrance.

SECT. XX. — PRESERVED FOOD.

776. The quotation from Mr. Goodrich, in a preceding section, about sweetmeats, and the general train of remark in the same connection, very naturally lead us to inquire concerning the healthful tendency of a large class of substances in very general use among us, preserved from decay by the application of salt, saltpetre, smoke, spices, syrups, spirits, &c.

777. Nothing is more obvious than that, in order to preserve a thing from decay, by means of any of the foregoing appliances, some change must be wrought in it. What is that change? Does it not simply consist in placing the substance to be wrought upon in such circumstances that it will, for a period greater or less, resist its natural tendency to decomposition or putrefaction?

778. Thus we apply smoke, or pyroligneous acid to our meats. This gives them a peculiar flavor, and at the same time, either with or without the addition of salt, enables them to resist every tendency to change, and to ultimate putrefaction.

QUESTIONS. — What is said by Dr. Dunglison about made dishes? What are they? Are made or mixed dishes very common? What was said by the late Gov. Hill? What is said of Mrs. Leslie's mince pies? What of the potato? What of modern bread? Why do we adhere to these follies so pertinaciously? What does Peter Parley say? How far is he right? What is meant by rebellious dishes? What is said of mixed dishes at the same meal? What of variety of food at different meals? Should the head or the stomach direct in the matter?

The same is true of the application of saltpetre, or nitre, of spirits, of highly concentrated acids, or syrups, of spices, and even of common salt.

779. Nor will it be doubted, by any reflecting mind, whether the same things which tend to render these and other substances indestructible, *external to the human body*, tend to render them at the same time indestructible *within the body*. Now, if they can and do resist the tendency to decomposition, both in the body and out of it, must they not, in nearly the same degree, resist the tendency to solution, and to chymification and chylification?

780. Grant—as we must—that these table changes are not identical with putrefaction, and that the human stomach is by no means a chemical laboratory; still it has laws; and those laws, though vital or unknown in their essence, often include or admit more or less of chemical law. At all events, food must be dissolved before it can be digested; but if it is so hardened or rendered tough as more or less to resist *all change*—solution itself not excepted—is it conceivable that it should not resist the changes which chymification, chylification and sanguification are designed to accomplish?

781. One grand objection to pickles, is that they are so changed by vinegar, salt, or such other appliances, as have been used for their preservation, as to resist chymification, and even solution. True it is that green grapes, green cucumbers, green tomatoes, green peppers, and the like, are of themselves quite insoluble and unwholesome; but they are not so bad in their natural state, as when artificially preserved.

782. Butter, in different circumstances, has very different meanings. In some countries and times, it means cream; in others, butter, newly churned, but not preserved; in others still, it includes salted or pickled butter. It is the latter which is most objectionable; and for the very reason that it is *preserved*. In Europe, at least in Western Europe, pickled or preserved butter, as we are told, is hardly known as an article of food. Cream, which you know is unsalted and miscible with water, is less objectionable.

783. And here, too, comes the main objection to syrups, sauces, sweetmeats, preserves, and the like. They are almost as indestructible within the body as without it; and hence, as Dr. Dunglison would say, "are more or less rebellious." If they do not make us quite sick, it is because we are constructed to live

and to resist, for a long time, all downward tendencies. At the least, they do us no good.

784. The custom of preserving fruits, and other substances used for food, in spirits, wine, cider, etc., is now well known to be objectionable; and is, by most temperance people, rejected. I wish I could say by *all*, as well as by *most;* for, unfortunately, the temptations of habit and custom are frequently more than a match for good sense and principle. The old Adam is often too strong for the young Melancthon.

785. The custom of preserving meats by salt, nitre, etc., but especially by common salt, is one of long standing, and will not easily be removed. And yet there is no doubt that it ought to be. The tendency of salt to scurvy and other diseases, especially skin diseases, has long been known. But the chief objection to its use is, that it resists change, and is therefore opposed to healthy digestion.

786. Such a statement, I am fully aware, will elicit many inquiries, and not a few grave objections. With a large proportion of our plain country population, a strong prejudice prevails against the use of unsalted meats, especially in summer. Dr. Ticknor, in his "Philosophy of Living," suggests the importance, in hot weather, of following the customs of tropical regions, and living chiefly on fruits and vegetables, avoiding not only salted meats for the summer season, but fresh ones.

787. Let it be observed, however, that to eat salted or pickled substances, in summer or winter, is one thing; to eat our meats and other articles *with* salt, as an accompaniment, is quite another. The latter practice might be tolerated, even though the other were proved to be wrong. I do not say it *should* be tolerated; for, of the propriety or impropriety of using salt at all, this is not the place to speak.

788. Many have inquired how our provisions could be kept without having them permeated or hardened, in their texture, by something. I reply that meats, both cooked and uncooked, *have been* preserved for years in a tolerable condition by merely removing the air from them, and hermetically sealing the vessels containing them. They may also be kept, for a considerable time, without change, in ice houses.

789. But, suppose it were true that some or all of these articles could not be kept without hardening the fibre, by external appliances; would there be any considerable loss, in this land of abundance, in omitting their use for a part of the year?

Is there not even an advantage in studying, more than we do, the law of adaptation? Instead of eating every thing, at all seasons, should we not use one thing at one time, and another at another?

790. The greatest difficulty in which the most fastidious will find themselves involved by carrying out, to the fullest extent, the idea of rejecting all preserved food, will be with regard to flesh and fish. These, many people like to have while recent, even though it were possible to preserve them in a vacuum or an ice house.

791. I do not mean to say of these people that they prefer their animal food, as do the Hottentots, reeking with blood; but they do prefer them when recently slain. And they could have them so. Fowls, pigs, lambs, fish, and every thing else, at least if a mutual understanding among a few neighbors were entered into, might be slaughtered for every day of the year.

792. All preserved substances tend to disease. But I must devote a separate section of the present chapter to the special consideration of diseases of digestion.

SECT. XXI. — MEDICATED FOOD.

793. By medicated food, I mean food which has medicine in it; whether that medicine belongs to it naturally, or is superadded. Of the former kind is the onion; of the latter, the dish highly spiced, peppered, or premeated with saleratus, or saltpetre.

794. By medicine, I mean that which is, in its tendencies, anti-vital; that is, opposed, more or less, to the natural operations of the system. Of medicated substances, which, in one place or another, are either found in food, or added to it, we have a very great number — from saleratus, sal-soda and assafœtida, down to ginger, allspice and common salt.

795. If all medicine is, in a greater or less degree, anti-vital

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QUESTIONS. — What must be done to an article of food to prevent decay? In what do such changes consist as prevent decomposition? Do the same processes which preserve from decomposition out of the body prevent change within the body? Are decomposition and putrefaction the same? What is said of pickles? What of butter? What of syrups, sauces, &c.? What is said about the morality of preserving things in spirits, wine, cider, &c.? Should the custom of salting food to preserve it, be abolished? Could we get along thus? What says Dr. Ticknor? Can we not salt our food on our plates? Is this as objectionable as to eat pickled meats? How can we keep things without salt? How could fresh food be had daily? Do preserved meats tend to disease?

—i.e. tending, in a state of health, to disturbance and derangement, both of the solids and fluids—then it must, almost of necessity, be liable to derange the function of digestion; at least if present while that function is active. This remark must be particularly applicable to the process of chymification.

796. Let it be received as a fundamental and demonstrable proposition, that medicine and food, in their action and tendencies, are absolutely and forever incompatible with each other. In other words, when food is in the stomach, medicine should not be; and on the contrary, when medicine is in the stomach, food should not be there. They should be kept entirely separate. Of course, I am here speaking of a state of health, and not, in particular, of a state of disease.

797. Wise medical men, however, as a general rule, recognize this great principle. They give their medicine, especially if pretty active, on what they call an empty stomach. In this way, as they believe, it is undisturbed in its action, and does not interfere very much with the natural operations of the system, especially the digestive function.

798. When alcohol is taken at our meals, or even in close connection with them, whether in the form of distilled or fermented liquors, medicine is taken. But the small beer, of home-brewed origin, no less than that of the shops, *if it has fermented*,—and no one would drink it otherwise,—as certainly contains alcohol, as rum gin, brandy or cider; only it is in the very small proportion, in some instances, of but one or two per cent.

799. Nor let it be supposed that we shall escape the penalty of taking medicine with our meals, by drinking it just before we eat, as was the custom of many in former years. It disturbs digestion, even in such circumstances; only not quite so much. The same might be said of drinking wine or beer at the *close* of a meal, as is the custom even now, at not a few of our fashionable hotels and boarding houses, and at public dinners.

800. Tobacco with meals, few, as I suppose, would think of using. Yet there are those, in considerable numbers, who think they cannot digest a dinner until they have taken their quid of tobacco; and a few may be found who deem it indispensably necessary to swallow some of the juice. At first it must be very unpalatable, but long use more than reconciles to the taste of it. There are those who say its very taste has become, to them, delicious.

801. Some *must smoke*, they tell us, after eating. Now, al-

though neither the juice of tobacco, in merely ordinary chewing, nor the smoke of the cigar or pipe, can reach the stomach *directly*, so as to affect the process of chymification, yet it is reached *indirectly*. In both cases, tobacco is absorbed into the circulation, and interferes, more or less, with the digestive process.

802. The same is true of the use of opium, assafœtida, betel-nut, arsenic, and all other very active and strong medicines, which are used as habitual stimuli. To use them up to the moment when we begin our meals, and to recommence their use as soon as we have finished, though it may not be quite as bad as to mingle them on our plates, or swallow them at intervals of mastication, is, nevertheless, to all practical intents and purposes, about as wrong, physiologically.

803. Tea and coffee are medicines, as truly as alcohol, tobacco, or opium, only not so strong; that is, not so active or poisonous. The reasons usually given for using them with meals, would be equally good for using any other medicine of no more than equal strength, that should happen to be in vogue; not excepting alcohol.

804. While I do not undertake to defend, nor even to encourage or tolerate the habitual use of any of these substances —alcohol, tobacco, opium, coffee or tea—either with our meals or elsewhere, and while I do not presume to place them on the same level as respects their injurious tendencies, it is needful I should say, that if taken at all, except as medicines, they should always be used by themselves, at as great a distance as possible from meals, and very infrequently.

805. The Spaniard and the Turk seem to adhere to this rule, in its essentials. The former makes his breakfast of strong coffee, and nothing, or almost nothing else. The Chinese, we are told, occasionally drink their tea by itself. But I regret to be obliged to say, that these oriental customs are going out of fashion, and unless an under-current can be soon established, the medication of our meals is destined to increase for some time to come, rather than diminish.

806. There is a long list of medicines that are apt to be incorporated with our food, in its preparation. Some are for the purpose of improving its odor; others its flavor. It is quite amusing to observe what custom will do in the way of making substances which are naturally offensive to us, not only tolerable, but absolutely agreeable. Thus even garlic and assafœtida,

offensive as they naturally are, become grateful as incense to the epicure.

807. Prof. Ives, formerly of Yale College, once related to his pupils the following anecdote:—A certain cook, at Philadelphia, became famous for her beefsteak. In odor and flavor it was incomparable. Her method of preparation, for some time a profound secret, was at length divulged. The heated platter, on which her steak was about to be laid, was first rubbed over with a piece of assafœtida.

808. But medicated substances are usually added to our food to favor the taste — in other words to render it more sapid. As water becomes not only tasteless, but unsatisfying to those who are accustomed to high living, so do plain viands. Hence they must have something mingled with them — so many think — *to give them a relish.* Once salt was sufficient. It was deemed quite a luxury when first used. Indeed, there are some nations or tribes that have not yet ventured on its use, such as the Camanches tribe of Indians, and the Todas or Todajas, an ancient tribe of India.

809. Yet even when salted, many articles of food are regarded as too tame; and pepper, spice, sugar, and various other things are superadded. Alkalies, also, in several forms, we think we must have, in not a few dishes; first, to neutralize an acid, real or imaginary; secondly, to render the food shorter and lighter, as well as more sapid or tasteful; and lastly, to render it more stimulating to the nervous system. To thousands of persons, at the present day, many dishes that come to our tables would be deemed insufferably tame without saleratus.

810. The medicine chest was formerly confined to the office of the physician; but, of late years, it has occasionally found its way to the closets of the mother and housekeeper. I have known a regularly built *chest* in the possession of one family; but it is much more common to find the ordinary family closet or pantry transformed into an apothecary's shop, and its shelves and drawers supplying the place of a chest. These family apothecary's shops, are becoming almost as common as dentists, physicians, and grave diggers!

811. All this would be comparatively tolerable, if here the matter ended. If every family kept medicine (as I used to keep many of the more active sorts), with a resolute determination never to use it, how little would be the harm! But it is not so. Its convenience encourages its use. Not a few dose their children with a most unsparing hand. And yet the very

individuals who are in this respect, most faulty, are apt to regard *themselves* as entirely free from blame; and to charge the sin of indiscriminate dosing and drugging on every body else rather than begin their severities where they should begin charities, at their own home.

812. Some mothers not only dose their children at home, but also when they travel. Even in travelling in pursuit of health they take medicine with them! Many a family carry their elixirs and cordials and powders on board our steamboats and railroad cars; and not only have them at hand, but use them. Indeed, some cannot wait till their arrival at a stopping place, but are found dosing not only at the several stations when they linger, but on the road between. And should the world be able to travel, by and bye, on electro-magnetic wires, who shall guaranty that these dosing parents will be willing to defer their dosing till their arrival at a station?

913. But the end is not yet. I have spoken of medicine chests. Practically, this indispensable of modern days, has at length mounted the table. Nay, we not unfrequently find, on our extended tables, in large families and boarding houses, some two or three or four of these medicine chests. I do not mean to affirm, here, that the castor contains nothing but medicine; but as far as I know from report and from the eye what their contents really are, they have been denominated by medical men — time immemorial — medicines. They may not be as powerful as morphine or prussic acid; still they are *medicines.*

814. If these medicaments are to continue at our tables, and to be as conspicuous, while there, as they have been for some time past, one improvement ought to be made in the mode of using them. Instead of besprinkling our food with them, dish after dish, let them be used as a separate dish, on occasions — say once a week, or once a month, according to *taste;* for tastes, you know, vary (627). At all events, whenever and wherever used, the strict laws of hygiene require that they should never be used with our food. Nor is there any contradiction here with what was stated in Sect. 20, (787), as may be found by careful and impartial examination.

815. Something has been said about the custom of endeavoring to make our food shorter and lighter, in various ways. Now I well know that there are over-indulged — almost infantile — stomachs, to be found, that require to have the attraction of cohesion, in some few articles of food, a little diminished;

and that, on this account, certain reasonable efforts at raising bread may be tolerated. But such necessity indicates a morbid or diseased state of the stomach. The more rigid laws of health permit no such manipulations or changes. Children who are correctly treated, from the first, are healthier without them.

SECTION XXII. — DISEASED FOOD.

816. Vegetable substances used for food, are occasionally found diseased; though much more seldom than animal substances. Thus, in certain seasons, our fields abound in ergot or spurred rye; one of the most active medicinal agents. It is, however, perfectly easy to separate it before it goes to the mill, as it has no resemblance to the grain itself.

817. Wheat is occasionally liable to disease; and what is quite unfortunate, instead of attacking certain kernels or stalks, as in the case of ergot in rye, the whole mass is affected by a black rust. In the proportion of only one part, by weight to sixty-four of the healthy, it causes pain in the stomach and slight headache. Happily the disease is not very common in this country. The French complain of it much more.

QUESTIONS. — What is here meant by medicated food? Name some few of the medicines used in food. Does medicine of every kind, interfere with chymification? And is it a fundamental law, then, that medicine and food should not be in the stomach at the same time? What custom among physicians is based on this rule? What effect has alcohol, when taken with our meals? Is this true of all forms of alcoholic drink — even small beer? Does alcohol disturb digestion when taken before and after our meals? What is said of the use of tobacco with food? What of tobacco smoke? What of opium, assafœtida, betel-nut, etc.?

Are tea and coffee medicines? Are they as bad, for health, as those just mentioned? Should they be taken with our meals? What is said of certain eastern nations in this particular? Have custom and fashion an influence almost omnipotent? What case is related, from Dr. Ives, in proof of this? What is the main object aimed at in mingling medicines with our food? Was salt always used with food? Is its use, even now, universal?

To what was the medicine chest formerly restricted? Has it occasionally found its way into our families? Are our closets — much oftener — themselves, medicine chests? On whom are mothers and housekeepers wont to throw the blame? Do many mothers carry medicine with them when they travel? Is this even done while travelling in pursuit of health?

What is said of medicine chests at the table? What is meant by them? Are all the varied articles of the castor medicinal? What improvement is ironically suggested in the way of using these medicines? What is said of raised bread? In what circumstances is this sometimes admissible? Is it a violation of the laws of hygiene for the healthy person to use it? Is it needful to those who are, from the first, correctly trained?

818. In some of the northeastern parts of South America, a species of disease in Indian corn is occasionally the source of very great suffering. Those who eat it lose their hair, and sometimes their teeth. Swine, that use it, lose their bristles, and become emaciated and feeble. Mules lose their hair, on using it, and have their hoofs swell. Apes, dogs, parrots, and deer, that eat it, fall down and act as if they were intoxicated. The substance is of a dark color, and is called spurred corn.

819. I have even known whole orchards of apples diseased; but I do not know that the disease has produced any sensible suffering, — I mean immediately — in those who use the fruit. The apples in this case, on being cut or broken, appear to be full of minute dark veins, which are believed to be the pathway of animalculæ. Sometimes these pathways are so numerous as to give to the whole pulp a brown or dark shade, as if beginning to decay.

820. But these diseases, (816--819), most of which are very rare in the United States, and none of which are necessarily productive of much mischief, have arrested very little the public attention; and have, by the potato rot of the last twelve or fifteen years, been thrown completely into the shade. This last, at one time, seemed to portend entire and utter destruction to the crop; but, within a few years, the disease appears to have somewhat abated. We may hope for the best concerning this valuable esculent, but it were almost impossible wholly to dispel our fears.

821. But the ravages of disease, even among the potatoes, admit of no comparison with the ravages of disease among the animal tribes, from which man, to a very great extent, selects his daily food. Some of these are almost always diseased, and most of them more or less so. Whereas it is only here and there that a vegetable has as yet been known to be affected, at least in the United States. And of those that have suffered, excepting the potato, it has been at intervals of many long years.

822. No animal in general use among us, is more frequently a sufferer from disease, especially chronic disease, than the swine. In truth, I do not know that it would be possible to find a domesticated swine, young or old, perfectly healthy. If any of these animals escape disease, it must be those that run wild in the woods, at the South and West, and live on *mast*. But even the flesh of these can hardly be called healthy. It

predisposes those who use it, to leprosy, or to other cutaneous diseases.

823. On entering the best pork market in the world, and searching for healthy pork, therefore, no person duly enlightened, should expect to find it. Such a result would be the merest accident; or at most, as an exception to the general rule. No animal can remain healthy that is kept in bad air, as most swine are, and fed in the worst possible manner. To escape disease in one of our modern swine pens, would be equivalent to miracle.

824. Many, I know, seem to think that a hog can *live* in almost any way, and so he can. But does this prove that living *in almost any way* is healthy? Does not the swine, with his smaller lungs, need pure air — what his lungs can hold — as much as any other animal? And will not the constant inhalation of bad air, in due time, render him diseased, as well as other animals? He has muscles, too; can they be healthy without exercise? And will not hot or diseased food affect him injuriously?

825. Let facts answer these queries. Our butchers, who are honest men, will tell us that nearly all our fattened hogs have diseased livers. Many of them have measles. In my native region, it was well understood as it is here, that hot liquid food was apt to render swine diseased. And not only there, but all over the country, it is customary to sell their hogs that have *measles*, to be consumed by the inhabitants of the town or city.

826. No living human being, treated as we treat our swine, would fail of having liver complaint sooner or later — to say nothing of hydatiss, or measles. Or if in any instance, there were an escape from it, the escape would not be owing to us, or to the circumstances. We shall have done our best to produce it.

827. Stall-fed cattle, no less than closely confined swine, are very often diseased. Prof. Dascomb of Ohio, informs me that in certain sections of the western country beef cattle are nearly all affected with liver complaint. In short, we have ample testimony to the existence of this and other complaints among our fattened cattle.

828. The cow, without being stall-fed, or even highly fattened, is sometimes diseased. According to Dr. Clarke, a highly accredited British writer, most of the milch cows in the city of Paris become, in later life, tuberculous — that is to say

scrofulous, or consumptive. But cows, in the United States and elsewhere, are made of similar materials, and must be affected by want of exercise, bad air, and bad food, in a similar manner.

829. Were it customary to eat the horse, especially the horse that has not been overworked or abused, he might be more frequently found healthy; but, except in a few instances of singular exception, this noble animal is not eaten. Still he has disease; at least occasionally.

830. The sheep is liable to disease; but not so frequently as the swine and cow; and the lamb is less liable to disease than its dam. And yet, in the rare case of her subsisting on buttercup and other noxious and irritating agents, the mother escapes disease, while they who use the milk, whether calf, lamb, or human being, are more or less poisoned.

831. Of the diseases of the goat I know but little — its flesh, moreover, is, among us, but little eaten, except while young. But, in the case of its cropping poison, as it sometimes does, its milk must be injuriously affected, as well as the flesh of its progeny.

832. The goose is very generally diseased by the fattening process. Nothing is more common than to shut up this animal in hot and close pens, and feed it to surfeiting, so that the greatest obesity may be attained in the least possible time. One man whom I knew, used to purchase all the very old geese he could, and fatten them in *nine days!* Their livers were greatly enlarged, though not, so far as I could learn, very much ulcerated. Their flesh was exceedingly tender.

833. Who has not heard of the Strasburg mince pies? They are found in almost all parts of Europe where there are gourmands, and are even said to have been brought to Philadelphia. They are made of the engorged, half-putrid livers of geese, fattened in close, heated pens, with their feet sometimes nailed to the floor. Perhaps they would *die* of liver disease, were they not slain and eaten before the disease has time to produce its legitimate results.

834. It ought to be more fully known than it now is, that all plethora or undue fatness is disease. A certain degree of plumpness, greater or less according to inheritance, temperament, habit, etc., is of course compatible with good health; but what is generally called fatness, whether among men or animals, is disease.

835. But liver disease, hydatids, measles, scrofula, leprosy,

consumption, and plethora, are by no means all the diseases to which our domestic animals are liable. Worms, murrain, horse distemper, staggers, glanders, heaves, eruptive complaints, and many more brute ills, might be added to the list.

836. What has been said of the diseases of domestic animals, such as are continually used for food among us, is of course inapplicable to the wild animals, the birds, and the fishes. These, generally, are not enough under human influence to become the victims of artificial habits. Even the barn-yard fowl is somewhat less liable to disease than the animals which are more immediately and uniformly our servants.

837. Yet even these, as the best authorities assure us, are sometimes diseased. Noah Webster, in his work on Pestilential diseases, assures us that the fishes of the sea, at particular seasons, die in immense numbers, and float on the surface of the water. There is the best of evidence that the dolphin and other fish are diseased, occasionally, even when no epidemic among its brotherhood is known to prevail.

838. I have witnessed the deplorable effects of eating oysters at certain times and seasons of the year. I have known every family and every individual of a particular neighborhood made sick by eating them. And while the report, which had become current, of sickness from oyster-eating in New York, in the year 1854, was being contradicted by high medical authority, the late Hon. William Jackson, of Massachusetts, then in that city, was made sick by them; and, though he returned to his family partially restored, died not long afterward of a chronic complaint, which, it is fully believed was hastened to its crisis by the oysters.

839. The partridge is occasionally known to be diseased. How it happens is, as yet, a mooted point. Many have supposed the cause to be the eating of poisonous berries. But it may be something else. In any event, it is not very desirable to partake of its flesh in this diseased condition.

840. Multitudes, in the old world, during the latter part of the last century, were made sick and actually destroyed by sausages; but they were what are called blood sausages, and may have developed a poison by their incipient putrefaction. I have, however, heard of a few similar cases, in our own country. The rations of soldiers and sailors occasionally prove to be diseased. And there are wicked men in every country, who sell diseased meats both for sausages and for other purposes, knowing them to be diseased when they dispose of them.

841. Cheese is very often diseased; but in what way, has never, I believe, been ascertained. A hundred persons or more partook of a cheese at Plymouth Hollow, in Connecticut, about the year 1827, and were made sick by it — some of them severely; though none of them died. A similar poisoning took place a few years earlier in Winstead, in the same state.

842. Fat and fatty substances have occasionally been diseased, in a manner not easily explained. Suspicion has, indeed, often been directed to incipient putrefaction. A female friend of mine in attending to some half putrid tallow, having at the same time a wounded finger, was attacked by a severe inflammatory affection of the part, and perished. I have known many sudden deaths of a similar kind.

SECTION XXIII. — POISONED FOOD.

843. It may not be easy, in every instance, to draw the line of demarcation between diseased food and poisoned food; nor is it, after all, a point of much practical importance. For, though some of the cases of the preceding section might be

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QUESTIONS. — Is food from the vegetable kingdom much less frequently found diseased than that from the animal world? What is said of ergot or spurred rye? What of diseased wheat? What of spurred corn? In what countries, respectively, are these diseases most troublesome? Are apples sometimes diseased? What is the most remarkable disease of the vegetable world which is recorded in history? Is this disease on the increase now; or is it diminishing?

Will the diseases of vegetable food compare at all, for danger, with those of the domestic animals? What domestic animal is almost always diseased? What are some of the causes of its diseases? Name some of the diseases themselves. What would happen to human beings who were treated as we treat our swine? What is said of stall-fed cattle? What does Dr. Dascomb say of the western cattle? Are cows apt to be diseased? What says Dr. Clark? Is it not highly probable that the Paris cows are like other cows? What is said of the liabilities of the horse to disease? What is said of the sheep? What of the liability of poisoning through the use of milk? Is the animal that furnishes the milk apt to be diseased at the same time? How may the flesh of the kid sometimes prove poisonous? How is the goose affected by the fattening process? How are the Strasburg pies made?

Is plethora always disease? Is it so even in man? Are the wild animals, the fowls, and the fishes, ever diseased? What does Dr. Webster testify? What is said of the dolphin? What has the author seen of the effects of eating oysters? What are the facts concerning the late William Jackson? Is the partridge sometimes diseased? What is related of poisonous sausages? Are there men depraved enough to sell diseased meats knowing them to be such? Is cheese sometimes poisonous? Does fat occasionally, by its putridity, or otherwise, become a source of disease?

regarded as cases of poisoning, there are so many more of the same general character, as to warrant a division of the subject, were it only to avoid tediousness.

844. Poisoning from lead is not, by any means, as common as it was a few years ago. Most people understand now that the red earthen of the shops is liable to become poisonous, even though they may not understand precisely *how* it can happen. And yet I have seen cases of disease induced by it within a very short time. Nor have many years passed away since a most deadly disease prevailed, one autumn, in Elizabethtown, Penn., and carried off from thirty to fifty of the inhabitants, which was distinctly traceable to this very same source.

845. A poison is occasionally developed by cooking in iron. In this case you will find the contents of the vessel blackened. Maple sugar boiled down in iron kettles, no less than vegetables boiled in iron, is thereby rendered poisonous; and I have known the former, on being eaten, to produce extensive and severe inflammation of the mouth, throat, and stomach.

846. Whether, in these cases, sulphate of iron, or, as it is popularly called, copperas, is formed in small quantity, or whether some other poison of equal potency is developed, remains as yet to be ascertained. In any event, great caution should be used with regard to iron rust — or oxyde of iron — since, though nearly harmless when taken alone, it may be poisonous by means of new combinations.

847. Newly painted wooden pails, such as are often used in our families, sometimes give us trouble. I have seen a good deal of stomach disease induced among the young in this way. If painted pails are used at all, great care should be had that the pail is thoroughly dry. It seems to me desirable that in painting these pails some material should be used which is less dangerous than lead.

848. Some dairy-women are said to use a little arsenic in their cheese. A quantity equal in bulk to half a pea, when dissolved in milk a little old, gives to the curd formed all the sensible properties of curds from new milk. Many years ago a family in Boston was supposed to be poisoned in this way; though none of them died. The poison was probably too little in the quantity eaten at once, to effect the destruction of life.

849. Here it may be well for us to refer the reader to a leading principle of this work, (Chap. VII. Sect. 7), in regard to small quantities of an injurious agent. As an apt illustration of this principle, I have watched this Boston family, ever

since the above occurrence with great care. One of them was dyspeptic before the cheese was eaten — the others possessed what might be called average health. About half of them are dead; and the remainder have *no health* or vigor.

850. Instances of poisoning by white lead, in powder, are not wanting. A careless clerk, in replacing some white lead, has thrown it by mistake into the flour barrel, from which he is daily and hourly retailing. The result, of course, has been its admixture with bread, and the production of stomach disturbance, greater or less, in the families of some of his customers.

851. We are exceedingly liable, by means of our modern complicated cookery, to be poisoned by verdigris; of which there are two kinds. Sauce-pans, such as are made of copper and brass, if not well tinned, and kept very clean, are liable to the formation of verdigris, whenever wine, cider, vinegar, oil, or the juices of fruits, are put into them. I have not a doubt that many a severe bowel complaint has originated in this very way.

852. Our people, of the present generation, have not been trained to the work of tracing effects to causes. A temperance lecturer, of some shrewdness, remarked the other day, that he never had so much as a cold which he could not trace to its cause. But we have few among us so bold as to dare to do this if they could. Even juries of inquest, despite of their oaths, find it much more easy and natural to say, for their verdict, "Died by the visitation of God," than "Died from carelessness or ignorance."

853. I have elsewhere (672), alluded to the custom of eating wafers, to which certain clerks and other persons are excessively addicted. Now the bright red wafer is often composed in part of red lead, as may be shown by burning it over a sheet of white paper, on which globules of lead will be precipitated. They who are continually wetting them in their mouths, sometimes suffer from it; how much worse it must be in the end, to be in the habit of eating them!

854. It is stated in the London Lancet, a highly respectable medical paper, that a secretary in England, some little time since, was twice attacked with severe disease from having wetted in his mouth the wafers of five hundred circulars. I have known several of our American clerks to suffer in the same way.

855. Confectionary, as is well known, often proves to be

poisonous. One thing which renders it poisonous is litharge, or is a preparation from lead. Red lead and massicot are also used. The frosting appears to be the most dangerous; but even the confectionary itself, when highly colored, occasionally produces mischief. The following anecdote, strikingly illustrative, is copied from my Lectures on Life and Health, page 382.

856. "A family of five persons, in New York, were all severely sick in the year 1835 — some of them came very near dying — in consequence of eating the frosting of a confectionary cake. Drs. Hosack and Rogers analyzed the colored ornament of the part of the cake that remained, and found one-fifth of it rank poison."

857. Nitre, or saltpetre, so much used in the preservation of our food, is poisonous. Christison, one of the best writers on the subject, says it is a "dangerous poison." Cases on record, well authenticated, seem to prove that he is correct. Some of our learned men, of both hemispheres, have tried of late years to set this matter right in the public mind, but, as I judge, without very great success. People cling to the wrong as with a death-grasp. How important, then, that they who know the right, and have any Christian principle to guide them, should set a good example!

858. Anatto, which is so much used to color cheese and butter, is known to be poisonous; though I believe not intensely so. The same may be said of several other substances, such as lettuce, containing *lactucarium*, (which is a poison), in small quantity. Mushrooms, of certain kinds, are poisonous: and have been known to do extensive mischief.

859. One of the worst domestic poisons with which I am acquainted is saleratus. I have mentioned it (809) already; but not so particularly as it should be. All alkalies are indeed poisonous, in greater or less degree; but I have aimed my blows chiefly at what is popularly called saleratus, because it stands out in bold relief, in the very foreground of a terrible picture.

860. The physicians in some parts of our country, do not hesitate to say that mothers kill half their children with saleratus. Not that they die immediately, from having the stomach and bowels corroded or eaten, as you may hastily suppose; but, rather, by having the system so predisposed to disease, that, when certain exciting causes so incident to the summer season become everywhere rife, the accumulated combustible material (including of course the irritation of the saleratus), becomes ignited, and there is a fearful, perhaps fatal, explosion.

861. Now it is in this point of view that I do not think the statements of our medical men very much exaggerated. Of the two hundred thousand children that die in the United States every year, under ten years of age, I have little doubt that one half — so far at least as the eastern states are concerned — would survive, but for the influence of saleratus. It poisons, more or less, the alimentary canal; and what is perhaps worse, it *disinfibrates* or *devitalizes* the blood, and unfits that and the whole system for withstanding disease.

862. More is true than even this. It prepares the system either to be unaffected by medicine at all, or to be injuriously affected by it. For what physician can know how to apportion his doses to the condition of a child who has, practically, been dosing every day, for months and years? This active medicine, it should be known, is a sword with two edges. If it does not cut the right, it is sure to cut the wrong way; for *cut, somewhere*, it must. And the usual result is — despite of the best directed efforts — that it aids in cutting down the child.

863. Some may doubt whether saleratus is as poisonous as medical men represent it to be. But they need not. Orfila, one of the best authorities on the subject, regards pearlash or saleratus as a poison, and so do the chemists and physicians. Dr. Ives, of New Haven, says it is a narcotic; and what is a narcotic but a poison?

864. Some abatement must be made, I know, in consideration of the fact that it is often used in such a way as to become neutralized in the stomach and intestines, if not even before it reaches the stomach. In company with an acid, it is often decomposed, to form carbonic acid gas (which escapes our grasp), and a new substance, which is not so poisonous as the saleratus. Still the latter is slightly injurious.

865. But though oftentimes neutralized, it is not unusual to find it employed in cookery in such a manner, and with so much liberality, as to leave an excess of the alkali; in which case it has its full force on the living tissues and blood. Nor is soda much better than saleratus; though so much is said of its safety. All alkalies, whether neutralized or unneutralized, should be avoided.

866. The time has been when less than a pound of alkali, of any and all kinds, would suffice for a year, even in a considerable family. Now, our families use from five pounds to twenty-five, yearly. Until within a little time, I had supposed ten or twelve pounds to be the largest quantity used; but many

use fifteen or twenty. And I have seen one family of ten persons that consume, by their own confession, about twenty-five pounds a year!

867. The most striking case of poisoning from saleratus I have ever known, occurred in Williamstown, in Massachusetts, about twenty years ago. The statements I shall make were obtained from one of the physicians who was consulted and employed at the time, and from survivors of the family that suffered. They may be most implicitly relied on; and, if necessary, sustained by the most competent testimony.

868. The keeper of a boarding-house, in connection with the College at Williamstown, having just rented her tenement, and being unacquainted with the cookery of fashionable life, while she was anxious to imitate it, made the mistake of using more saleratus in her food than was customary, and of continuing to do so, till some of the stomachs of her boarders actually refused to receive it. But the greater part persisted, till a most severe disease broke out, of a peculiar kind, of which thirteen in fifteen of their number sickened, and two died. No other sickness prevailed at the time anywhere in that vicinity. The two who escaped the disease had not used much of the alkali. Neither they nor the physicians, to this day, have ever doubted that the disease was produced by this cause.

869. I ought to say, moreover, that the disease was peculiarly depressing. Blisters drawn on the surface would be followed by immediate putrefaction of the parts to which they were applied; and the alimentary canal was in a condition that evinced very great debility, not only of that particular part, but also of the cerebral and nervous system.

870. One inference should be made from such a terrible fact as this. Whatever may be our theories with regard to the manner in which this poisonous agent operates to effect destruction, its depressing power on the living system must be very great. And, if it occasionally operates with such severity in the case of adults, can it be innoxious to children who have made it a part of their diet from month to month, and from year to year?

871. But is saleratus the only medicament, I may be asked, which places the human system in such a condition as to embarrass the physician, and compel him to do harm, when he would do good? I wish it were so. I wish there were not a dozen or more of these foes prowling about. But we must first attack

the foremost of the gang; and saleratus is that distinguished individual.

872. It is becoming fashionable with some, to charge this relentless, terribly successful war on the vital forces of the young—this mighty work, not of manslaughter, but of *child*-slaughter—on physicians. But what can they do, more than now? People call them—they obey the summons—do the best they can—but the child dies. Their efforts, it is true, may accelerate the progress of the disease, if they do not even increase its fatality. But are they at fault on this account?

873. A word or two is needed about other poisons. Lime is said to be used by bakers in inflating their loaves, as well as many other medicinal, if not corrosive, agents. There is, however, one way of escaping this evil in most families; which is, not to patronize the public bakeries, but make our own bread.

874. Then I have referred, once or twice (802, 848), to arsenic. This terrible poison is not much used, so far as I know, except occasionally in cheese; and, apart from food, as an extra stimulant, like opium or betel-nut. And even this abomination, as we have reason to hope, is as yet but little known in the United States. But no one can tell how soon it will permeate and poison scores of our daily dishes; to be followed, no doubt more or less remotely, by new forms of disease, which may be blasphemously set down as new judgments of high Heaven.

875. Our mustard, pepper, vinegar, and almost all our condiments or seasonings of the aromatic or biting kind, are neither more nor less than medicines, and our children are early Mithridated* by them. In other words, they seem to be hardened to their use, while, in reality, they are slowly poisoned. Can it be expected that medicines constantly taken in this way will do any other than render their diseases complicated, severe, and unmanageable? Such expectation, were it to be indulged, should be confined to the day of miracles.

* It is related of Mithridates, king of Pontus, that, in order to harden himself against the influences of hemlock, which it was so common to administer in his day, in order to poison the kings and great men who were not in public favor, he commenced taking it from time to time in small doses, which were gradually increased, till no ordinary amount of the poison would have any effect upon him. The story may or may not be true; but it most certainly illustrates a deep-laid principle of the human constitution.

876. It is one of the most marvellous things of our times—spirit-rappings not excepted—that so many children who sicken recover, and not that so many die. But the marvel is increased when we consider how freely, in many instances, medicine is taken, both in health and sickness.

877. If these abuses of the rising generation are to be continued, one thing is quite obvious: we should trust their diseases to nature herself, and to good nursing. Physicians and medicine, at the best, can only hope, *as a general rule*, and *as a whole*, to hasten the exit of their patients from time to eternity. They can hardly hope to cure; or that many who take their medicine have firmness of constitution enough to recover in spite of it!

SECT. XXIV. — CONFECTIONERY AND SWEETS, GENERALLY.

878. After what has been said in the preceding section (855), it seems almost idle to add anything with regard to confectionery. Besides, the public mind is beginning to be enlight-

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QUESTIONS. — Was lead, in connection with food and cookery, a source of frequent disease, in former times? Is it still occasionally injurious? Name some few instances of the kind. Are substances cooked in iron sometimes poisonous? By what marks can they be distinguished?

How are children occasionally poisoned in drinking from wooden pails? What is said of arsenic in cheese? What facts are given in support of this opinion? Do small quantities of poison, habitually applied, sometimes prove more injurious than occasional large ones? How are families sometimes poisoned by white lead?

What is said of poisoned maple sugar? What is said of poisoning by verdigris? Do we often trace effects to causes? Do juries of inquests ever do so? Is eating wafers dangerous? Why so? What says the London Lancet?

How is confectionery so often injurious? Relate the case which occurred in New York. For what purpose is nitre or saltpetre used in cookery? Is this well known to be poisonous? Is anatto poisonous? What is one of the worst of domestic poisons now known? What do some of our medical men say about it? Does it kill directly? How does it destroy life? Is it a sword with two edges? What is the testimony of Orfila about saleratus? What that of Dr. Ives? Is it injurious when not used to excess? In what strange quantities is it beginning to be used? Relate one of the most striking cases of this kind of poisoning now on record. What inference should be made from such a terrible fact? Is it right to charge the mortality of children's diseases, as much as we do, on physicians? How is lime occasionally poisonous? What is said, in particular, of arsenic? What of pepper, mustard, vinegar, &c.? What is meant by Mithridation? Is it any wonder so many children sicken and die? Must we abandon these abusive practices and customs, or else abandon physicians and medicine?

ened on this subject; and it is generally admitted to be more or less injurious. And yet it is still very largely used. We have, in this matter, as well as in many others, made good the saying of Solomon about long deferred punishments. (62.)

879. The truth is, that the public have, in theory, *admitted* confectionery to be injurious, rather than *believed* it to be so. Especially is this the case with the unenlightened part of society. They seem to suppose that the diseases and premature deaths which have been connected with its use have had their origin in foreign or poisonous additions, as in the frosting, coloring, etc. Apart from these, they do not see how confectionery can do any harm; and what they cannot see, they will not believe to any practical purpose.

880. There is one exception to the truth of this last remark. There is a supposed evil arising from the use of these substances, and from that of sweets generally, viz: that they injure the teeth. But I have said all that needs to be said on this subject already (634, 635). My readers may be assured that neither sugar nor confectionery produce their mischievous effects on the teeth by mere contact.

881. One might almost suspect a little misrepresentation on the part of mothers, and housekeepers, and aunts, and grandmothers. May they not, we are sometimes ready to ask, have imposed on the credulity of the young, and told them that sugar was injurious to the teeth, when they were more careful about the safety of the former than that of the latter?

882. When taken separately from our meals, and even *with* them, in any considerable quantity, these substances undoubtedly impair the tone of the stomach, and produce what we are accustomed to call foulness of that organ. This condition of things, and not, I again say, mere contact, reacts on the teeth. In other words, the lining or mucous coat of the stomach first becomes weakened, and the gums, perhaps from sympathy, become spongy and diseased. And when the gums begin to suffer, the teeth will soon suffer with them.

883. One good evidence that all concentrated sweets injure us, is found in the fact that their use, if at all free, renders us thirsty. What does this thirst indicate? Most certainly, a degree of inflammation of the stomach and intestines. Now, that can hardly be healthy food which produces, almost immediately, so much heat and thirst.

884. It was formerly urged, in favor of concentrated sweets, that the negroes in the West Indies, during the sugar-making

season, became quite fat. But, even if it were certain that sugar was the cause of their fatness, it would remain to be proved that fatness is a sign of health. For the most part, it is a sign of disease.

885. Many things which we eat contain sugar enough for our health, without any additions at our tables. Thus, wheat flour is believed to contain about eight per cent; oatmeal, eight; cherries, eighteen; plums, eleven; peaches, sixteen; beets, five to nine; milk, four to seven; and even peas, corn, and rye contain one, two, or three per cent of this substance. So that we could hardly suffer, constitutionally, for want of a due supply of sugar, even if no concentrated sweets were in use.

886. If we eat baker's bread, old and dry, from which most of the sugar and starch have been expelled in order to make a large loaf, or if we use rice—an article which has hardly one per cent of native sugar in it—we may, without particular wrong, add a little sugar.

887. But, after all—need I repeat it?—the danger from this substance seems to lie in excess. And the remarks which have been made will apply, without much modification, to the use not only of sugar, but also to that of honey, molasses, manna, etc. They all, as a general rule, furnish a supply where none appears to be needed; and hence, to say the least of them, are superfluous and luxurious.

888. Besides, it is always hazardous to separate things which God has so obviously joined together. Thus it is wrong, in the very face of things, to separate the bran from the flour, for both are needed. So the farina, or starch, or sugar, from the substances which contain them. So, again, the butter and cheese from the milk, in which the God of Nature has placed them. Let both be alike received, or alike rejected.

QUESTIONS.—Is the public mind beginning to be enlightened on the subject of confectionery? Has the blame, when mischief has ensued, been hitherto laid to the frosting of these substances? What has been believed in regard to their effect on the teeth? How far is this belief well-founded? What might one almost suspect of those who have cautioned children so strongly about sugar? What is the true way in which sugar and confectionery injure the teeth? What does continual thirst, in the case of those who use sweets largely, appear to indicate? What has been said about the negroes, when they eat much sugar? Is this a certain proof that it is healthy to them? Do not many things we eat contain sugar enough for health, without additions? What are some of these last? What is said of bakers' bread? What of rice? Does not the danger, after all, lie very largely in excess? But are they not all superfluities? Are we quite safe in attempting to separate what God has joined together?

SECT. XXV.—ABUSES IN COOKERY.

889. A new sect, in dietetics, has made its appearance in Europe (628), who abjure cookery almost entirely. We have a few of them in this country, though, in general, they have been a little less ultra in America than in Europe. The American Schlemmerites have generally indulged themselves in our rich farinaceous substances, such as wheat, rye, corn, and rice, as well as in fruits; while the followers of the reformer in Europe have lived chiefly, so we are told by themselves, on dry and raw peas, beans, chestnuts, and acorns.

890. We need not be afraid of that kind of cookery which makes an article of food at once more agreeable, more nutritious, and more digestible. Thus, the potato, by cookery, is improved in all these three particulars. The apple is made more digestible, and some kinds of this fruit more nutritious; while its agreeableness is but little diminished. So the Indian corn. If not made more agreeable, it is little less so; while its digestibility is increased. Such cookery I call legitimate.

891. But it is not so with many things. Take milk, for example; or the banana, or the strawberry, or the melon. Now, we cannot bring any known processes of cookery to bear upon these without injuring them in one or more of the three points above named—agreeableness, nutrition, and digestibility—while they are improved in no one of those particulars, nor in any way whatever.

892. The taste of a few fruits, I grant, may be improved by cookery. Many, however, carry this notion so far as to be unwilling to eat so much as a raw apple. But such preferences are never born with us; they are always acquired. They are, moreover, always unnatural, entirely so.

893. Some things are injured by partial cookery, or by cookery which is excessive; while they are improved by being cooked thoroughly, or in a truly scientific manner. Rice, peas, beans, and chestnuts, only half cooked, are injured. Thus I have known rice, half cooked, produce disease. Over-cooked eggs have induced the same results. Bread, moreover, but half cooked is not so good, in any particular, as the raw grain; while, rightly prepared it is, emphatically the staff of life.

894. I have alluded to the egg. There is but one good method of cooking this article. Cooked at a heat above 165°, the albuminous part becomes coagulated, and is nearly or quite insoluble in the human stomach; but, cooked below that point, it is perfectly soluble. It may be cooked at 160°, as long as

is preferred—fifteen minutes or fifty. If not cooked in this precise way, it should be eaten raw.

895. Many processes of cookery prove injurious, by being carried too far. Thus, in toasting bread, we are liable to make it bitter. In these circumstances, an empyreumatic property seems to be developed, which is slightly injurious. An empyreumatic oil is also developed during the process of preparing fatty substances; as in frying pork, preparing doughnuts, cooking buckwheat cakes, etc. Some individuals, with weak lungs, cannot endure the vapor of burnt oil or fat.

896. Frying, by which is usually meant the fashionable process of preparing food in fat or grease, is always objectionable. Nothing is improved by it, and many things are greatly injured; such as the onion, the apple, and the potato, and cakes and puddings. Com. Nicholson, of Revolutionary memory (as I am informed by his daughters), would never allow a frying-pan or spider to come into his house.

897. In general, we cook too much, and cook erroneously. Seasonings for food, if applied at all, should never be applied till the food is on the table. Even then, it were well if custom required us to make the additions supposed to be needful on our own plates. The idea of compelling everybody to the same conventional law, in this particular, is, to say the least, quite unrepublican.

898. There is a good story told of a foreigner at a table in New York. One man had besprinkled the platter of hash with pepper, saying, at the same time, "I take it, gentlemen, you all like pepper." Another had added mustard, with the same assurance and the same remark. The foreigner, not a little vexed, took out his snuff-box, and in his turn sprinkled its contents on the food, saying, "I take it, gentlemen, you all like snuff!"

899. All unnecessary cookery is, in one important sense, an abuse. It is a *moral* abuse. It involves a useless waste of health, and of woman's time. On the latter point, much might be said, if this were the place for it. Time is too valuable and life too short to be squandered or made useless; above all, on pernicious cookery.

QUESTIONS. — Have we a new dietetic sect among us? In what consists their chief peculiarity? What is legitimate cookery? Give examples of it. Give examples of illegitimate or useless cookery. Is the cookery of milk legitimate? Why? What is said of cooked fruits?

SECT. XXVI. — WHAT IS THE BEST FOOD.

900. What the best food is, for the first months of human life — whenever and wherever that food can be obtained — we are not left to conjecture; for this, the Divine Providence has settled. But what is best for us, subsequently, is not so certain, and requires a little study, assisted by much of Mr. Locke's "good, sound, round-about sense."

901. Trained as we are, it is practically impossible that the appetites should not be perverted or fallen ones. Then, we know it is so, at least to some extent, from common observation. Most of us like certain things we ought not to like; and we know it. How far this perversion goes, few of us are aware, till we become more or less emancipated and changed.

902. Now, this doctrine of fallen appetite is particularly applicable in the case of food. Milk, as we have seen (900), is the first food of all; and all like it. And when, by the direction of judicious physicians or wise mothers, the child, at five, six, or eight months of age, passes to the use of good bread or bread crust, this kind of food is relished by all. At least, I have never known anything to the contrary.

903. Further than this, however, we cannot, in this particular matter, very well go. The child's instincts are now disregarded so generally, and so little reason is used by those who control him, that, by the time he is four or five years old, if not sooner, it is utterly impossible to know what true and unperverted instinct would require. If instinct, under better training, as some have maintained (I think, however, very erroneously), might have been an unperverted guide, she certainly is not so now. Nor is mere reason, as a guide, without science, much better.

904. It is, I am well aware, a common saying, that what is meat for one person is poison for another. Taken with some limitation of meaning, and as we now are, with all our acquired habits, both perverted and unperverted, the saying has truth in it; but, in the abstract, it would be utterly false. For, has it

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What is said of certain substances half cooked? What is said of the cookery of the egg?

Is there not such a thing as excessive cookery? Do we not, generally, cook too much? What is said of frying food? Relate the anecdote of Commodore Nicholson. What is said of toasted bread? How should seasonings be applied to our food, if applied at all? What story is told of a foreigner? What is said of the moral abuses of cookery?

not been shown (900, 902) that children at first relish, prefer, and digest well, the same things?

905. I have, indeed, seen a few men that could not relish milk or bread, though we could hardly go so far as to say they were their "poison;" but who has ever seen children that did not love new milk, and good wholesome bread? And, in truth, the number of adults that do not relish plain milk and bread is exceedingly small.

906. Were everything as it should be, mankind would, no doubt, pass from the use of milk, their first food, to that of bread and fruits. What the instinct suggested, even though it should be on the wane, would be encouraged by the increasing, usurping higher power, reason. And were it practically desirable, or even safe, to confine ourselves, all our lives long, to these two articles—plain bread and fruit—I suppose the saying above (904) would be just as true of the animals, in their natural wild state, as of man.

907. That bread, or breadstuffs, or what we call farinaceous food, is the staff of life, beyond the merest infancy, is, I suppose, undeniable. For, admitting the Bible-trio—corn, wine, and oil—to include the whole of human food, it would still be true that bread (corn) should stand at the head of the list; or, as a general rule, should occupy the middle of the table.

908. But, by corn or bread, we no more mean one particular kind of bread, to the exclusion of all others, than by wine, the juice of the grape, exclusively. As wine is the representative of the fruit juices, whether expressed into "Pharaoh's cup,"—*not fermented*,—or taken in the pulp where nature has imbedded them, so bread or corn, or bread-corn, is the representative of all the farinaceous substances in human use.

909. Thus, we may have bread, not only from Indian corn, but from wheat, rye, barley, oats, etc. Then we may have many half-breads, so to call them. Such are rice, beans, peas, chestnuts, arrow-root, sago, tapioca, etc. All these belong to the centre of the table; not perhaps at the same meal, but they are all *central articles*. They all belong to the corn or bread-corn family. They are all the staff or staple of life.

910. Then, again, each article may be prepared in so many different ways, as to add greatly to the interest of those who desire variety. Thus, Indian corn may be boiled, parched, torrefied, cracked, ground coarsely or finely, and made into loaves thicker or thinner; as well as formed into several kinds of puddings, which, in reality, are but a species of thin bread. And

all this, too, without the admixture of anything else but water. And so of nearly all the articles belonging to the corn family, or first class of human food.

911. Again, there may be mixtures* of various sorts of bread-corn, should our perverted and half-perverted palates desire it. Thus, we may make bread or plain puddings of Indian and wheat, Indian and rye; of rye and wheat; of rye, wheat, and Indian. Or, with any of these grains, we may mix boiled chestnuts, potatoes, or rice. All these belong to our first class, or middle-of-the-table division; and they may be made in such ever-varying proportions as to seem like so many new dishes.

912. From what has been said in former parts of this work (537--542), it is obvious that these various forms of what I have called bread, are of various excellence, according to their firmness or adaptedness to easy mastication, and according to their natural or unnatural re-union into such shape as is suited well to human mastication.

913. For bread, in order to be perfect, should be practically the re-union of the ground or broken parts of farinaceous substances, with a single addition, that of combining water with it and forming it into masses larger than the original kernels. And the more these larger masses, whether we call them cakes or loaves, can be made to approximate, in consistency or firmness of texture to the original grain, and also the less the change of properties, the better their adaptation to the laws of health, and the more legitimate the cookery.

914. This is said, I repeat, on the presumption that they who use it are healthy, or have tolerably sound teeth; for I have admitted elsewhere (885) that, if there is disease, whether of the teeth or of any other part, the medical adviser may, at his discretion, allow the attraction of cohesion in the mass to be diminished somewhat from its original or normal condition.

915. Fruits or fruit juices, of which the word wine is here made the representative, form our second class of food; and, to carry out the original idea (907), should form a concentric circle on the table, enclosing the bread. Observe, however, that in all this, I refer to adults, and not to little children. Fruits and milk seem incompatible with each other; and

* If it should be said that I object elsewhere to mixtures or made dishes, I reply that the mixture of farina with flour is not a made dish, properly speaking.

children who use milk should have little to do with fruit. The fruit-juices — the wine, as I have called it — are the milk of adults.

916. These — the fruits — may grace our tables just as they came from the hand of the Great Preparer, or may undergo rational processes of cookery. I do not say that many of them can legitimately be cooked; but a few of them can. The quince, several kinds of pears, and perhaps the sweet apple, and a few others, may be improved by baking. But we are to have a section of this chapter exclusively on the use of fruits.

917. One class of food, if indeed it deserves the name of a class, is hardly included in the foregoing division and arrangement of alimentary substances — I mean the bulbous roots. These, except the potato, which would seem to belong to the farinaceous, are less valuable than farinaceous food; nevertheless a few of them deserve our attention. These are the turnip, carrot, beet, parsnip, and radish.

918. The most valuable of these is the turnip, though the beet has usually been preferred, especially by the young. The beet and carrot certainly contain more nutritious matter than the turnip; but then they are not so easy of digestion. The turnip, if properly cooked, is exceedingly easy of solution, and probably so of digestion. Bread, in England, has even been made of it.

919. Most of the esculent roots are best when roasted in hot ashes. But, as this method of cookery, in the age of stoves, is not very convenient, baking and boiling are usually preferred. Baking divests them of a large portion of their water, as it does the fruits, which is an advantage not to be overlooked. Like roasting, it renders them more digestible, as well as more agreeable.

920. The nuts, except the chestnut and hazel-nut, may be regarded as belonging to the oily class of productions. They are, however, exceedingly hard of digestion, to such stomachs as most of those we meet with in civic life. In a normal state of the stomach, there is reason to believe they would be digestible and healthy. In order to be nourishing, they must, of course, be finely and thoroughly masticated.

921. This class of substances — the oily — is last in order, and last in point of importance. It is not, however, to be lightly passed over, especially as so large a portion of our population still cling to it. The nuts, as we have seen, will

do for strong stomachs. Others may need milk, or the products of milk. If flesh is used at all, it should be used chiefly for the sake of its oil.

922. We are not obliged, however, to resort to nuts on the one hand, or to flesh on the other, in order to procure oil. Nearly all the farinaceous articles, with some of the fruits, contain such quantities of it as is best for human health, in all parts of the world, except, perhaps, in the frozen regions of the extreme north and south; and probably there, also, if it could be obtained readily, and in a good state of preservation.

923. Thus, each contains, according to its different varieties, from four to nine per cent of oil; oatmeal two per cent; and rice a very little. Plums are said to contain thirty-three per cent, and grapes, and most other fruit, a small portion. The olive contains from thirty to forty per cent.

924. To those who doubt whether these substances furnish oil enough for all the purposes of health, it is sufficient to say that the inhabitants of the Ticin, according to the testimony of travellers, live almost wholly on food from Indian corn, and yet are among the most robust of our race. Their laborers in that region are even preferred, on public roads and elsewhere, to the athletic Swiss, their neighbors.

925. Nor do the armies of South America, when, during a forced march of 600 miles, they have lived exclusively on parched corn, suffer any inconvenience for want of sufficent oil in their food. And those who are familiar with the early history of New England, know very well what large use the savages of the country made of what they called their *nokake*.

926. The wild men of Borneo, as they are called — though I know not what they really are — which have, for some time, been traversing this country by way of public exhibition, never, till within a year or two, have used any kind of oily food, except what is obtainable from fruits and farinaceous substances. Yet, beyond the possibility of a doubt, though weighing less than fifty pounds each, their strength greatly exceeds that of any grown man to be found among us.

927. But I need not go further. We have before us, at least in imagination, a well furnished table. We have an extensive variety of farinaceous articles and fruits, with several agreeable and not hurtful roots; and, for those who can bear them, a variety of nuts. Then, for those who *require* them, there remain to be added to the list of the oily sub-

stances, the various kinds of flesh, fish, and fowl, which have, by common usage, been so long sanctioned.

928. Then, too, there are the animal products; of which the most important and most healthy, except milk, is eggs. They are almost one-third oil. Fresh butter and new cheese are also tolerable food, and abound in oil, of course. Old or salted butter and old cheese, as we have seen, are irritating, if not poisonous.

SECTION XXVII. — ON FRUITS AS FOOD.

929. So far as I am acquainted, it has been customary among us, until within a few years, to eat fruit of most kinds at all times and hours of the day, whenever the appetite, however capricious, seemed to dictate. Seldom, if ever, till quite recently, has it been eaten as a part of our meals, like the soup, the fish, or the potato. When used at the table, it has been as an adjunct, and not as a principal dish; or, at most, as a dessert. Thus, baked sweet apples, or berries, with milk, or raisins, apples, grapes, oranges, figs, or the like, have been used as a dessert, time immemorial.

930. But, within a few years, the custom of having fruit at the table, from the first of our sitting down, and of regarding it as a principal dish, has been gaining ground very fast. It began with the rich; but has been followed, to a greater or less ex-

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QUESTIONS. — Can there be any doubt what is the best food for infancy? Are our appetites — that for food not excepted — perverted or fallen ones? What is said of milk and bread as an illustration? Beyond the merest infancy, do we know what instinct would demand? How far can instinct be relied on?

How far is it true that one man's meat is another's poison? Is bread, after infancy, or is it not, the staff or staple of life? What is said of the trio, corn, wine, and oil? What great class of alimentary substances does corn here represent? What are some of the farinacea? What is meant by wine? Does this include fermented wine? What is said of nuts? What of the other oily substances? What is the true physiological idea of good bread? Are fruit-juices and milk compatible in their action? Should the fruits ever be cooked? What is said of the bulbous roots? What of the turnip in particular? What are the best modes of cooking the esculent roots? What is said of the nuts as food? What is said of other oily substances? What of flesh, fish, and fowl? Are we compelled to the use of these, in order to obtain oil enough for the system? What proportion of oil do some vegetables and fruits contain? What is said of the armies of the south, in some of their forced marches? What is said of the wild men of Borneo? What makes up a well-set physiological table? What is said of the animal products?

tent, by other classes. It is hoped and believed that what is so well begun will in a few years be perfected.

931. Should the potato continue diseased, I am not without the hope that the apple may be its substitute. It differs, of course, in its properties, from that excellent and long-tried friend; and yet, on the whole, would probably be almost as valuable. And, by proper management, it could be had, at all times of the year, in nearly as good condition as the potato.

932. It will doubtless take some time so to fasten upon the public mind the idea that fruits are food, as to give to the apple a standing and character among us, similar to that which the potato now sustains. For there will not then, at first, be any place for our acrid condiments, — our mustard, pepper, saleratus, etc., — or even our sugar and salt. Habit, as you know, is exceedingly powerful.

933. Sugar, milk, molasses — and perhaps certain sauces — we might indeed soon learn to relish on our fruits; for some advance in this department has been made already. But, to learn to relish apples, or strawberries, or peaches, when well besprinkled with mustard or cayenne, or well permeated with gravies, or even well showered with salt, will be a work of slower progress. And yet, in the nature of things — apart from custom or fashion — I know of no reason why mustard or pepper are not as well adapted to an apple, baked or raw, or to strawberries or cherries, as to a potato.

934. We have a few among us who say, men can live — nay, even live and labor hard — in the exclusive use of fruits. I have known those who did this for a few years, and yet all went on well with them. But I have never known the experiment tried sufficiently long to be satisfactory. Such an experiment, to be decisive, would require more than one individual, and a longer time than merely a few years.

935. Some have endeavored to show that the word which, in the Scriptures, is translated bread, as used in a general sense, might as well mean fruits as farinaceous articles. This certainly may be the Scripture meaning occasionally; but I think it must be but rarely, after all. When the Saviour and Paul so often *broke bread, can any one believe* they had nothing before them but fruit?

936. But, to repeat the idea, fruits, though second to bread in point of importance, are yet second to bread only. Bread and fruits, in the larger sense of the term, such as I have used,

contain all the essentials of a correct human diet; whether it be for combustion in the lungs, as the chemists call it, or for nutrition — whether for blood, flesh, brain, or bones. Other things may indeed be added, by way of indulgence or gratification; but these, when they can be had in perfection and abundance, are most undoubtedly all that are indispensably necessary.

937. There are abuses, with regard to fruits, which deserve consideration. For, while I recommend fruit as an indispensable part of our table fare, daily, I do not recommend its indiscriminate or illimitable use. There are times and seasons and circumstances, to which it is less applicable than to others. There are also cases to be found where it is wholly inapplicable.

938. Thus, as I have more than once said, fruits are not at all adapted to the wants of young children, especially nursing children. They are not very good for them, in fact, as long as they use milk, whether it be in one way or another. These juices of fruits are believed to be intended as a substitute for milk (915), never as an accompaniment.

939. Fruits are not so good in the evening as in the early part of the day. We have an old adage, that "Fruit is gold in the morning, silver at noon, and lead at night." In any event, it is best in the early part of the day. If the first meal is not received till ten or eleven o'clock, that is the best time for fruit; but, if the custom of taking a very early breakfast is to be continued, my advice is to use the fruit at the second meal, or dinner.

940. Those fruits are generally best for health, which, when perfectly ripe, dissolve most readily and completely in the mouth. Those which have thick skins, or large seeds, or hard insoluble masses in the centre, should be eaten with great care; and their doubtful parts rejected. Fruits with stringy pulps are not so good as those whose pulps are more friable and tender.

941. Fruit, to be useful as food, should be perfect. It should be neither unripe, nor in a state of decay. It should be adapted to the other articles which are conjoined with it, to the temperament and habits of the individual, and to the season of the year in which it is used.

942. Fruits, of many kinds, are in perfection but a very short time. The purple mulberry, for example, is in perfection but a few minutes. The strawberry and raspberry are in

perfection a little longer, but not long. The cherry is in perfection several hours; but we can hardly say *days*, even of this. The blackberry is short lived, but the whortleberry and bilberry last longer. The melon is not long lived, but will remain in perfection several days. The currant is in perfection a little longer still, and so the peach and plum. But the apple and pear are very long lived; and some of these retain their excellence nearly all winter.

943. We see, hence, how difficult it must be for the poor, and for those who, from any cause whatever, rely wholly on an ordinary market for their fruits, to procure them in the best and most healthy condition. In general, they are carried to the market, by design, a little green; for how else could they be kept till a sale could be effected? Hence, in fact, we seldom have any perfect fruits of the more evanescent kinds in our markets. Every one knows that the orange, lemon, banana, and other foreign fruits, are plucked before they ripen; but it is little better with the fruits which are raised and marketed among us.

944. We may also hence see how important it is for those who wish to have strawberries, cherries, raspberries, blackberries, etc., in perfection, that they should raise them for themselves. Nor is it so difficult as many suppose. Whatever may be their varied occupations, most men and women have leisure enough for this purpose. Females, even, would not be so much taxed by being compelled to raise fruits for their families as they now are by being compelled to spend days and nights in suffering from feeble health, and from the various forms of disease!

945. There is, therefore, neither room nor occasion for discouragement. Most of us have — I repeat — time enough for raising all the fruit our families need, and in full perfection. But we must not hesitate, even if discouragements arise. We are not at liberty to reject fruits, beyond the merest threshold of infancy. Divine Providence has pointed to their use as a part of our diet, and in a way which the most obtuse among us ought to understand.

946. I refer here to the wise adaptation of particular food to particular seasons. Thus, the strawberry would not be so well adapted to the great heats of summer, when strong acids and much liquid are needed to counteract the tendency of the system to morbid thirst and incipient putrescency, as the currant, and the melon, and the cucumber. But these last would

be equally unadapted to the wants of the system, or the demands of the season, in the month of June.

947. Then, too, the apple and pear, which last almost all winter, some kinds of which are hardly ripe when winter arrives, and in fact would seem to be undergoing a ripening process nearly all winter, would be very poor things in the early part of summer, and even in June or July. Do not these considerations show, as plainly as words could do it, what the indications of Providence are, in this matter? I could as well resist the belief that two and two make four, as that these fruits are intended for our use.

948. Taken properly, and in the order I have mentioned, — that is, when they are ripe, — they have a tendency to prevent disease. I know that a different opinion has in times past prevailed. But, if fruits ever cause disease, it is when they are imperfect or improperly used; for, if rightly used, they are better as preventives than a whole world of medicinal agents.

949. It is a matter of much more doubt whether fruits which are preserved by removing air from them, or reducing greatly their temperature — according to the suggestions of Dr. Ross and others — are preventive of disease; for the object, in this case, is not to use them *in* their season, but *out* of it. The fact that when thus used they do not make us sick immediately, is far enough from being positive proof that they do not slowly injure us, or at least that they do us good.

950. Some regard must always be had to the temperament and habits of an individual. Thus, the man of bilious temperament and dyspeptic habits must avoid eating too freely of the sweet fruits; for, owing to his debilitated digestive system, they will be apt either to irritate, or to run into acidity. Currants, and other sour but agreeable fruits, will suit his stomach, surprising as it may seem, better than sweet ones. So, too, of the extremely nervous person.

951. I have repeatedly said that milk and fruits do not, as a general rule, go well together. So it is with many other things. Bread, especially bread crust, is best with fruits. Rice, however, is by no means unfriendly to a union with them. The drier, harder, firmer fruits may go well with potatoes, and with peas and beans; but with the very juicy fruits they would not harmonize.

952. Of the use of unripe fruits it remains for me to add a few words. Not that there is much danger to adults from unripe fruits, as they seldom eat them uncooked; though children

sometimes — indeed very frequently — abuse themselves in this way. They are unwilling to wait for them to ripen. A cherry that is beginning to turn red, they regard as ripe; and forthwith they compete with the birds for the prize.

953. But my remarks on this point should be directed chiefly to green or unripe fruit, when cooked. Currants, gooseberries, and apples, plucked ere they are half ripe, and stewed, or made into pies, are exceedingly common. Many think that cooking, with the addition of sugar and other seasonings, removes their bad qualities and renders them healthy.

954. Now, I do not hesitate to say that much more sickness is caused by these unripe fruits after they are cooked than before. In their crude state, uncooked, comparatively few would be eaten. Then, again, cooking only makes unripe fruit soluble, and the addition of condiments renders it agreeable, and tempts us to eat freely of it.

955. But the cooked fruits contain all the noxious ingredients that the raw ones do. The sun, in the process of ripening, may change them to healthy ingredients, but cooking does not and cannot do it. All is included that was included before they were cooked; and to this we have added the mawkish, concentrated, or sickly condiments besides. In this way a world of unripe fruit, so to say, is eaten; and a world of disease and premature death is the consequence.

Questions. — What was the most frequent use of fruit in former times? Is it becoming more common to bring it to the table? How is it used at the table? Is that the true method of using fruit? What fruit is almost fit to be a substitute for the potato? What popular objection will be found to its use? Could we not learn in time to use all sorts of seasonings on the apple, as well as on the potato?

Have some people subsisted, for a time, entirely on fruits? Is such a diet probably the best? Are they the best food next to bread? Should fruits be used indiscriminately, and without any limit? Are they adapted to the wants of very young children? May the fruit juices be called the milk of age? Are fruits as good in the evening as in the morning? What old adage prevails on this subject? Are those fruits the best in general, which are most soluble? Is it indispensable that fruits should be perfect? Are many of the summer fruits in perfection but a very short time? Is it not extremely difficult to procure perfect fruit without raising it for ourselves? Have we time for this?

Does the Divine Hand seem to point to the use of fruit as a part of our meals? What proof have we of this? Do fruits used in this way prevent disease? Has a contrary opinion formerly prevailed? What is said of their use, out of the appropriate season? In their use, must due regard be had to the habits and temperament of an individual? What are the best accompaniments of fruit at table? Are children extremely fond of unripe fruits? Which are worst for health, the cooked unripe fruits, or those which are uncooked? What reason can be given for this?

SECTION XXVIII. — COOKERY AS IT SHOULD BE.

956. Most of the little talent woman possesses at invention, so far as the culinary art is concerned, is manifested in taking very indifferent or insipid articles, and making them not only palatable, but positively agreeable. The great question, with her, is not whether she can make changes, by her art, favorable to health, or even to Christian economy; but rather whether she can render them more agreeable to our fallen standard of taste. She does not inquire whether God will be pleased with the changes she makes, but whether man will be.

957. Thus, suppose green apples, currants, etc., to be in the garden at the same time with ripe ones, and both in the greatest abundance, so as to render it entirely optional with the housekeeper which she uses. We will still further suppose them equally accessible. Which will she prefer to place upon the table for her guests, — the cooked green fruits, or the uncooked ripe ones? Except in the case of a very few, who have of late dared to oppose the fashions, can there be a doubt?

958. In the one instance, woman would have no opportunity to evince her skill, or secure either approbation or admiration. The food prepared by Heaven's own culinary processes, so to call them, would be simply eaten without note or comment. But making sour, bitter, or insipid green articles into sauces, pies, tarts, puddings, etc., by various and tedious admixture and combination, may perhaps gain her a little reputation.

959. Now, few housekeepers will do this in ignorance of the general fact that green fruits are unhealthy. And yet, unaddicted to reflection on this subject, and to have any higher standard of action than a regard to the good opinion of their fellow creatures, they seem to flatter themselves that they can actually improve the condition of the substances they take in hand. They improve a little, they would seem to think, upon the handiwork of the Creator.

960. But it is not so; and it is high time they should know it. They make them worse rather than better. They are, we know, more palatable. They pass the mouth and throat very quietly, to perform their work of destruction in the stomach and intestines. Woman, during all this, professes Christianity, perhaps, — which requires us to do all things to the glory of God, preparing food as well as anything else. This she has not done; she has glorified herself!

961. Who is not aware that thousands of bushels of green

fruit, of various kinds, are swallowed in New York and Boston, every day, at certain seasons of the year; not merely by the poor and necessitous, who can hardly afford to buy that which is better, but by the comfortable, and even the opulent? Yet some of these fruits contain the deadly prussic acid, in small quantity: whether cooked or uncooked, makes little difference.

962. Another case is that of the potato. Thousands of families will turn away from the use of the boiled or baked perfect potato, to eat a miserably poor, unripe, watery thing, in the shape of the genuine article; when they know, or might know, that it is as unfit for the stomach as a mass of common putty. Why do they make the exchange? First, because they must have something *new*. Secondly, because the seasonings of the imperfect article delight them more than the natural excellences of the perfect one. How long shall cookery, by Christians, be prostituted to such unworthy and unhallowed purposes?

963. The true preparation of food, on Christian principles, would neither require nor permit a waste of valuable time on things in themselves indifferent, even though it should effect a slight improvement in their condition; nor an expenditure of time in attempting to alter or amend such things as God has already perfected. It would allow us to take the good things of God, and, if possible to do so cheaply, improve them. Art should adorn nature,—it should never be a substitute for it.

964. Thus, we may lawfully take wheat, corn, rice, apples, and other simple articles of food, and, by healthful processes of preparation, try to make them better. Then we may combine things which are not greatly dissimilar, such as rice and wheat, rye and wheat, potatoes and arrow-root, etc. These combinations of farina with farina would not be as objectionable in themselves as the combination or union of opposites (911).

965. One danger to which we are liable, in making up our mixtures of various sorts of food which are unlike each other, is that of bringing into play new chemical affinities, whose results may, for anything most housekeepers can know, be virulent poison. Such things as this have happened a thousand times, and have resulted, many a time, in the loss of health and life.

966. But, above all the rest, cookery, except on Christian and scientific principles, is a wicked waste of time. For example, a housekeeper, or dairy-woman, in changing milk into

cheese, requires equal to three months of valuable time to make *three thousand pounds of cheese.* Now, the latter, when made, is neither so agreeable to a correct taste, nor so digestible, as the former; nor is there, in the aggregate, so much nutriment.

967. These three months, expended to no valuable purpose, by woman, who was destined, not to make cheese, but to be an angel of mercy, are they not worse than wasted? How much might a female as intent on doing good—instructing the ignorant, feeding the hungry, clothing the naked, or visiting the prisoner—as John Howard or Elizabeth Fry was, perform in three months? How many bodies might she, perhaps, save; and, perchance, how many souls?

968. It can be demonstrated, beyond doubt, that an active woman, who is fully imbued with the spirit of Christian cookery, is perfectly competent to prepare food for two hundred or two hundred and fifty individuals, such as usually make up our families. Whereas, now, the energy spent in cooking for two hundred and fifty persons is equal to the whole time of from six to ten efficient laborers. These things ought not so to be. They will not be so always. A better day is coming, or Scripture and science are mere humbuggery.

SECTION XXIX.—GOOD APPETITES.

969. Many among us seem to regard the human appetites as essentially and truly sinful, even when not dishonored by abuse or excess. This is, at least, their *theory*—how well their practices correspond with their theory is quite another question. Hence their aim, professedly, all their lives long, is to eradicate or annihilate them. Most happily for humanity, they are unsuccessful.

QUESTIONS.—How do housekeepers generally apply their inventive talent? Will you give an example? Are our cooks utterly ignorant of the laws of health? Why, then, do they not cook according to their best knowledge of what these laws require? Why do Christian women seek to glorify themselves rather than God? What may be seen, to illustrate our errors on this subject, by looking into the city of New York? What is said of potato cooking, to illustrate human folly? What is it said true Christian cookery would require? Present a few examples illustrative of this principle. To what danger does our habit of mixing up things in the processes of cookery particularly expose us? Does our modern system of cookery—if system it may be called—involve a wicked waste of time? What is said of cheese-making, by way of example? For how many people, old and young, on an average, might one efficient woman prepare suitable food? Ought these things so to be?

970. For our appetites, though perverted, are still appetites, and God intended they should be so. They were designed for our happiness; nay, for our moral elevation. They are like the beetle or mall that impels forward; except that, as they are without intelligence, they need the direction of a higher power —the head. They are not, indeed, the lever by which we are to be raised heavenward, but the fulcrum on which it must rest.

971. The grand point to be secured with regard to our appetites, after having found out the Divine intention respecting them, is to keep them in the precise shape which Providence designed. This being done, they minister to our happiness, individually and as a race; both here and hereafter. Used as a fulcrum for the great lever of Christianity, they are a means of lifting us toward the Eden whence we came.

972. It has already been shown (657, 658, 704–707) that we should never lose our appetites; or, in other words, should never eat enough. The truth is, we should never — if we wish to be efficient or useful — be without good appetites for a single moment of our lives. By night or by day, at home or abroad, at the end of a meal, no less — or, at least, little less — than at the beginning, every living being who is in health should have a good appetite.

973. More than even this may be said. Every truly healthy person *has* this at every moment of his life. Did his head — the higher power — so will it, he would gladly sit down and partake of a hearty meal of any plain thing fit for the stomach which could be named, and enjoy it.

974. It is indeed true, that he who is impelled by his bodily propensities may be powerful to do evil as well as good; but thus, He who made us to be free agents no doubt intended it should be. He made us to take the kingdom of heaven by "violence;" but he also left us capable of descending to the lowest hell, if so we determine. "Heaven but persuades," says an old English poet, "almighty man decrees." But man's almightiness — his efficiency for good or for evil — depends, in no stinted degree, on his appetites. Take these away, and you make him as inefficient at the court of a heavenly monarch, as he would be at that of an earthly or diabolical one.

975. Would we elevate man to his truly normal state, we must arm him with mighty appetites; but we must, at the same time, give him the disposition and self-control which will secure their right direction. "Always drink before you are dry, and you will never be dry," said the half idiot (658). The secret

of so eating and drinking as never to be truly hungry or thirsty, was well known in practice, long before any fool in Athens or America divulged it.

976. We rise in the morning, refreshed by sleep, and ready, with the addition of a little brisk exercise of body and mind, for almost any efforts not superhuman. But, before we have accomplished much, perhaps anything at all, while the system is still well replenished with good blood and nervous and cerebral energy, and with everything, in short, which is needful, we proceed to load the stomach. It is empty; and though, as yet it asks for nothing, unless from bad habit, it will receive a reasonable amount, and make the best disposition of it possible.

977. Being just raised from the death of sleep, and tenacious of life, we go on very well with our load till noon. But our stomachs are then hardly unloaded, and at all events there is no real hunger. Yet the presence of tasteful viands in rich profusion, made to tempt us, excites the imagination no less than gratifies the eye, and we partake. But, I repeat, we eat before we are hungry.

978. The evening meal finds us with only half an appetite, as the dinner did. But we eat again, either with or without provocatives, and often of the most indigestible food in which we are accustomed to indulge — the pie, the cake, the cheese, the sauces, the preserves, and the tea. Then we retire to our beds to sleep, if we can, — at least to dream, — to rise the next day and pursue the same beaten round, only with greater loss of appetite than before.

979. Is it, then, an exaggeration to say that we never have good appetites; or that such a thing as a good appetite is hardly known? From the cradle to the grave — from birth to death — as a general rule, to which I know there may be a few exceptions, we eat before we are really and truly hungry; and thousands and millions pass through the world without once enjoying a truly normal appetite.

980. How sad would be the condition of a world without appetites! How enfeebled, and even crippled, would men be — what triple eunuchs — without the motive to strong effort which these are designed to afford! It would, indeed, be something above the pit which is bottomless; but it would not be a world of happiness.

981. How much below what it might be, then, is a world in which, by the constant anticipation of every want, the bodily powers are debilitated — where none are what they might be,

and where few are even in tolerable strength and energy! Yet such a world as this is the one in which we live. Not, indeed, as it came from the hands of Him who saw it to be good, very good; but as it comes from the hands of perverted, fallen man.

982. One reflection here, both compensatory and consolatory. To what sublime heights, in intellect and pious worth, may men arrive, when all shall not only hunger and thirst after righteousness, but after everything else subordinate to this, after which God *intended* they should hunger! If a few greater and lesser lights are pleasant to behold, how much more glorious the sight when the whole moral firmament shall be studded, as it one day will be and must be, with suns and stars of the first magnitude!

983. How great the mistake of those who, in order to rouse an appetite at once, actually enfeeble it. He who has lost his appetite should not attempt to call it up by excitants. For, should he partially succeed, it would be but to sink him still lower in the slough of inertiæ than before. The way to have a good appetite for food is never to lose it.* And the way to gain it, when lost, is to suffer the machinery of digestion to rest till it arrives.

984. They who will follow out the suggestions of this section, will do much to preserve their physical integrity; but they who obey all the laws of health will do still more. However, it is they who obey all law, moral and physical, and who follow an ancestry that never disobeyed, who alone can expect appetites which are perfect.

QUESTIONS.—Are the human appetites essentially sinful? Is it not, then, in vain to attempt to annihilate them? Are our appetites blind guides? To what may they be compared? By what is the mall or beetle to be directed? Does our duty lie, so far as the appetites are concerned, in giving them the right direction? Should we ever lose our appetites? Do not the appetites, in giving us force, render us powerful for evil as well as for good? Must the human appetites be strengthened rather than weakened, in order to secure the greatest height of moral elevation?

What is said to be the ordinary routine of eating and drinking for the day? Is a normal or natural appetite rarely known among us? What would be the aspect of a world without appetites? Must we return to good appetites? How shall he who has lost his appetite contrive to regain it? Is it desirable to obey all law? In whom alone can we expect to find perfect appetites?

* The late Amos Lawrence said, "Begin to eat *hungry*, and leave off *hungrier*."

SECTION XXX. — THIRST AND DRINKS.

935. Thirst may be natural, or it may be morbid, that is, diseased. In the present state of things and of the dietetic art, it is for the most part morbid. Natural thirst, like natural appetite for food, is believed to have died out long ago. But what *are* natural and morbid thirst, respectively? Let us attend to the distinction.

986. When the blood is in a healthy condition, it is, as you are already aware, chiefly water, or serum. In the whole three gallons of it that circulate in the heart, arteries, and veins of an adult person, and that dash through the heart every three or four minutes, or much oftener, may be found more than two gallons and a half, or ten quarts, of water.

987. Where do we get this liquid? It does not *grow* in our bodies, most certainly. It is *manufactured* there. The water and the other ingredients of which it is composed, unite together in some way, and form the blood. But how, I say again, does the system obtain this water?

988. It comes to us, at first, partly through our food. He who eats properly very soon receives water enough, through this medium, to dilute (or form the serum of) three gallons or more of blood. It takes, at the longest, but a very few days. But then the blood is wasting every day. The solid parts of it —the fibrine—go to build up or renew the fabric or house the soul lives in; while the watery parts, at the rate of from two or three to six pints a day, pass off through the skin or lungs.

989. It is quite obvious that, if the blood is used up so rapidly, some provision must be made for replacing both its solid and more watery parts. Our food indeed continues to furnish it as before; but sometimes the supply falls a little short, and a sensation is then felt in the mouth and throat, which we call *thirst*. Did we obey all the physiological laws, we should drink then, and at no other time.

990. But we do not thus obey. As we shall see (1574, 1583) we continue to get many hot and irritating things into our blood-vessels. In truth, they go all over us, and produce heat and dryness, and a sensation like thirst. Indeed, we *call* it thirst. But it is morbid or diseased thirst. It is a desire for drink, when the blood really needs no recruiting. It is a desire for something to cool the blood, when it ought not to have been heated.

991. Then we have morbid thirst, too, from another source. We have learned to drink in early life, most of us, for the mere

pleasure of drinking. Our friends allowed us to taste certain liquids which were agreeable to us, *because* they were agreeable. And, by the laws of association, whenever now we see or think of such liquids, we want them. This, too, we call thirst. It is so; but, like the former, it is morbid thirst.

992. But this morbid thirst is not to be despised. When the house we live in is on fire—whatever the cause may have been—shall not the fire be extinguished? And what method is better adapted to this end than to throw on water? Surely we would not hope to extinguish fire, in one place or another, —certainly not in the house we live in,—by throwing on rum, brandy, gin, wine, or cider!

993. Whether our thirst is natural or morbid, it should be removed. And, as in the case of morbid thirst, so in that of natural, the proper drink is water. It is water which has been taken away from the blood, in perspiration and in other ways; and it is this, and no factitious or mixed liquid, that must supply its place.

994. In fact, no other drink *can* supply its place. When natural thirst exists, and we swallow wine, cider, beer, tea, coffee, etc., it is the water alone which these articles contain which is absorbed into the blood, and which quenches our thirst. The other ingredients, in the varied proportions of from one to twenty-five per cent, do not aid the work, but rather impede it. It is, I say, the seventy-five to ninety-nine per cent of water contained in these liquids that quenches our thirst.

995. On this principle, as a foundation, we rest the cause of modern temperance. Water is not only the best drink God has made, at least for this world, but the only drink. Whatever mixtures we may swallow, and whether the thirst is natural or diseased, it is the water alone that can *quench* thirst. And hence, as the legitimate object of all drinking is to extinguish thirst, we should forever, if possible, exclude all drinks from our interior, but this pure, native element.

996. We may indeed err in the use of water—*nature's best and only*. We often *do* err. When we use it very *cold*, and in large quantities, and *rapidly*, we abstract too much heat from the stomach, and in many instances *produce* thirst; so that the very gratification we receive, by inflaming the lining membrane of the alimentary canal, kindles anew the fire as fast as it is put out. We should drink slowly, and our water should not be very cold.

997. Men have died, almost instantly, from this use of cold water, while highly heated. It has sometimes been said, they died of *sun-stroke;* but this last seldom makes its attacks, in this climate, unaided by other abuses or indulgences. If the men who are said to die in our cities of sun-stroke had always obeyed the laws of health, not only in eating and drinking, but in everything else, more than one-half of them would, at this moment, have been alive and well, despite of any such thing as sun-stroke.

SECTION XXXI. — ARTIFICIAL DRINKS.

998. By artificial drinks, I mean water and something else superadded. In the preceding section, I have shown what the general objection to their use is; but a few more suggestions, whose object is chiefly to show how and why it is that mixtures are incompatible with health, seem desirable, if not indispensable.

999. Distilled liquors, by which are meant rum, brandy, gin, etc., are mixed liquors; but they contain so much of alcohol (about one-half) that, I suppose, no thinking person will believe them to be useful in quenching thirst, whether natural or morbid. They doubtless increase it.

1000. Fermented drinks, from which, by distillation, rum, brandy, gin, etc., are procured, may and do, for the time, extinguish thirst; though they increase it in the end. Wine is of various strength, containing from eight to twenty-five per cent of alcohol. The rest is chiefly mucilage and water, with a little acid, especially the tartaric. But I speak here of *pure* wines; for much of the wine of the market is manufactured from drugs, vinegar, cider, and other cheap liquids.

1001. It has been maintained that there is one thing in some of our mixtures, besides water, which has the power to quench thirst, viz: the acids above mentioned. But these acids, in a

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QUESTIONS. — How many kinds of thirst are there? Is most of our thirst, in these days, morbid? Is there a large amount of water in the blood? How do we obtain this water? Does it remain in the blood unchanged, or is it used up and renewed again? How is the waste of water supplied? How, then, does natural thirst originate? And what is its object? What is morbid thirst? How is it best removed? Is natural thirst best removed in the same way? Is thirst extinguishable in any other way except by water? Is there, then, any real drink but water? On what is founded the true doctrine of temperance? May not cold water sometimes injure us? How may this happen? What is said of the disease called sun-stroke?

concentrated or pure state, would be too caustic or too acrid to remove thirst. They would be much more likely to increase it. Diluted with water, they allay thirst, as I have admitted; but, in this case, is it the acid or the water that accomplishes the work?

1002. Cider is chiefly water, mucilage, and acid. Its natural proportion of alcohol can hardly exceed six or seven per cent. Ale has also more than ninety per cent of water. Porter is of similar strength. Bottled beer, as it comes from the fermenting vat, has only two or three per cent of alcohol; to which a factitious strength is sometimes annexed, by the use of drugs or an extra quantity of alcohol. Home-brewed beer has one to one and a half per cent of alcohol — the remainder is chiefly water.

1003. Bottled beer, as often prepared in this country, deserves a passing notice. A near friend of mine, who manufactures this article, came to me, once, with the inquiry how much alcohol ought to be superadded to a barrel of beer, to give it the proper character! — I had heard of these extra additions before; but my doubts whether the reports were correct or not were now removed.

1004. There are mixtures which have obtained particular names, slightly differing from the above, and are yet, in essence, about the same thing. Such are mead and metheglin, in our own country; and arrack, in foreign countries. There are also spruce beer, ginger beer, etc.

1005. Soda water contains no alcohol. It is an effervescing article, not a fermenting one. What makes it boil and sparkle is the carbonic acid gas which is set free in its preparation. It is slightly alkaline; but only slightly so. It quenches thirst, for the time; but sometimes increases it in the end. So that even in this case it is the water that answers the purpose of a drink, and the water only.

1006. Lemonade, so much used in hot weather, I hardly need to describe. If not too much sweetened, its ninety-nine per cent of water will quench thirst for a time; but, how much of this effect is owing to the water, and how little to the acid, no one, I believe, knows. Methuselah did not probably have access to it.

1007. Coffee is a drink prepared from a roasted foreign berry. I suppose ninety-nine hundredths of this mixture, in its strongest form, are water; but, along with the rest, is a substance, in small quantity, that has narcotic or medicinal

properties. It is also said, by some, to contain a little nutriment; but this, except in the case of additions of milk or sugar, is doubtful. Coffee made of bread, corn, rye, &c., I need not describe.

1008. Tea is of various kinds; but is generally spoken of under two heads — the black and the green. The green is narcotic; of the black there are various opinions, but probably that, too, is slightly so. Some teas are not only narcotic, but poisonous in another way. The Chinese dry them on copper sheets, by which means a foreign poison is introduced. Both tea and coffee, moreover, when they quench thirst, do so in virtue of their ninety-nine per cent of water.

1009. All these mixed drinks are unhealthy, if we except lemonade and coffee made from bread and other simple or farinaceous substances. They would be unhealthy used alone, but they are still worse with food. Even those which are made from bread, etc., are inferior to water. For the healthy, they are all what might be called *second best;* and by what right can such drinks be used, in a Christian land, when better ones can be had just as well?

SECTION XXXII. — DRINKING WITH MEALS.

1010. This subject has been adverted to, in the preceding pages, more than once; but I must invite attention to it again, in some of its essential features. The principal argument hitherto adduced against drinking between meals, is, that we thus substitute an inferior drink for nature's own.

1011. But another strong objection to the practice in question is, that it dilutes the gastric juice, so as to deprive it of what might be called its intensity. The laws of the human system furnish this liquid in just the degree of consistency

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QUESTIONS. — What is meant by artificial drinks? What is said of distilled liquors generally? Do they ever quench thirst? What is said of fermented drinks? Do not acids aid in removing thirst? What reasons are there for this belief? What is said, particularly, of wine? Are cider, ale, porter, and beer, fermented drinks? What is said, in particular of bottled beer? Are mead, metheglin, and arrack, fermented drinks? Is soda water a fermented drink? What do you say of lemonade? What of coffee? Is every form of coffee narcotic or poisonous? What do you say of tea? Which is worst, green or black tea? What is done by the Chinese to their tea which renders it liable to be doubly injurious? Are all the mixed drinks I have mentioned unhealthy? Are they not all *second best?* And, by what right, as Christian people, can we use the *second* best, when *first* best can be had as easily?

which is best adapted to good and perfect chymification; but when diluted with any other drink, even water, must it not necessarily fail to accomplish its intended purpose?

1012. For, suppose a person has swallowed with his food half a pint of water. What, now, is to be done? Can the work of chymification proceed forthwith? Here the observations of Dr. Beaumont may aid us. He found that the extraneous fluid must be absorbed in the first place; after which, but not before, the work of chymification could go on.

1013. I may, perhaps, be asked, what is the disadvantage of a little delay? There is at least *one* disadvantage, which is, that the vital energies which the stomach receives from the brain — of which I shall shortly have occasion to say more — are thus expended, in part, on the work of absorbing the extra fluid; so that the great work of the stomach — the work of chymification — is not commenced till a part of the strength of this organ is expended in another direction.

1014. There is another difficulty. The gastric juice, as such, is not made to be absorbed into the system. There is no redundancy of it, for such a purpose. It is in just sufficient quantity for a due supply of proper food; and it is formed and poured into the stomach soon after the arrival of the food. Now, if we pour a quantity of any of our ordinary mixtures into the body to combine with this mass, is there not great danger that, during the work of absorbing its watery parts, some of the gastric juice itself will be carried into the circulation?

1015. In short, it must be obvious that a well-masticated mass of food contains just the due proportion of solids and liquids which the laws of health demand; and that all adventitious or artificial substances must be less healthful. Why, then, will we not follow nature herself, and not a foolish and unnatural custom?

1016. The usual argument, that, since the domestic animals use no drink with their meals, *we* should not, is entitled to very little weight. It is not always safe to reason from the lower animals, whether wild or domestic, to man, who is so much above and in some respects unlike them. Besides, we are not driven to the necessity of so doing. I have advanced better arguments, and in sufficient number.

QUESTIONS. — What is the principal objection to drinking with meals, which has been mentioned in former sections? Are there not other objections? Will you name the first? What second argument is used?

SECT. XXXIII. — INFLUENCE OF THE MIND AND HEART ON DIGESTION.

1017. Suppose a person sits down to his dinner in the most perfect health, and with a good appetite. The food before him, we will still suppose, pleases him exactly, and he commences the work of dispatching it. At this very moment a letter is brought him containing unwelcome intelligence — such as the loss of property by fire, or at sea; or the loss of a near and dear friend. Is not his appetite gone in an instant?

1018. Or suppose that, when he is just sitting down to the table, with a perfect appetite as before, a sudden gust of wind, or a startling clap of thunder, brings him under the powerful influence of fear. Is not loathing more probable than appetite? Some few, I know, are fearless; but generally the appetite is partially or wholly suspended.

1019. The same remarks are applicable, in greater or less degree, to any other strong passion or affection which, for the time, wholly absorbs the mind or the heart. They are so to the elevating as well as the depressing passions — to love, hope, joy, etc., when in excess, as well as to fear, grief, hatred, anger, envy, etc. Sweetser, in his work entitled Mental Hygiene, tells us that, under the influence of anger, "more or less distress is apt to be felt in the region of the stomach; and the functions of this viscus, with those of the liver and bowels, may be seriously disturbed." He even says that "anger destroys the appetite."

1020. And why may it not be so? Broussais, the physiologist, says that anger imparts, "even to the saliva, poisonous qualities;" and this not merely in cats — a fact well known — but in man. And Beaumont assures us that, in the case of St. Martin, anger or any other severe emotion would sometimes cause a species of inflammation of the stomach, and at the same time a temporary fit of indigestion.

1021. But I need not quote authorities on this subject, though they are almost innumerable. Most of us know something about it from experience. We have all felt the power of grief on the one hand, or joy on the other. We seem to be affected deep at the pit of the stomach, as it is called, or at the pylorus — where are found the large ganglions, or little brains.

What conclusion must be obvious? Why is the usual argument — that the other animals do not drink with meals — considered as of little weight? Have we not a full amount of testimony on the subject, which is less doubtful?

And does not the very phrase, "*bowels of compassion*," occurring in Scripture and elsewhere, take for granted the connection between the passions and affections and this abdominal region?

1022. But the mind, too, no less than the feelings, has an influence on the stomach, and on appetite and digestion. How many an individual becomes so intensely interested in an exciting book or in exciting conversation, as to lose all immediate desire to eat or drink? And so of favorite studies. The mathematician, deeply engaged in solving his problem, not only forgets that the hour for eating has arrived, but actually finds, to his surprise, his appetite half gone, as he seats himself at table to gratify it.

1023. Now, it should not be forgotten, that if the larger measures of grief, fear, anger, joy, devotion to reading and study, etc., exert their larger measures of influence, smaller measures of the same passions and affections, continually operating, cannot be wholly inert. And it is these silent but certain results, on appetite and digestion, to which I wish to call your attention.

1024. "Under the habitual influence of fear," says Sweetser, and even under the influence of what he calls a morbid timidity, "the body grows pale and emaciated, the appetite diminishes, the stomach and bowels get disordered, and so enfeebled," that the slightest noise, if sudden, or any sudden and unexpected appearance, as of an individual, may cause nervous tremors and agitations, and even fainting. And is not the influence of the mind on digestion considerable?

1025. The same author also says, "Dyspepsia is exceedingly liable to be induced under the protracted operation of sorrow." He quotes Dr. Heberden as saying, that "there is hardly any part of the body which does not appear to be deeply injured by the influence of great dejection of spirits; and none more constantly than the stomach and bowels, which hardly ever escape being embarrassed with pains, an uneasy sense of fullness and weight, indigestion, acidities, heart-burn, sickness, and wind."

1026. He goes still further, and adds, that "chronic inflammation, and even scirrhus and cancer of the stomach, will sometimes succeed the deep and prolonged influence of the passion" I am noticing. It is even thought that the extensive ulceration of the stomach, of which the Emperor Napoleon is known to have died, was originated or excited by the sorrow or chagrin arising from his painful reverse of fortune, and the wrongs and

unkind treatment he received, or fancied he received, on the island of St. Helena.

1027. The liver is particularly apt to suffer, sooner or later, from the influence of mental depression. And one fact, in connection with this subject, is very curious. It is the concurrent testimony of such men as M. Pelletan and Sweetser, that, in the case of long continued grief, sorrow, and despondency, biliary concretions, or gall-stones, are likely to be found. This, if a fact, is a most important one; especially in a country and age when these complaints are becoming every day more and more frequent.

1028. M. Pelletan observes, moreover, that, with regard to the victims of suicide, so common in France, while he has never found any gall-stones in the livers of those who have destroyed themselves on account of sudden reverses of fortune, and in the wild transports of despair, he has, a great many times, found them in those who have been induced to commit self-murder by long and lasting distress. I mention this to show the powerful influence of the mind and heart on this part of the great digestive circle; and especially the probable influence of the smaller degrees of depressing passion, when long continued.

1029. I never yet knew a person who gave way for a long time to habitual worrying and fretfulness, whose digestion — to say nothing of the cerebral and nervous apparatus — did not suffer under it. Indeed, I might safely challenge the world to produce an exception — a fair one — to this general rule. As certainly as "Laugh and be fat," means "Laugh and be healthy," and is true, just so certainly is it true that a want of proper cheerfulness leads to that opposite feeling which is so often accompanied by emaciation.

1030. Were mankind really gallinaceous in their character, one might be led to believe that the old-fashioned though vulgar caution, "Fret not thy gizzard," was founded on a knowledge of the general tendency of fretfulness to produce unfavorable results to the stomach, and to the whole digestive system.

Questions. — What remarkable illustrations of the effects of sudden grief on the digestive system are here mentioned? May not the elevating passions, in excess, produce similar results? What does Dr. Sweetser say? What facts does Broussais mention? What is the testimony of Dr. Beaumont on this subject? Is it not, with most of us, a subject of every day experience? What is said of the phrase, "bowels of compassion?"

May not the excessive application of the mental powers depress and

SECTION XXXIV. — HEALTHFUL CONDITION OF THE DIGESTIVE MACHINERY.

1031. I have more than once alluded to the importance of having those parts of the system concerned in the work of digestion in good and perfect health. The subject is, however, of too much importance to be dismissed without giving to its consideration a separate section.

1032. Imperfect teeth and premature decay are not only a frequent result of imperfect mastication and chymification, but sometimes a cause of it. First — they who have imperfect teeth frequently have a soreness, or at least a tenderness, of the mouth. The nerve is partly exposed, and a very high or very low temperature, or the pressure of very hard substances, is apt to give pain. Hence they neglect to use them, were it only to avoid pain. But, secondly, he who has lost part of his teeth, and has others which are more or less decayed, does not possess the power of thorough mastication, were he disposed to exercise it. The same amount of mastication, besides being more painful, will require more time, and, in his eagerness to save time, he will defraud himself of his teeth and spoil his digestion.

1033. But diseased salivary glands, no less than diseased teeth, are bad for digestion. Whether they are merely debilitated or congested, or only inflamed, no person's chyme, chyle, and blood, can be as perfect whenever these glands do not perform their perfect work, as when they do. The machinery being disordered, the manufactured product suffers, as the consequence.

1034. In order to perfect digestion, the esophagus and the whole alimentary canal should be sound and healthy. And in order to facilitate the passage of the nutritive substances through this extended tube, more or fewer glands, called mucous glands, are placed in its lining membrane, whose object is to furnish, in

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impair the digestive powers? And may not smaller measures of the same passions, affections, and mental influences, when long continued, produce similar effects? Have we not here, also, the testimony of high authority? Of whom? Who does Dr. Sweetser himself quote? What is suspected of the cause of death in Napoleon? Is the liver particularly liable to suffer? What observations, in this direction, have been made on the bodies of those who have died in France from suicide? What is the testimony of the author of this work? What is said of the saying, "Laugh and be fat?" What important hint is thrown out on fretfulness?

due quantity, a suitable fluid to lubricate it. In order, then, to have the supply of mucus abundant and healthful, the whole tube should be healthy.

1035. The stomach, in particular, must be healthy. Acidity, flatulence, worms, and all foreign bodies or absolutely indigestible substances, must, of necessity, interfere with the process of healthy chymification. So must habitual pressure of the abdomen, by means of a bad position. So, also, a want of that agitation of this organ which is produced by gentle bodily or physical exercise.

1036. The mind, and its organ, the brain, have much to do with the integrity of the stomach and digestive organs; and, consequently, with the results of their activities. When the brain and nerves are vigorous, the mind will be so, in nearly due proportion; and a corresponding amount of digestive vigor and power will be the consequence.

1037. Hence it is that a suitable degree of mental cultivation adds to the power of the digestive system to perform its important functions. And hence, too, one reason why too much intellectual application, at our schools and elsewhere—this pushing the intellect, as it might be called—breaks down the digestive system, and scatters the seeds of dyspepsia broadcast over the land.

1038. In order to healthy digestion, the stomach must not only be healthy, but the liver, the pancreas, the lacteals, the mesentery, and the mesenteric glands; in truth, the whole intestinal canal. Obstructions in these parts; crudities too long retained; ulceration of particular parts; worms, etc., etc., may and do interfere with the production of healthy chyle and blood.

1039. Finally, it must be obvious that it is in the circulatory system, with the heart and lungs—particularly the latter—that the work of digestion is completed, and the blood *finished*. How important, then, is it that all these should be perfect in their condition, and perfectly correct in the performance of their functions.

1040. Need it be said here, that, although the food should be thoroughly masticated and of proper quality, yet, if the stomach fails to do its duty, and the chyme is imperfect, there can be no perfect chyle and blood? And, again, that even if the chyme were perfect, and yet the chyle not well formed, there must still be a failure, as regards perfect blood? Or, in other words, that, in order to the most perfect results from the machinery

of digestion, the whole circle of this machinery must be healthy ?

SECTION XXXV. — THE DISEASES OF DIGESTION.

1041. Some of the diseases which have, at times, their origin in disobedience to the laws of digestion, have been barely mentioned in the various sections of this chapter. But it will be necessary, at its close, to descend to a few particulars.

1042. The word dyspepsia, or in plain English, indigestion, as generally used by the mass of society, is a term by which to designate certain chronic affections of the stomach and the rest of the digestive machinery. It is one of the most obstinate diseases we have to encounter ; for, if it is not so certainly nor so immediately fatal as consumption, it is almost equally incurable. It is, in its hydra aspect — as it deserves to be — the terror of the sedentary and literary world.

1043. Constipation is one symptom of dyspepsia ; though, in some instances, it seems to be more immediately dependent on the liver, or to have its origin in suspended action of that organ, without being accompanied by much general derangement of the system. It is troublesome ; but, though not easily cured by medicine, may be often relieved by a prompt return to a course of faithful obedience to the laws which we have broken. It is, however, more easily prevented than cured.

1044. Lientery is generally an accompaniment of weak digestion, whether the latter is hereditary or acquired. It is a state of the system in which the food is, at best, but imperfectly chymified ; and, without being much changed by the action of the bile and pancreatic juice, is carried through the body in such a manner as to afford it little nourishment.

1045. With the mass of mankind, this passes for no more than a general relaxation of the bowels ; at least, unless it becomes diarrhœa — a result by no means unusual. It is a very

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QUESTIONS. — Do imperfect teeth and imperfect mastication have a bad influence on the work of digestion ? May not diseased salivary glands have a similar ill effect? Must the esophagus — to the same end — be healthy ? How may a diseased alimentary canal affect the digestion ? Why must the stomach, in particular and above all the rest, be in a healthy condition ? Why the liver and pancreas ? Have the health of the brain and nerves any thing to do in this matter ? Is it probable that in general healthy activity after eating, by gently agitating the whole frame, aids in the formation of good and healthy blood ? Does general mental cultivation improve the digestive process ? Have the heart, the lungs, and the whole system, something to do with this work ?

frequent disease; and not a few appear to have it during their whole lives. I have known it to affect, habitually, whole families, and even to descend from father to son.

1046. It is important that society should be well aware of the first approaches of this disease. It is either accompanied by a ravenous appetite, with thin, soft, slender, and flabby muscles, and great nervous sensibility, on the one hand, or by a feeble and fickle appetite, and a tendency to a kind of delicate corpulence, on the other.

1047. Acidity, accompanied often by heart-burn, flatulence, and worms, may be either connected with other diseases, or have a somewhat independent existence. It is not easily removed, except by removing the cause. The practice of giving temporary relief by draughts of magnesia, pearlash, or Indian pink-root, is objectionable. It only suspends disease, at most; it seldom cures.

1048. We hear much, in these days, about liver complaint. Sometimes the liver is merely surcharged or congested, as the result of using coffee, or oily food, or other injurious agents In a few instances, it is not only engorged, but ulcerated. In instances rarer still, gall-stones are found in its ducts. These I have mentioned before (1028).

1049. It is less than a year since I was called to the bedside of one of these patients. She was exceedingly yellow, almost dark, like a northern African; and was subject to paroxysms of a most excruciating kind. On inquiry, there was the most substantial and tangible evidence that her sufferings were occasioned by the irritation of gall-stones.

1050. Colic is of various kinds, and is the result of various causes—all, however, or nearly all, within human control. One fruitful cause is the frequent or continued operation of slight obstructions or irritations in the alimentary canal. In this case, little is wanted for the removal of the disease but abstinence, quiet, time, and patience; and wisdom to avoid the cause or causes which have led to it.

1051. In other instances it is caused by having one portion of intestine, greater or smaller, contract somewhat suddenly (owing to wrong or irregular habits), and fall into the portion next below it, so as either to block it completely up, or close it in part. This disease is often fatal, especially in those cases where—ignorant of the cause—cathartics are administered.

1052. In other instances still, though happily of rare occurrence, cherry-stones or other foreign bodies obtain a lodgment

in the weakened or abused alimentary canal; where calcareous or limy matter attaches to them as a nucleus, till, after the lapse of much time and a great deal of suffering, the individual perishes. In children, worms have been known to form knots or inextricable masses in the intestines.

1053. Diarrhœa and dysentery often, but not always, begin as colds or catarrhs. But, even when they begin thus, they are frequently aggravated by indigestion, or other causes. The same may be said of cholera. Whatever *predisposition* there may be to the latter disease, whether in earth, air, or water, it would seldom exist among us but for the influence of *exciting causes.* The last remark will also be applicable to that severe disease called gastritis, or inflammation of the stomach.

1054. Piles, in many instances a most distressing disease, is often, if not always, connected with derangement of the digestive system, of long standing, especially in the sedentary and studious. It is, however, always aggravated, if not caused, by the too frequent use of greatly concentrated and highly nutritious food, especially when taken hot, or late at night.

1055. Nervous headache — *sick* headache — many times has its origin in the derangement of the machinery of digestion, and is always aggravated by it. One evidence of the correctness of this view is found in the fact that strict obedience to the laws of digestion will, in many instances, remove it without delay, even where it had long resisted time, and patience, and medicine.

1056. Many a disease of the skin is induced or aggravated by derangement of the digestive organs. Much is said about chestnut sores. They are oftenest seen about the corners of the mouth. They make their appearance at a season which has led to the suspicion of chestnuts as a cause. I have not a doubt they are one cause; but I believe there are many others.

1057. It would probably be found, on examination, that these last-mentioned sores are always preceded by disturbance in the stomach, and frequently by eruptions on the mucous surface of this viscus. So, in any event, Dr. Beaumont found it in the case of St. Martin.

1058. Boils are said to be healthy; but why? Because, as it is supposed by the ignorant and unthinking, the blood is in a bad state, and the boils are a sort of drain to the poisonous or irritating matters within it. I have more than once traced

these boils to the breathing or swallowing of putrid animal matters.

1059. Indeed, there is always a connection, in these cases, between the internal and the external surface. He who has a healthy alimentary canal, and good digestive machinery, will have no boils, and will need no plasters to apply to them, nor medicines to purify or cleanse the blood. Of this popular idea about cleansing the blood, I may speak more fully hereafter.

QUESTIONS. — What is dyspepsia? Is it very common among us? To what class is it most a terror? What disease is sometimes coupled with it? Is not constipation, in some cases, an independent disease? What is lientery? Is it a frequent disease? Is it sometimes born with us? Should we be particularly careful to prevent the approaches of this disease? By what marks may it be known?

What is said of acidity? What of flatulence, heart-burn, and worms? What are some of the more frequent sources of liver complaint? What is said of gall-stones? Describe the case of this kind which is mentioned. Is colic sometimes among the diseases of digestion? What are mentioned as among its frequent causes? What is said about diarrhœa and dysentery? What about piles? Has sick headache any connection with the stomach? Is there any connection between diseases of the skin and the state of the stomach? How do we know? What is said of chestnut sores? What of boils? Are they really healthy? Would not he be healthiest who was healthy enough not to need them?

CHAPTER V.—CIRCULATION OF THE BLOOD.

SECTION I.—THREE-FOURTHS OF THE BODY FLUID.

1060. It may be demonstrated that at least three-fourths of the human body are either fluid, or may be readily changed to a fluid state. Some of our anatomists and physiologists have even asserted the proportion of fluids to be nine-tenths.

1061. Of this mighty mass of liquid, or semi-liquid—for a part of it is little more than fat or tallow, in different degrees of solidity, but easily resolved into fluid—amounting to a hundred pounds or more in the adult, twenty-five or thirty pounds are blood. Much additional blood may also be found partly incorporated into the muscles, but yet removable by maceration.

1062. Next to blood, water is the most abundant fluid in the human system. Perhaps its quantity may be found to exceed that of the blood; though it is generally thought to be less. About three-fourths of all the muscles of the body are said, by chemists, to be resolvable into water.

1063. But our concern, at present, is chiefly with the blood. The basis of this curious fluid is called serum, and is found to be, essentially, water. Commingled with this is the coagulum, made up of fibrine and albumen, through which are diffused many red globules. The color of these globules has sometimes been ascribed to iron, which, in one form or another, certainly exists in the human body, in small quantity.

1064. All blood is not necessarily *red* blood. In some of the lower animals no red globules are found. And, in some small portions of our bodies, it does not appear that there is any red blood. This is especially true of the tendons and cartilages. One set of blood-vessels, the capillaries—strange to say it—do not appear to contain any red blood. They are, moreover, exceedingly numerous.

1065. This mass of fluid is by no means motionless or lifeless. It is not the same yesterday, to-day, and always. It is continually changing, and as continually circulating. Were it

to stand still in our bodies but a single day, the consequences might be most deplorable. Putrefaction would be inevitable. Why, the three or four gallons of blood in the human body, if placed apart from us, in a vessel, could not be kept alive, so to call it, a single day.

1066. I have spoken of the circulation of the blood. This is not a partial circulation. All parts of the body, not excepting the tendons and the solid bones, have more or less blood in them. Nor is it diffused, as water through a sponge; but it is circulated everywhere, in tubes of various kinds and sizes. If there are any exceptions to the leading truths asserted in this paragraph, they are in favor of the hair, nails, and cuticle.

1067. The blood is continually used up for the purposes of growth or renewal; while its watery parts are as continually disappearing in the processes of secretion or evaporation. Were it subject to no changes, and could it even escape putrefaction, its quantity would gradually diminish. This diminution of quantity would be equal to several quarts, if not a gallon, for every twenty-four hours.

SECTION II. — MECHANISM OF THE CIRCULATION.

1068. The blood is set in motion by means of the lungs, heart, arteries, veins, and capillaries. Being heated and rarefied in the lungs, it must needs expand more rapidly than the vessels which hold it will permit, and hence it is pushed forward in these vessels into the heart, which is so constructed as to facilitate its course toward the extremities and surface of the body.*

1069. The general account of the lungs may be reviewed in its proper place. They form, as it is believed, a basis or starting point in the great system of the circulation, and give an

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QUESTIONS. — How great a part of the human body is probably fluid? Is it all one kind of fluid? What is the most important? What is next most important? How much of each does the human body contain? Is all the blood red? Of what is red blood composed? Is there any iron in the blood? Does the human blood stand still? What would happen if it did? Does the blood circulate in vessels? Does it circulate in all the parts of the body? Does it remain the same always, or is it changed? As it is continually being used up, what would happen if it was susceptible of no change?

* This is, at least, one of the more modern theories — that of Mrs. Willard, of Troy, N. Y. — and seems to accord very well with known facts.

impulse to the blood which is never wholly lost. The blood goes in two great vessels to the left side of the heart. These are called pulmonary veins, but they deserve, far better, the name of arteries.

1070. The heart is so constructed as to be every moment accomplishing four separate offices. 1. It receives the old blood from all parts of the system, and the chyle mingled with it. 2. It sends this mixture to the lungs. 3. The renovated and new blood is received from the lungs. 4. This last is sent, by the united efforts of the lungs and heart, to all parts of the system.

1071. The vessel which carries out the new and newly recruited blood, from the left side of the heart to all parts of the system, is called the aorta. It is quite large, but soon divides and subdivides into branches almost innumerable. The latter are reckoned at a thousand, or more; though anatomists have given names to a few hundred only.

1072. The arteries have a motion which is usually called pulsation. This is supposed to be caused by the contractions of the heart, especially as the motions of this last and the pulse are harmonious. The heart and arteries project the blood, or *pulsate*, about once a second in the adult, though much oftener in early infancy. The motion of the blood gives a sensation of jerking.

1073. These arteries lie deeper in the flesh than the veins, and can seldom be felt, except at certain points where they run across the bones, as at the chin, temples, or wrists. They have a whitish appearance, especially the large ones, and are very tough and elastic. They are found almost everywhere in the body.

1074. The veins, after having received the arterial blood through the intervention of the capillaries, conduct it back to the heart and lungs. Their number is very great, being usually estimated at three thousand, though I do not know that names have been given to more than three hundred. They unite in two large streams before they reach the heart. They lie nearer the surface than the arteries, and have a blueish appearance.

1075. At every beat of the adult heart, about two ounces of blood are forced into the aorta. This is more than a gallon a minute; or it is a hogshead an hour, or twenty-four hogsheads in twenty-four hours. We are therefore justified in saying, that

a quantity of blood equal to the whole mass in the living body passes through the heart nearly every three minutes.

1076. Is there not something most amazing in the consideration that a little handful of tubes of delicate structure can bear to have a hogshead of blood forced through them every hour for a period of seventy, eighty, or a hundred years, and not wear out? Why, at this rate, a man's heart, in his whole lifetime, would carry through it a quantity of blood equal to six hundred thousand hogsheads. It would make an artificial pond or lake a thousand feet square and five feet deep.

1077. It is quite obvious that much of this circulation has to take place in opposition to the laws of specific gravity. Consider, for example, how large a share of the blood, which is sent through the arteries of the lower limbs to the feet, has to return "up hill!" Now, is it possible for the blood to flow upward, from the feet to the heart, at the rapid rate above mentioned?

1078. A description of the means of doing so would require more space than can be spared for it here. It is, perhaps, sufficient to say, that the blood has to find its way upward, when we sit still, with very great difficulty. The veins are valvular; and, as there is a considerable force behind, the blood gradually gets above a valve, whence, like water in a pump, it cannot go back, while the force from behind urges it a little way forward.

1079. When we walk, there is something more in addition to the above. The muscles are so constructed, in relation to the veins, that, instead of hindering the advancement of the venous blood upward, they rather favor its progress; and it circulates almost as freely when we are in motion as the blood does which is above the heart. This is as important a fact as it is curious (1099).

1080. I have said (1066) that the blood penetrates every part of the body. To some, it may not be easy to understand how the blood, carried along as it is in tender and delicate vessels, can penetrate the hard bones. But nature has not forgotten to make ample provision for this, by oblique passages into the more firm and solid ones, and by openings, of some sort, into them all.

QUESTIONS. — How is the blood supposed to be set in motion? What are the general and prescribed offices of the heart? Describe the aorta. How many arteries are there in the living human body? What do we mean by pulse or pulsation? What are the veins? How many veins and arteries are there? What are the capillaries? How much blood passes through the heart in an hour? How often does all our blood pass through the heart? How can the blood in the feet and legs ascend to the heart? How can blood be circulated in the hard bones?

SECTION III. — USES OF THE BLOOD.

1081. We have seen, in the chapter on "*growth and renovation*," that the blood is the principal agent for developing, sustaining, preserving, and renewing the body. It is quite obvious that the mere application of certain substances to the surfaces of the body, both external and internal, would be a slow process. It seems, then, highly necessary to bring the elements of nutrition more closely in contact, as it were, with the parts that are to be increased or renovated.

1082. The blood contains the needful elements of the fabric Nature wishes to rear, and in just the requisite quantity and quality. Were they, on the one hand, more diffused, or on the other, more concentrated or consolidated, they would be so much the less valuable in accomplishing her purposes.

1083. But the blood — spread over the system as it is — has another object. It becomes a set of sluices or channels in which the waste matters can be poured, and thus, as it were, obtunded, in the first place; and afterward removed! For the dead particles of the system would be irritating — I might say poisonous — were they to remain in the body. It is, therefore, a wise provision that quenches fire, as it were, in water; and then, in a reasonable time, deposits it in a suitable sepulchre.

1084. Then, again, the blood being everywhere diffused, in just the needful proportion and quality, preserves the parts which it penetrates in a supple and pliable condition, instead of allowing them to become too rigid or too dry. It is very curious to observe the tendency there is in the conservative power of the human system to preserve the same quantity from day to day, and from hour to hour, of this needful pabulum of life.

1085. So important is the blood to the health and even to the existence of the body, for one short hour, that it was a current opinion among the ancients that the blood of the human body was the life thereof. It is, in truth, an opinion that finds advocates, here and there, to the present day and hour. That the blood is alive, will not be denied; but whether it is the life itself, is quite another question.

QUESTIONS. — For what purposes is the blood the chief agent? Why is a fluid indispensable in this work? Does the blood contain all the needful elements in rearing the house we live in? Has it not other important offices to perform? What are some of them? What were the ancients accustomed to say of this fluid? Do some of the moderns adhere to a similar opinion? How far is it true that the blood is the life?

SECTION IV. — INFLUENCE OF AIR ON THE CIRCULATION.

1086. A thousand reasons might be given why the great circulation of the human body is best performed, and its objects best accomplished, amid pure air rather than elsewhere. Not a few of these have been incidentally referred to already, and more will be in subsequent pages.

1087. We are told by philosophy with what weight the atmosphere presses on the human body — amounting to about fifteen pounds to the square inch. The pressure, therefore, on two thousand square inches — for such is the average extent of the adult human surface — must be more than a ton and a half. But, as there is a corresponding internal pressure, the weight is unperceived.

1088. And yet we have probably no adequate idea of the silent but irresistible influence of this element in which we are so profoundly immersed, and which presses upon us with such force, both without and within. Regarded merely as a principal instrumentality in buoying or holding us up, and saying nothing of its stimulus, we can hardly estimate its influence too highly.

1089. It was the opinion of Professor Nathan Smith, late of Yale College, that the capillaries are the source of circulation, and not the heart or the lungs. Without receiving or indorsing his theory, it must be admitted that the capillaries have great power and influence. Now, as the skin includes them in very great numbers, the atmosphere, taken as a whole, must exert, inevitably, a control over the circulation which has as yet been but little understood.

1090. In truth, every living individual can bear testimony to this influence of air on his circulatory system. Who does not know that his blood circulates more rapidly in winter than in summer? We may even perceive the effect of a change of wind from northeast to northwest. There are those who can detect the change with closed doors.

1091. The effect is perceived by many in passing from a low, damp country to a more elevated and dry region; and from a dry atmosphere in a level country to the top of a high mountain. In going from a damp air to a dry one, the latter becomes actually exhilarating to the circulatory system. But in ascending a very high mountain, the rarer air becomes less and less bracing, and more and more relaxing.

1092. After spending considerable time, once, in a northern region, in the daily use of a pair of lungs full of air highly

charged with oxygen, I found that my circulatory system, which till now had been unusually active and strong, was growing inactive and languid. In a few weeks I was attacked with asthma, from which I did not recover till I sought a less bracing climate.

1093. This northern air, in ordinary circumstances, has a healthful influence on the circulation; but when we are already broken down by hard labor or any other cause, it is the reverse. So it is with a highly oxygenated air everywhere. It is, in general, most admirably adapted to invigorate the constitution and promote health, provided we have strength enough to bear it.

1094. It is by no means improbable, that one reason why a good bracing air has such favorable effects on the circulation is because it is a bad conductor of electricity. A warm, moist atmosphere is well known to have a relaxing effect; for such an air is a good conductor of the electricity from our bodies. This may be one principal reason why we feel so much better and have a circulation so much more energetic during the winter than in the summer, and during the day-time than in the night.

1095. To obtain the full benefits of the atmosphere on the human circulation, so far as electricity is concerned, we must understand that the air is most highly or positively electrified during the first two or three hours after sunrise, and during the last two hours before it sets. Its intensity is greatly diminished during the middle of the day, and still more so during the night.

1096. If it be true, as some suppose it is, that the verdant fields and towering forests are continually manufacturing certain aromatic principles, and sending them forth wafted on the wings of the wind for the benefit of the lungs, it is manifest that, through the united influence of the latter and the skin, as a double receiver and conductor to the internal domain, the sanitary influence must be greatly increased.

QUESTIONS. — With how much force does the atmosphere press on the human body? Is it possible that such an agent can be neutral in regard to its effects on the health? What opinion was entertained by Professor Smith? What may we learn from his theory? Who does not know a great deal on this subject from his own experience? What can some persons detect, even with closed doors? What may be perceived from the common inequalities of the earth's surface? What anecdote is given by way of illustration? What may be one reason why a bracing air is so salutary? What facts are important to be known by late risers? What thoughts are suggested about the aroma of plants and flowers?

SECTION V. — INFLUENCE OF EXERCISE ON THE CIRCULATION.

1097. They who sit much have cold feet, and very often a hot head. The blood is circulated much more slowly than it should be in the lower limbs, and more rapidly in the same proportion in the upper limbs and upper part of the body. Hence ensues, ere long, a diseased condition of the fluids; and, in the end, of the body in general.

1098. Why this condition of things? Chiefly, if not wholly, because the blood does not circulate freely. It lingers in the veins, where it has to act against its own specific gravity; and hence those changes do not take place which are so necessary to life and health. The blood is not freed as fast as it ought to be from its superfluous carbon, nor re-supplied promptly enough with oxygen.

1099. When, on the contrary, we walk about, not only is the blood pushed along in the ascending veins, but there is a provision for its penetrating the muscles, which is seldom noticed even by the best writers on these subjects. One would naturally think that the strong contractions of the muscles of the legs when we walk would exclude the blood from their substance or tissue; but there is a curious arrangement, both here and elsewhere, for its introduction into the very heart of the most solid of them.

1100. Where the arteries penetrate the muscles there is a kind of ring, not unlike the ring which is sometimes found at the mouth of a purse or a net, which allows the blood to flow in spite of the contraction. This is especially true of the larger arteries, both of the lower limbs and the upper.

1101. In truth, it may be laid down as a universal rule, that, the more we exercise, the better the circulation of the blood. Few people exercise so far as to over-fatigue themselves, unless the exercise is violent or unnatural. More persons, in the proportion of a hundred to one, rust out than wear out.

1102. In general, he who takes proper exercise in the open air will have a good and vigorous circulation. I shall dwell at considerable length in Chapter VI. on the importance and necessity of breathing right, and of inhaling a proper material; but it is hardly possible to repeat too often a great truth from Mr. Thackrah, that we subsist more on air than on food and drink.

1103. He who wishes to have a good circulation must make up his mind, whatever may be his business and whatever his inclinations, to use as much exercise in the open air as the

nature of the case will possibly admit. And, be it remembered, that this remark is for every individual, without reference to sex or age.

SECTION VI. — INFLUENCE OF TEMPERATURE ON THE CIRCULATION.

1104. By temperature, in this connection, I mean the internal heat rather than that which is merely external; for I shall show hereafter that all undue exaltation of the temperature of the body, by external causes, tending as it does to reduce the calorific powers of the system, is apt to end in local and general debility.

1105. Now, a good internal temperature greatly promotes the free circulation of the blood, and indeed of all the fluids. Thus, a degree of natural, healthy heat, in the stomach, lungs, and skin, is alike favorable to a free flow of the blood and to a healthful action of the heart and lungs which propel it.

1106. On the other hand, any increase of temperature which is caused in an unnatural way, has an unfavorable effect. It may at first quicken the motion of the heart and arteries — probably *will* do so. But an increase of activity in the circulation is not necessarily an increase of strength. It indicates weakness rather than strength.

1107. Thus, suppose we swallow rum, or smoke tobacco, or chew opium. The rum and opium, if not the tobacco, will increase the action of the heart and arteries, and, for a time, increase the heat. But, as soon as the force of the stimulus is gone, we are not only no warmer than before, but rather colder.

1108. So it is with mustard, pepper, and spices; and so, in truth, with tea, and coffee, and all other medicaments, solid and liquid. They doubtless make us a little warmer for the time, and hence at first they as certainly increase the activity of the circulation; but it does not last long. The final or remote influence of all these is unfavorable.

1109. It is so with mental excitements no less than physical ones. Cheerfulness, and all the elevating passions and affections, warm us internally, and thus favor the healthful circulation of the blood and all the other fluids. But excess of these,

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QUESTIONS. — Do they who sit too much have cold feet? Why is this? Is walking much better? What special provision has Nature made to facilitate the circulation while we are walking? Are there few that exercise too much? What remark of Mr. Thackrah deserves to be continually repeated?

especially of joy, love, etc., have the contrary tendency. They warm us, and cause the heart to beat high for a short time; but the final result is to reduce the heat of the system, and enfeeble, in a corresponding degree, the circulation.

1110. Moreover, they not only tend, by lowering the internal heat generally, to enfeeble the action of the heart and arteries, but to render it irregular. In order to have proper action everywhere in the system — the regularity of health — the action of the heart should be regular. An eminent physician whom I once knew, whenever he put his finger on a steady, regular pulse, was accustomed to say, with great delight, "That's a pulse of *ninety*." He meant, of course, a pulse which indicated a long life.

1111. There are very few among us whose circulation is just as it should be. Our dietetic habits are far enough from being favorable to a free and healthful circulation. Perhaps, however, no one thing does more mischief, in the final result, than the habitual use of alkalies.

1112. The internal heat is greatly increased by heat applied externally, and hence has an effect on the circulation. Breathing air too highly heated, all day long, must of course excite or delay the action of the pulmonary vessels, as well as quicken, in a more indirect way, the whole circulatory system.

SECTION VII. — INFLUENCE OF THE MIND ON THE CIRCULATION.

1113. If the brain is the organ or instrument of the mind, as almost every one admits, then it is easy to see how the latter can have influence on the circulation. For, as the mind cannot act without a due degree of vital energy imparted to it through the brain, it follows that this energy may be so largely applied to this particular organ as to leave an insufficient supply for the stimulation of the other organs, and the circulatory organs among the rest.

1114. It may be asked, whether, on this principle, it would

QUESTIONS. — Has this section a principal reference to external or to internal heat? Does a steady internal heat greatly favor a free circulation of the blood? Must the heat, to this end, be got up in a natural way? Is a quick circulation always a strong one? Why do not rum, opium, and tobacco, permanently warm us? What is the effect of mental excitements on the circulatory system? Describe, if you can, the "pulse of ninety." Are many persons favored with a good circulation? How do our dietetic habits affect us in this respect? Does heat, externally applied, increase the activity of the circulatory organs? Does it necessarily strengthen them?

not be better to omit thinking altogether. But there are action and reaction. We are not made to be as the trees of the forest, or even as the beasts that perish. The former have no mental apparatus, and the thoughts of the latter are limited by the Creator himself.

1115. If the tree could think, it would interfere with its growth, unless there were added to it other resources than its present ones. If the horse could be taught Greek, Latin, and Mathematics, it would probably spoil him, as a horse; at least, in the progress of a few generations. He would lose his bright eye and fine proportions. His vital energies would be expended, in part, on that for which they were never designed, which would be the same thing as if so much life and spirit were stolen from his general system.

1116. On the contrary, were man not to expend a part of his vital energy in thinking, he would come as much short of the Divine intention as the beast or tree would in being cultivated, were such a thing possible. As a consequence, his circulatory system, no less than his other organs, would lose a part of their energy. For vital energy is the result, not of the action of the brain alone, but of the united activities of all the organs and parts of this wondrous frame. Could the stomach, lungs, skin, liver, muscles, and bones cease to act, there would as certainly be a deficiency of vital energy, in some small degree, as if there were an interruption or cessation of action in the brain and nerves.

1117. It is, however, particularly true of the brain and nerves that their action or exercise is indispensable to good and perfect and high health. Just as surely as the ox, or horse, or an apple tree, would lose in point of health and vigor by thinking and reasoning like man, just so surely would the human being be a loser by neglect in these particulars. Idiots are not by any means remarkable for their longevity.

1118. The savage is not an exception to the truth of this remark. He does not inherit a cultivated mental apparatus like ours. He is more nearly on a par with the brutes. Still, a degree of cultivation, to which his ancestors have been accustomed, with slight additions thereto, are as indispensable to him as the larger measures of cultivation are to ourselves.

1119. But while it is true that the sons of such men as Cuvier, Webster, Kossuth, and Franklin, need cultivation for the purpose of general health, it is to be remembered that over-

cultivation, or a cultivation which is disproportionate, is equally injurious. It causes an expenditure of energy, that, while it results in a hot-house growth of the mind, at the same time robs the heart and arteries of their vigor and the blood of its juices.

1120. This over-cultivation of the intellectual powers runs through all our education and all our systems. To push the intellect prematurely — to make little boys men, or rather monkeys — is becoming the grand aim. It is the purpose, at least, of the rich and influential; and is, of course, aspired to by the lowly and the indigent.

1121. But, as a practical result of all this, you will find the children and young persons, whose intellects are thus urged forward in disproportion, either with a pale, shrunk skin, habitually, or with one which is habitually congested. You will find the action of the heart feeble and irregular, though rapid. You will find the blood to be less nutritive, and less vitalized or less alive. And all this, too, even though the cigar and the confectionery have been duly avoided.

1122. The cultivation of the perceptive and reflective powers, without much aid from books, is more favorable to a free and vigorous circulation than the cultivation of mere memory; and, above all, of mere imagination. The study of the exact sciences is better for the heart, arteries, and blood, than the study of poetry and fiction. The study of natural science is better for the circulation than that of belles lettres and accomplishments.

1123. I would not be misunderstood. It is no part of my purpose to *taboo* all works of imagination, or repudiate all accomplishments. It is the custom of giving a disproportionate degree of attention to these branches, of which I complain. It is the want of harmony and symmetry, that produces derangement and ill health.

SECTION VIII. — INFLUENCE OF THE FEELINGS AND PASSIONS ON THE CIRCULATION.

1124. "The passions founded on pleasure," says Dr. Sweetser,* "cause a universal expansion — if so it may be expressed — of vital action. The blood, under their animating influence, flows more liberally to the superficies; and playing freely through its capillary vessels, the countenance becomes ex-

* Mental Higiene, page 86.

panded, its expression brightens, and the whole surface acquires the ruddy tint and genial warmth of health."

1125. "Nothing," adds the same excellent writer, and in the very same connection, "contributes more effectively to the healthful and harmonious action of our organism, than an equable distribution of the blood to its various parts, and especially the free circulation of this fluid in the extreme vessels of the surface. Thus a full, bright, and ruddy skin is always ranked among the surest tokens of health." And Haller had said, long before this, "Love, hope, and joy, promote perspiration, quicken the pulse, promote the circulation, restore the appetite, and facilitate the cure of disease."

1126. But, as the elevating passions and affections promote the circulation and give a centrifugal tendency to the fluids generally, so the depressing passions and affections have the contrary effect. The blood, instead of tending to the surface, expanding the body and lightening and cheering the heart, abandons the surface; and being thrown, in undue quality, upon the internal organs, a painful sensation of stricture and suffocation is apt to follow, and the health must ultimately suffer.

1127. I do not say that the painful emotions and passions, when only temporarily indulged, are destructive of health in any considerable degree. Thus, we may be subjected to a limited measure of fear, grief, and perhaps even of hatred and anger, for a moment, or on special occasions, for a very short time, as at the approach of a thunder-storm, or at the loss of a dear and valued friend, without material injury. God has kindly adapted us to the world in which he has placed us — its storms as well as its sunshine.

1128. It is, in general, the permanent influence of the depressing passions that does the mischief to the circulatory sys-

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QUESTIONS. — How can the mind have influence on the circulation of the blood? May the brain, then, as the organ of the mind, be overtaxed? Shall we rush to the other extreme, and not tax it at all? What lessons may we learn on this subject by reasoning from analogy? What is said of the probable effect of cultivating the horse or the tree? What would be the result to man if he were to use his brain no more than the horse or ox? What is said of the savage? Is he an exception to the truth of these remarks? Are the sons of great men? What, once more, is the universal error of modern education? What is the appearance, physically, of our young people whose brains are over-worked? What is best for health, the cultivation of the perceptive and reflective powers, or the cultivation of memory and imagination? Is the latter to be wholly excluded?

tem. It is this that fills the world with mourning, lamentation, and woe. Not, I again say, that the temporary influence of such things has no evil effects, but only that it is not this whose influence is most to be deprecated.

1129. It is not a little curious to observe the wonderful fact that what is good for the bodily health is equally good spiritually. Thus, Christianity, by encouraging the cultivation and the enthronement of the elevating passions and affections, and inspiring us with hope and trust in God and love to man, is as profitable for the life that now is as for that which is to come.

SECTION IX. — COMPRESSION OF THE HEART.

1130. The heart, situated as it is near the centre of the body, midway between the lungs above and the digestive organs below, is greatly liable to compression. Probably there are few persons to be found in civilized society who do not compress this organ, more or less, every day. It is true that it has a case or sack as a protection, in part; but this is membranous, and not bony like that of the brain.

1131. The heart is compressed by bending the body forward and making a joint, as it were, at this particular place. It is thus wedged between the lungs, on the one hand, and the stomach and liver, on the other; and its contractions and expansions are performed with more difficulty than when the body is perfectly straight. The blood, also, in its passage from the heart through the aorta, as well as its return to the heart through the great veins, is necessarily hindered.

1132. The work of compressing the heart often begins with the beginning of life. The child is hardly in the arms of its nurse ere it is in this respect injured. The head and lungs, more fully developed than the rest of the system, cannot be well sustained by the feeble parts below, especially the partially developed spinal muscles. And yet nurses are exceedingly fond of holding them in an erect or semi-erect position.

1133. I have seen the breast bone actually displaced, in this way, so that the lower part, which should have hung pendulous, was turned inward, almost at right angles with the main shaft

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QUESTIONS. — What is the testimony of Dr. Sweetser on this subject? What that of Haller? Do the depressing passions and affections have exactly a contrary effect? Which of these two classes of influence is said to have a centrifugal tendency? Do momentary tendencies of either kind exert the influences spoken of, or is it these which are habitual? Is godliness as profitable to the life that now is as it is to that which is to come?

or body; and this malformation has been known to give trouble through life.

1134. Then, when they are laid down, instead of being placed on their backs, or if on their sides in a straight position, they are often laid in some narrow cradle, where not only the head but the shoulders are too high, and the body bent and the heart compressed. Indeed, there are very few instances in which little children, of any age, habitually lie straight.

1135. Then, finally, they are required to sit too much, and too long. The young should sit very little. The muscles of their backs, not being as yet well developed, will sooner or later give way; and they will acquire the habit of sitting in a crouched or stooping position. And yet the cruel custom of compressing the heart, and preventing its free and unrestrained activities, is exceedingly common, not only in our schools but everywhere else.

1136. It may be true that the mischiefs of the workshop and bench are not as great as those of the schoolroom, in every particular; because the confinement to a single position is not so rigidly enforced in the former as in the latter. And yet, I have seen very young boys subjected to great evils in our boot and shoe shops.

1137. Think, for once, of a heart — delicately constructed as the heart is — borne down by the lungs above, with the head and shoulders hanging like a dead weight upon them, and crowded upward by the stomach, liver, and intestines beneath. What can it do? How can it receive and discharge, at every second, its two ounces of blood, or every hour its hogshead? Yet, in order to have all the purposes of the circulation duly accomplished, it should be so.

1138. But, instead of receiving, during the hours of labor, from the various parts of the body, its ten hogsheads of half-spoiled blood, and sending it onward to the lungs to be purified, suppose the crowded, laboring, struggling heart should only be able to receive and send forward, to be duly oxydized, one half that quantity, or five hogsheads; and suppose this to be repeated every day, for three hundred and more working days of each year. Must there not be suffering as the consequence?

1139. Suppose, again, — a much more frequent occurrence, — that our little children, at school, whose opening natures demand that the blood should be fully and largely aerated, are to sit two hours of each half-day at school, in a bad position; and that instead of sending two hogsheads of blood to be depurated

at the thoracic centre, they only send one. Is not this a serious evil?

1140. A full stomach adds to the evil of which I am now speaking. They who sit much, whether at school or at their work, should be careful about overloading this organ. They should especially beware of sitting in a stooping or crouching position. It is quite a wonder that so few are diseased among us, when we consider well their erroneous habits.

1141. I have taken for granted, in these cases, that what little blood is carried into the lungs to be aërated or oxydized is so fortunate as there to come under the influence of pure air. But if, instead of this, that air is unventilated, and especially if it is loaded with carbonic acid, how can there be any escape? Or, if an escape there seems to be for the present, does not the punishment surely come, somewhere in the distance, according to the views of King Solomon?

SECTION X. — IRRITATING THE HEART.

1142. The heart is easily irritated, and so are the arteries connected with it. The lungs seem rather less delicate in their structure. Both have, however, a very delicate and susceptible lining membrane; though that of the heart is evidently the more delicate of the two.

1143. Most fluid substances which are taken into the stomach pass, as we have seen, into the circulation, without digestion. Some of them, such as alcoholic mixtures, are absorbed very rapidly; while others, such as water and mucilage, are absorbed more slowly. Nutritious liquids, as milk, milk and water, molasses and water, soups and gruels, require different times for absorption, according to their differing natures.

1144. Water, pure and soft, does not irritate the vessels into which it is absorbed, nor the heart into which it is carried. It may have, on the contrary, everywhere it goes, a soothing

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QUESTIONS. — How is the heart situated? Are we not apt to bend the body when we sit, at this particular point? Is the work of compressing the heart begun very early? How early, and by whom? What particular deformities are sometimes induced? What mistakes of position are made in laying down infants? When and where do they sit too much? Which are greatest, the evils of the workbench or those of the schoolroom? Why so? Does a full stomach add to the evils of a bad position? Why? Is the evil state still further increased, when to a bad position is added neglect of ventilation, and, above all, a quantity of carbonic acid? Is it any wonder we have so much disease among us?

and quieting influence. But hard water, by which is meant water holding in solution salts and other substances of various kinds, such as carbonate of lime, phosphate of lime, etc., is more irritating. Its effects in small quantity are, however, usually remote.

1145. They are not only remote, but *cumulative;* or, in other words, the effect is as if certain deleterious particles were hid, from day to day (laid up in some corner of the system to which the heart and arteries have had access), till so large a pile or mass is accumulated that they can be retained no longer, when, of a sudden, there is an outburst.

1146. But it is not the particles of mineral substance that are found in hard water, alone, that irritate the heart; though these are sufficiently injurious. There are other substances much more poisonous, and hence, doubtless, more irritating, which are nearly as much in use as hard water. A large majority of the civilized world are accustomed to make daily use — some of them three times a day — of medicated mixtures, solid and fluid, which are as certainly irritating to the heart as they are swallowed.

1147. Among the substances which may be called medicated mixtures (793—815), and which have a tendency to irritate the heart, are cider, wine, beer, coffee, tea, and soda water. All these affect injuriously the delicate machinery of the circulation, even in small quantity; and when used largely, or in great strength, sometimes affect it violently.

1148. There are numerous other substances of an irritating or poisonous character, not usually diffused through any liquid, but either sprinkled on our food or dissolved in it. Such are mustard, pepper, spices, saleratus, and the like. These are exceedingly injurious to the circulating apparatus, and through that to all parts of the machinery in which the blood circulates. These substances are never digested, but are carried with rapidity into the circulation.

QUESTIONS. — Is the heart very susceptible of irritation? Is its lining membrane particularly so? Is alcohol digested, or is it carried rapidly into the circulation, without any change? What is meant by hard water? How does this prove injurious to the heart? How is it with soft water? What is meant by the evil effects of a thing being cumulative? Are not solid substances sometimes found injurious, as well as liquid ones? What are some of the liquids which irritate the heart? What some of the solids?

SECTION XI. — DISEASES OF THE BLOOD AND HEART.

1149. The heart of man and sundry other of the higher animals is in two halves; between which, in a natural and healthy state, there is no more connection than there is between the heart and the stomach, or even the heart and the brain. So far as the mere purposes of health are concerned, the Creator might have placed one of them in one part of the system and another in a part quite remote from it.

1150. Occasionally, however, we meet with an individual in whom there is a connection between these two halves or parts of the heart, so that the blood contained in the hollows or cavities of the two sides gurgles through. In this condition of things, the blood is never well cleansed or decarbonized, which gives to the surface of the body more or less of a bluish appearance. This disease, called cyania, or blue skin, is exceedingly troublesome; and is, of course, incurable.

1151. The heart sometimes becomes ossified or bony. Naturally, it is fleshy; but, owing to confinement or compression, or perhaps other causes, it becomes bony in certain places. Or, what is nearly the same thing in its effects, the aorta, or great artery which conducts the blood from the heart toward the extremities, becomes ossified near the point where it leaves the heart, and, as the consequence, is liable to be broken by violence, and to cause sudden death.

1152. But, even if no violent motion or sudden gust of passion (for the last might have the effect) should burst these brittle parts, it is not very desirable to have them within us. No person in this condition enjoys firm health. He has a pale or leaden appearance, especially about the eyes; and is liable to a thousand bad feelings, especially when he lies down and rises up, or when there is any great or sudden bodily or mental change.

1153. One individual of this description, with whom I am well acquainted, is liable to sudden and most excruciating pains in the region of the heart, greatly resembling (to use his own words) what would follow if a large knife were thrust from side to side through the cardiac or heart region. These feelings may sometimes, it is true, be connected with stomach affections, especially with that many-headed monster, dyspepsia.

1154. Of the two or three thousand that die every year of heart diseases, in the United States, a large proportion have ossified hearts or aortas. They generally, though not always, die suddenly. Not a few distinguished men have died soon

after the completion of a speech or sermon, during which they had made a strong effort. Not a few die during violent or protracted political or other contests, or at the close of some public day, or large concert, or exciting levee.

1155. Others, however, expire suddenly — perhaps in their carriages — without any obvious, immediate cause. Public men, in large numbers, within the last half century, have died at or near what is called the grand climacteric; or at about sixty-three to sixty-five years of age. One that had studied this subject might almost predict the dissolution of hundreds of such men — not indeed to a day, but to a year or two.

1156. I knew a man about sixty years of age, who, being affected with heart disease, came where I was, to be bled in the arm; but no blood could be obtained. After he left, I expressed my surprise. "The vessels," said the physician, "were all ossified." Now we bleed from the veins, which are seldom found ossified. That man must be most sadly situated who has veins ossified at such a distance from the heart. But so it probably was, in the case I have mentioned; for the man died soon afterward.

1157. We hear, now and then, of sudden deaths under the influence of violent anger, excess of joy, etc. The celebrated Dr. John Hunter perished in a fit of anger; and so did George III. of England. Diagoras of Rhodes, Dionysius, the second tyrant of that name, Chilo, a Spartan philosopher, and Sophocles, are all said to have expired from excess of joy. In all these cases, except that of Dr. Hunter, there was probably heart disease, for otherwise the sudden elevation or depression would not have destroyed them.

1158. Hydro-cardia is another disease of the heart. This organ, as you have already been told, is enclosed in a sack, in which water sometimes collects. The popular name of these accumulations is dropsy of the heart. It is accompanied by troublesome feelings of various kinds, among which are temporary faintings and violent palpitations. Some of our best citizens have perished under it. The disease is incurable.

1159. Angina pectoris is by most medical men considered as a heart disease. John Hunter, above mentioned, is supposed to have had it. Happily, it is not a frequent disease, for it is a very painful affection, and is almost universally regarded as incurable. It is, however, very difficult of detection.

1160. Then, lastly, there are aneurisms of various kinds. There are aneurisms of the heart, and aneurisms of the aorta.

An aneurism is, properly, a sac of blood. The sides of the heart become so thin and weak as to seem swelled like a tumor. In these circumstances they give way, or burst. There are instances, however, in which the arterial coats are thickened, so as to appear as if swelled or enlarged like an aneurism.

1161. But aneurisms of the aorta are much the most frequent, after all; and are very fatal. The thick coat of the artery first bursts, and allows the blood to flow into the cellular membrane; which soon becomes so much compressed as to prevent the blood from flowing very far, and a sac is formed. This sac may remain a long time ere it bursts, though it is apt to burst, sooner or later; and the consequences are fatal. The person is drowned, as it were, in his own blood.

1162. Many complaints, which are supposed to depend on the state of the heart, are nervous or stomach diseases. Disorders of the heart and the other organs of circulation are, in these days, sufficiently frequent, without charging upon this department of the human machinery anything which does not properly belong to it.

1163. The veins have diseases; but the most important one of this kind — and the only one which in a practical point of view is worth mentioning — is that state of enlargement which has given rise to the term varicose. But varicose veins have been already spoken of in another place.

SECTION XII. — PURIFYING THE BLOOD.

1164. Not a little of our modern quackery is fed and nourished and strengthened by the notion that we can cleanse the blood. This liquid can most certainly become impure, and this in various ways. In truth, most persons, by their errors of

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QUESTIONS. — Has man a double heart? Is there no direct communication between its two halves? Where there is a communication, is it disease? What is the disease called? What is ossification? Is the heart ever ossified? Should sudden or violent motions be avoided when it is so? How does a person appear under this disease? What are some of his strange sensations? Of the two or three thousand deaths, annually, in this country, from heart disease, what proportion die of ossification? At about what age are men apt to die of this disease? What anecdote is related about ossified veins? What distinguished men have died suddenly in anger? What ones with excess of joy? What is hydro-cardia? What angina pectoris,—and who died of it? What are aneurisms of the heart? What are aneurisms of the aorta? Do not stomach and nervous diseases sometimes simulate heart diseases? Have the veins diseases? What is the principal?

diet and regimen, as well as by other errors, contribute, more or less, to its impurity every day of their lives.

1165. But, as the purity of the blood depends on the purity of our food, drink, air, etc., as well as the healthy condition of those parts of the machinery which act upon our food to appropriate or digest it, is it not obvious that, in order to purify the blood, we must purify the materials from which it is made, and improve the condition of the machinery which is employed in making it?

1166. And in accordance with what plain common sense would dictate, beforehand, we find all human experience. Though we spend our millions and tens of millions, every year, on various articles for purifying the blood, and perhaps indorsed by men of high reputation, we seldom hear of any cures performed by them which could not be traced quite as easily, and with greater certainty and simplicity, to a change of habits, or of diet and regimen.

1167. The absurdity of the common notion about purifying the blood, and thus removing disease from the human system, must be apparent when we consider that the blood is never, for one hour, nor even for one minute, the same. It is used up and wasted continually; and as certainly renewed. The whole quantity in the body would thus disappear in a very few days, were it not continually renovated.

1168. Now, suppose it were possible to purify three gallons of blood, which are coursing their way in my arteries and veins at the present moment. Twenty-four hours hence, if I continue alive and in health, one-third or so of the old blood will have disappeared, and a new-formed quantity will occupy its place. Will not this new recruit of blood want purifying in its turn? How is the mass of blood, now in my system, supposing it were pure, likely to make the blood which is formed hereafter — to-day, to-morrow, and next day — pure?

1169. The very idea is as absurd as would be the idea of cleansing the waters of a flowing stream. For, suppose such stream to be cleansed this day, — this hour, — how long will it remain so? The present mass of waters running by will soon be replaced by another mass coming from the same contaminated sources; and the process of cleansing, for aught I can see, must be repeated as often as the mass of waters is renewed, or the idea of a pure stream should be relinquished.

1170. This thought is repeated and retained, because the error which it is desired to remove is one in which ignorance,

quackery, and humbuggery love to revel. Remove it, and you remove half the sources of a tax on the community equal to a hundred million of dollars yearly. But this estimate includes time wasted, and many other items, besides the mere first cost of the medicines which are used.

1171. If people are in earnest to purify the blood, let them pursue such a course of conduct as will be likely to form good blood of suitable materials, and to keep it so. They who would have the products of a factory such as they wish them to be, must take good care of the machinery. The requisite care of the human machinery is not of less importance with a view to the desired results.

1172. It may not be amiss to say, here, what should be said somewhere, that medical quackery, especially the sale of nostrums, would be greatly diminished if good and enlightened men would cease to recommend such medicinal preparations. Many of them, I grant, are efficient medicines; or, what is more correct, they are very efficient and active poisons. It would be the strangest thing in the world, if a few persons should not get better under their use.

1173. Among these few is here and there an individual — one or so in a million — whose name is worth trumpeting abroad, in recommendation of the wonder-working medicine. His recommendation is therefore obtained, and made available in the sale of almost endless tons of the medicine, by being published from one end of the land to the other. Those who are not benefited, of course, have nothing to say; and dead men never tell tales.

1174. But observe, that, even of those who seem to be benefited by the use of a particular medicine, it is quite probable that a majority recover or improve in spite of it; and that a very considerable number recover as the consequence of a wise return to proper obedience to physical law. They pay the penalty of transgression, and nothing remains but to let Nature reinstate them once more in their wonted health.

QUESTIONS. — What prominent error lies at the foundation of modern quackery? But is not the blood sometimes actually impure? On what does this, then, chiefly depend? What does common sense say? What does experience? What physiological consideration shows the folly of attempting to cleanse the blood? What illustrations of this folly are given? In what do ignorance and quackery love to revel? What is to be gained by removing this error? What must they do who are really in earnest about having pure blood? Are not our nostrums — some of them at least — very efficient medicines? How do they get into use?

SECTION XIII. — EDUCATION OF THE HEART AND BLOOD-VESSELS.

1175. The proper education of the body and mind, generally, has much to do with the right condition of the heart and arteries, and their contents, the blood. Or, in other words, the best education throughout, is, at the same time, the best for the circulation and the blood.

1176. But is there nothing to be done, then, directly, which will influence the heart and arteries and blood? Can we neither strengthen the former nor purify the latter, except by such general efforts as invigorate the whole system? The lungs and stomach have been shown to be susceptible of improvement; ay, and even the muscles. Are the heart, arteries, and veins beyond the reach of all our educational attempts, and this because they are deeply situated?

1177. It is very well known that certain moral qualities have much to do with the size and strength of the heart and arteries. The man with large heart and high bounding arteries will be a man of physical courage; while the man of feeble circulation will be the reverse. He will be, in very deed and truth, chicken-hearted.

1178. There is, moreover, both action and reaction. Not only will the chicken-hearted or hen-hearted be hen-hearted physically (for the hen is well known to have in reality a comparatively small heart in size), but, under the indulgence of a hen-hearted disposition, the heart and arteries can never gain much in point of strength and efficiency.

1179. Were there no other earthly reason for educating the young so as to render them bold and courageous — truly lion-hearted — but that they may be lions indeed in the cause of truth and righteousness, this surely would be sufficient. For we are all too timid. The world, the flesh, and the devil set up claims, and who is he that dare oppose them? Whereas we ought to obey God rather than man. We ought to be bold and brave enough to do that which is right.

1180. I remember an old schoolmaster, of almost fifty years ago, who got up a very formal, not to say imposing, imaginary trial one day in his school. The offender was "can't," or "cannot." The accused tried to defend himself, but in vain.

Are they often the cause of cure, after all? How often? How, then, can we explain the fact that some persons actually get well while using them?

Poor "can't" was condemned, and as the teacher declared — who was both judge and jury — was expelled from the school.

1181. The great idea to which I wish to draw your attention by this anecdote is the enfeebling tendency of saying "I can't," especially on the nerves and on the heart. It is by no means improbable that those of the young whose framework is but feeble are among the first to fall into the habit of saying this; nevertheless, the more they yield to it, the worse will be their condition.

1182. It is not those who say *I can't*, but those who say *I'll try*, who will be able to do something in this world. I *can't* is hen-hearted; I'll *try* is lion-hearted. I *can't* increases the hen-heartedness; *I'll try* gives tone and vigor to the whole circulatory system.

1183. It is on this account that *can't*, either with or without formalities, should be expelled, not only from all our schools, but from all our families. Were we, as parents and children, to be in the habit of demanding impossibilities of our children, this attempt to expel a natural feeling from their bosoms would be not only useless, but cruel. But none of us will plead guilty to this charge. We only demand of the young what they are able to do, — what, in a word, they ought to do. At least, they ought to attempt it, and in good faith.

1184. When Abraham, at the command of God, said, practically, "*I will try* to follow thee," though without knowing whither he went, he was as truly and certainly invigorating his physical frame, especially his nervous and circulatory systems, as he was growing strong in a moral and spiritual point of view. Let our children be educated to Abraham's faith, and to Abraham's courage, too, and the reward would be exceedingly great.

1185. Need I point out to you the great evils of all those early habits, in family and school, which, if they do not originate timidity and irresolution and corresponding feebleness of body and mind, do, at least, foster and encourage that morbid growth of all these which is the almost certain product of the soil of a world into which sin has entered, and in which it holds nearly universal sway? Surely a word to the wise, in this particular, must be sufficient.

QUESTIONS. — Is there a natural connection between the right education of the heart and arteries, and the right education of the body and mind generally? Can we educate the heart and arteries by direct efforts?

CHAPTER VI.—BREATHING AND VENTILATION.

SECTION I. — LIVING ON AIR.

1186. "BE it remembered," says Mr. Thackrah, an eminent British writer on the health of human employments, "that man subsists on air more than he does on his meat and drink." The remark, though not strictly true, has truth in it. We subsist much more on air than those who have not examined this subject will readily believe.

1187. But how can man — it may be asked — be said to live largely on air? Surely he cannot eat or drink it, nor could it, if eaten, make blood, or flesh and bones. This is true; and yet we can neither eat nor drink, nor do any thing else, to much purpose, *without* it; at least, many moments. Let our food and drink be ever so healthy, and our chyme and chyle ever so well formed, yet, if the lungs and other contiguous parts do not perform their office perfectly, we can have no good blood, or healthy flesh and bones; nor can we long survive.

1188. It would even be natural to conclude, beforehand, and without any physiological knowledge, that man has something to do with the air. Here it is, all around us; and, as our astronomers say, forty-five miles high. We are inhaling it, at about a pint at a time, nearly a hundred thousand times every twenty-four hours. Thus we every day receive into our lungs about fifty hogsheads of this fluid. Must not this fact *mean* something?

1189. We receive our "meat and drink," in ordinary cir-

What is meant by the phrase hen-hearted or chicken-hearted? What by lion-hearted? Should we not educate the young, then, to be lion-hearted?

What anecdote is related of an old schoolmaster? Is it desirable that "I can't" should be expelled from all our schools and families? Is it not enfeebling to the frame to be timid? Does it not strengthen us, on the contrary, to be resolute, and to say, "I'll try"? Are not children in duty bound to say, in reply to parental direction, "I'll try"? What is said of Abraham? How must we be educated in order to have Abraham's faith and courage?

cumstances, at most but three, four, or five times a day; but we are taking into our bodies — eating, so to speak — atmospheric air, every three or four seconds; and, if we did not do this, we should speedily perish.

1190. Let us consider, briefly, what is the object or end aimed at by an arrangement which brings so much air into our bodies. Let us see what changes the air has to make or undergo while in the cavity of the lungs.

1191. There are three great objects accomplished in breathing or respiration, besides others of minor importance. These are — 1. The change of chyle into blood; or at least the completion of this work. 2. The renovation or depuration of the blood already made, but partly spoiled during its circulation in the body. 3. The calorification or warming of the whole body, especially the lungs themselves.

1192. With regard to the manner in which these important results are accomplished by the lungs, there is some difference of opinion; but there are two great facts in which I believe all physiologists are agreed. The first is, that the venous blood, which during its circulation in the body loses much of its oxygen and becomes loaded with carbon, is no sooner brought to the lungs and diffused in the coats of their air-cells, than it loses more or less of its carbon, and acquires a full supply of oxygen.

1193. A second fact is equally well established. It is, that, while the blood is thus renovated in the lungs, a great change takes place in the air which is in close contact with the blood in the air-cells. Something like one-fifth or one-fourth of its oxygen disappears, and its place is partially supplied by an increased quantity of carbonic acid.

1194. About twenty per cent of pure atmospheric air is oxygen, and nearly eighty per cent nitrogen. Though the respiratory cavity will hold from three to four quarts, yet, as we have just seen, we ordinarily inhale at once but about an eighth part as much, or about a pint; so that air, which has been once inhaled or inspired, on being thrown out of the lungs is found to contain only about fifteen or sixteen per cent of oxygen.

1195. If we breathe the same pint of air a second time, another portion, say one-fourth, of the remaining oxygen is used up; and another quantity of carbonic acid is substituted in its stead, and thrown off. If we breathe it a third time, we lose about another fourth of the oxygen, and so on.

1196. However, it is wrong to do thus, if we can help it.

We shall see, hereafter, that no air ought to be breathed twice over. We begin to feel uncomfortable, more or less, as soon as this is done; but we suffer much more after we have breathed it the third time. Dr. Franklin found that, when an adult confined himself more than one minute to the same gallon of air, he suffered very severely.

1197. We ought always to have air in our lungs that is, one-fifth of it, oxygen. We can, indeed, live a short time in pure oxygen; or in a mixture of one-half oxygen; or with a considerable quantity of carbonic acid in the lungs; or with more than the usual proportion of nitrogen. But all these conditions are unnatural, and tend soon to disease. Dr. Jarvis, in his Practical Physiology, says: "We spoil, for all the purposes of respiration, about four cubic feet of air a minute."

1198. Yet very much depends, as may be seen, on what we mean by the word *spoil*. If we receive, at each ordinary inspiration, a pint of air, we only respire about seven hundred cubic inches in a minute; which is considerably less than half a cubic foot. How then can we be said to spoil four feet in this same period?

1199. I will endeavor to explain. We not only use up one-fourth of the oxygen in each pint of air we successively throw out of the lungs, but along with it some eight or nine per cent of carbonic acid, which, in the proportion of more than three or three and a half per cent, is unsafe to be inhaled again. We see, therefore, that according to these more extended calculations we render about four cubic feet of air unfit for use, every minute.

1200. But these estimates — even these — fall short of the real truth. For, though we can endure, without serious immediate injury, the presence of some three or four per cent of carbonic acid gas in the air we breathe, yet, in a normal state, the atmosphere does not contain one per cent. To be perfect, therefore, we ought to have *more* than four cubic feet of pure air a minute; and Dr. Jarvis says, that, "taking the lowest estimate, seven feet will be considered as necessary for the maintenance of the healthy respiration of each person." Dr. Reid allows ten feet.

1201. Let us adhere, for the present, to the *seven feet*. This is four hundred and twenty feet an hour. Now I have slept in many a room not more than ten feet by seven. If such a room were airtight, and the air in it were to be spoiled at the rapid rate of four hundred and twenty cubic feet an hour, it would take but a single hour to spoil the air of such a room to the

depth of six feet; and, in such a case, what would become of the occupant? But these rooms are not often air-tight, and hence we seldom perish in them; though in the progress of several hours most people suffer in them, and a few perish.

1202. How many times I have seen from thirty to fifty children "cooped up" in a school-room eighteen feet long by sixteen broad! Suppose there were only thirty children present, and that, with their immature lungs, they only spoiled the air at the rate of two hundred and ten cubic feet an hour. Yet, even at this rate, if the room is perfectly air-tight, the whole mass of air will be spoiled to the height of six feet, in about nine minutes.

1203. But we may be assured — and in the assurance we ought to be thankful — that there are none of our school-rooms, of the old-fashioned, contracted kind, which do not permit, more or less, a circulation of air. Still, the suffering, in loss of general health and vigor, in many a school-room where ventilation is unattended to, is immense.

SECTION II. — THE MACHINERY OF RESPIRATION.

1204. The apparatus, or machinery, of respiration or breathing is inclosed in the upper part of the trunk of the body, called the chest. Everywhere, except at the bottom, it is surrounded with a framework of bones, which, in its natural or normal condition, has a slight resemblance to the old-fashioned bee-hive. It is broad and spreading at the bottom, but contracted and tapering at the top. Or, as some would say, it is conical, or cone-shaped; or as others, still, it is shaped like a sugar-loaf.

QUESTIONS. — What eminent writer says that we subsist more on air than on food? Has not the statement some truth in it? Will you tell me how it can be, in any measure, true? What evidence have we, "beforehand," that man has much to do with the air? What are some of the great ends of breathing or respiration?

Is there not a considerable difference of opinion among learned men about the offices of the lungs? Does this concern the facts in the case, or the modes of change? What are the two or three great facts of respiration on which all, or nearly all, agree? How much air do we ordinarily inhale at once? Will not the lungs hold more? How much will they hold? How rapidly do we consume the oxygen of the air we inhale? What did Franklin say? What does Dr. Jarvis say? How is this to be understood? What example is given of using up air very rapidly in a bed-room? What in a school-room? Have we many airtight bed-rooms and school-rooms? While mankind remain as ignorant and as reckless as at present they are, is it not well that it should be so?

1205. This bony framework is made up by the spine or backbone in the rear, the breastbone in front, and the ribs at the sides. The ribs, twelve in number on each side, begin at the spine and go forward in a curved or semi-circular direction to the breastbone. Seven of them are attached directly to the breastbone; the other five, indirectly. The collar-bones, which pass from the top of each shoulder to the breastbone, like shoulder-braces, though they appear at first view to aid in closing up the top of this cavity, have in reality but little to do with it, except to strengthen it.

1206. Between the ribs are short muscles, passing obliquely from one rib to another, and seeming to cross each other, like the main strokes of the letter X. Such is the relative situation of the ribs and muscles, that, when the latter contract or act, they slightly enlarge the thoracic cavity in every direction except the perpendicular one. They do this by raising the forward part of this bony cavity.

1207. The bottom of this cavity consists essentially of an umbrella-shaped membrane, which is muscular, and called the diaphragm. Is so situated and fastened that, when it contracts, it is rendered less convex, and hence increases the capacity of the thorax in that direction, as the contraction of the muscles does in every other.

1208. When we wish to respire, or, as we say, draw our breath, the muscles between the ribs, and also the muscular membrane or diaphragm of which I have just spoken, should instantly contract, and enlarge the thorax in every direction, so that it will hold a pint, or so, more than before.

1209. Thus is formed a vacuum in the chest, into which air rushes, to the extent I have just mentioned. We can, indeed, so expand the chest by a strong and greatly prolonged effort as to admit much more than a pint; but this is, in general, about the average quantity (1194). Thus the motion of the chest is partly voluntary and vital, and partly involuntary and mechanical.

1210. The air which we breathe does not rush into the open cavity of the thorax, but into two considerable air-bags, which, with their contents, we call the lungs. They hang somewhat loose and pendulous; and yet always fill the thoracic cavity. The inside of this cavity of the thorax is lined by a fine, smooth, shining membrane; and the outside of the air-bags or lungs, where they rest against it, is covered with the same.

1211. The inside of the lungs is so curiously constructed,

that it is not easy to describe them. The air, when it rushes into the lungs, to fill the vacuum before mentioned, is obliged to pass through a large tube, in the fore part of the throat, called the windpipe. When this tube reaches the level of the air-bags, or lungs, it divides into two: one for the right side, the other for the left.

1212. Each division, on entering the lungs, is divided; and these branches, in their turn, subdivided; till the branches seem thicker than the limbs of the thickest bush or shrub. They are called the bronchial tubes. Though their number appears to be immense, there is room between them for blood-vessels and nerves, and a good deal of cellular membrane besides.

1213. These bronchial tubes, after dividing and subdividing to such an extent that the naked eye cannot follow them, terminate in clusters of air-cells or bladders, so exceedingly small that some of them are said to be but the hundredth part of an inch in diameter. Their aggregate number is immense.

1214. But, small as these cells are, and thin as their covering must be, it is in this very thin covering that the blood is circulated,—both the old blood and the new,—and here the changes take place of which in the preceding section I have spoken. The whole internal surface of the lungs, if it could be demonstrated or exhibited, would doubtless astonish us. The number of the cells has been estimated at six hundred millions.

1215. Now, if these estimates approach the truth at all, and if we suppose, as some have done, that one thousand of their coats, if spread out, would make an aggregate surface of a square inch, the whole superficies of these cells would equal four thousand square feet—equivalent to a covering for almost one-tenth of an acre of ground!

SECTION III. — CAPACITY OF THE LUNGS.

1216. From what has been said, in the preceding section, it is obvious that the man who has the largest lungs, all other things being equal, and at the same time keeps them best

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QUESTIONS. — Where are the lungs situated? By what are they almost inclosed? What is the general shape of the bony cavity? How are the ribs connected by muscles? On what sort of a base do the lungs rest? How does air get into the lungs? What large tube must it pass through? Has it innumerable branches? What are they called? In what do they terminate? Are these cells very numerous? Are they very minute? Were their surfaces spread out, or fairly exhibited, how large a surface is it estimated they would cover?

supplied with the purest air, must be the most healthy. For, the larger the lungs, the more air they will hold; and consequently the more oxygen and carbon can be presented to the surfaces of the air-cells, to be absorbed or expelled, according to the circumstances.

1217. It has been shown (1194) that the lungs will hold, in some instances, a gallon of air. Farmers, laborers, soldiers, and sailors, who have a large amount of out-of-door exercise, have, in general, the largest lungs. There may, of course, be here and there an individual, of this description, the capacity of whose lungs is somewhat greater; but, in a country where there is so much compression by dress, and so many consumptive people, the chests of thousands of people will scarcely hold as many as three quarts.

1218. From the beginning of the present century—perhaps earlier—the capacity of the human lungs has been diminishing. If it has diminished most rapidly in the female sex, still our own cannot be far behind. If mothers have small or feeble lungs, the inheritance of the next generation must be immediately affected. There is no possible escape.

1219. The late William Sullivan, a distinguished lawyer of Boston, and author of The Moral and Political Class-Books, in view of the prevailing customs of female dress, was accustomed, many years before his death, to say that, if the existing state of things should continue three hundred years longer, the present race of mankind must become extinct.

1220. Now, it is difficult for me to admit, for one moment, the bare possibility of such a result; and yet I confess I am not wholly without forebodings. The prospect is certainly discouraging. Clouds and darkness are round about us; yet let us remember that, in some instances, it is the darkest time just before daybreak!

1221. Admit that many persons, with comparatively small lungs, do yet outlive others, as well as enjoy better health than they while they live; still, it were better, if those lungs which are diminutive could be gradually enlarged. The fortunate holder would have tenacity of life still greater, as well as greater power of muscle. And if it be true, as held by Mrs. Willard and others, that the lungs, and not the heart, are the seat of life, it is of incalculable importance that the former should be well developed.

1222. It may not be unworthy of remark, though I suppose the fact is generally known, that they who possess large chests

are not only stronger and more tenacious of life than those whose lungs are slender, but they are also less liable to that fearful scourge of the country, pulmonary consumption.

SECTION IV. — FREE MOTION OF THE LUNGS.

1223. I have stated, very briefly (1206–1208), the manner in which the lungs are moved. The leading object of the present section will be to show that, during their movements, they should be free and unembarrassed.

1224. The motion of the bony cavity of the lungs is, essentially, double. The first division of this double movement may be briefly described as follows. The ribs are attached to the spine in such a manner that there is an upward and downward motion of the whole bony cavity, like the slight elevation and depression of a trap-door on its hinges. When we inhale air, the edge of the trap-door rises a little; when we expel the air, it falls.

1225. The second part of this complicated motion is less easily understood. It is as if the ribs, on each side, as a whole, had an independent motion from the centre, like that of an inverted steel-trap. When we inhale air, the two halves spread and expand the internal cavity; when we expel the air, they again collapse, or approach each other.

1226. The result of this double and somewhat complicated motion is, that, during the time when the lungs are most filled and expanded by air, the diameter of the cavity is considerably increased in every direction, both horizontally and perpendicularly. The motion is greater or less, according to the force or energy of the general act of respiration.

1227. Now, there should be nothing done in the way of dress, posture, eating, or anything else, to prevent the twofold motion I have mentioned. There should be no pressure upon the sides or front of the body, either above or below the base of the lungs. Such pressure operates as a weight, and

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QUESTIONS. — Is he who has the largest lungs, and who breathes the most and the purest air, most likely to be healthy? For what reason? How much will the lungs generally hold? What classes have the largest lungs? Who, in general, have the smallest? Is the capacity of the human chest now on the decline? Is this owing largely to dress? What did Mr. Sullivan say? Is there not hope he was a little mistaken? Do large lungs give greater tenacity of life? What should be done, then, especially if Mrs. Willard's theory should be true? Are people with large lungs less liable than others to pulmonary consumption?

greatly impedes that free motion which is so desirable, and without which the lungs can but feebly perform their duty, and the blood be but partly oxygenated.

1228. Nothing can be more obvious than that a weight, or clog, suspended from the edge of a trap-door, would impede or embarrass its motion. It is also equally obvious that the opening and closing of a gate or common door, hung perpendicularly, in the usual manner, might be impeded in the same way. These may serve as illustrations.

1229. All tight dressing does this, as most of us must be aware. Or, if it should be said that tight dressing is out of date, my reply is: It was always said to be so, by those on whom it was charged. Thousands have been ready enough to criminate others in this matter, though very few have ever been willing to confess themselves in fault. It is certainly true that there is less of this tight dressing than there was twenty-five years ago; but there is still quite too much of it. (286–289.)

1230. And then the custom of wearing a vast amount of dress and wadding across the hips is not without its influence with regard to the motion of the lungs. We have seen that the diaphragm—the arched membrane on which the lungs rest—requires free motion. But this it cannot have, when a weight hangs from the hips, or when the abdominal muscles are so compressed that they cannot, by their proper action, draw down the diaphragm.

1231. In truth, pressure, of every kind and sort and in every degree, whether against the chest or the abdomen, and whether from above or below, impedes the action of the lungs, They who sit or stand habitually in a crouching posture, *i. e.* with their shoulders thrown forward, whether at study, labor, or amusement, are injuring themselves in the same way.

SECTION V.—CARBONIC ACID GAS IN THE LUNGS.

1232. You have seen, already (1190—1201), that carbonic acid gas in the lungs, except in very small quantities indeed, is

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QUESTIONS.—Is there a double motion of the bony cavity of the lungs? Can it be easily described? What is said of the vertical or trap-door movement? What of the steel-trap motion? Is the diameter of the chest increased by inhaling air, both horizontally and perpendicularly? In what various ways can this motion be impeded? Does tight dressing have this effect? Does wearing a great amount of clothing about the hips have a similar effect? Do wrong positions, in study, labor, or amusement, have the same effect?

a very destructive agent; though we shall understand this more clearly when we come to the section on "Death from Charcoal."

1233. We have also seen, in part, how this deleterious gas is manufactured. It belongs to the present section to show how to guard ourselves, in the varied circumstances of our lives, against a foe that is almost everywhere present, and almost always injurious.

1234. It was intimated, in another place (1200), that one per cent, or so, of carbonic acid gas in the lungs was not injurious. Those who have most deeply examined this subject tell us that, besides about four-fifths of nitrogen and one-fifth of oxygen, the atmosphere contains, as inherent in its constitution, a very small quantity of carbonic acid. How much, they are not quite agreed; but no one places it higher than one per cent. It may be much less. This small proportion has been, therefore, considered uninjurious. At least, if injurious at all, the injury is so trifling or so remote as to be hardly appreciable.

1235. But it requires no little care and caution to prevent the inhalation of this gas in proportions much larger. When we are abroad in the open atmosphere, we are not under the necessity of inhaling more of it than that atmosphere constitutionally contains; for it is much heavier than the rest of the ingredients of the air, and, in larger proportions than one per cent, or so, falls quickly to the ground, and is beyond our reach.

1236. You may be inclined to ask, here, whether, in some densely populated spot, as in the lower part of our large cities and villages, it might not, in the compass of days, weeks, or months, so accumulate as to annoy us, especially if we happened to sit or take the recumbent posture while in it.

1237. In general, the motion of the atmosphere prevents such accumulations; and so does vegetation. All vegetable growth absorbs or consumes it, in a greater or less degree. It is, in truth, the very food which the craving vegetable world demands. Then, again, water, by its incessant motion at the surface, absorbs some of it.

1238. Beyond all this, however, we find a highly important law in chemistry which illustrates the subject, and removes the difficulty in a manner more striking still. It is a law among gases that one gas will absorb another; or, at least, that the gases will commingle. Even the heavier gases, like carbonic acid, when they have the lighter gases above them, will gradually find their way into them. So that the Creator has, as

you see, specially provided against such accumulations, at least, permanently.

1239. Practically, however, and for a time, such accumulations do exist. Where there have been sudden or large collections of carbonic acid, as in some mine or coal-pit, or well or cellar, or even bedroom, a considerable time must elapse before it will all be removed, or even become diffused in the atmosphere, or into other gases; and hence the injurious and sometimes fatal results which follow.

1240. Thus, suppose a house has been burnt, and, during the combustion, the well near it has been half-filled with carbonic acid gas. A few days after the fire, a person descends to remove the rubbish in it, or perhaps to bring up a bucket, which, in consequence of the rope being burnt off, had fallen in. He sinks under the influence of the choke-damp, as it is called —the carbonic acid—and, unless quickly removed, perishes.

1241. You have heard of the Grotto del Cane, in Europe, in which a human being may walk uninjured, while the faithful dog at his side perishes. Here is a layer of heavier carbonic acid gas, which is deep enough to drown the dog, so to speak, but not deep enough to drown his master.

1242. Then you have heard the far-famed and oft-repeated story of the Black Hole, at Calcutta. There, out of one hundred and forty-seven persons confined in a dungeon, eighteen feet square, with little or no ventilation, one hundred and twenty-four perished in less than twenty-four hours, and the rest were almost dead ere they could be taken out.

1243. Now, neither of these cases absolutely proves that the heavy carbonic acid remains always at the bottom of the atmosphere, and next to the ground; but only that, in some circumstances, it is not so rapidly diffused, or removed, or used up, as to prevent evil results.

1244. In the first instance—that of the well—the carbonic acid, or choke-damp, being confined to a deep pit, is not much agitated by the air, and it meets with no vegetation to absorb it. And then, too, from its great depth and comparatively narrow extent of surface, it is commingled with the atmosphere and with other gases but very slowly. It might be days, if not weeks, in wholly dispersing itself.

1245. In the second instance—that of the Grotto del Cane —it is doubtless true that, though the gas is diffused more rapidly than in a deep well, yet it is, after all, diffused slowly.

Besides, the same cause which originated it still continues it; so that, as fast as it is removed, it is renewed.

1246. In the Black Hole at Calcutta, the accumulation from nearly one hundred and fifty pairs of lungs was so great, and the circulation of air so limited, that the whole dungeon was soon filled with it, from bottom to top. No wonder the prisoners were thrown into a raging fever, — a fever that terminated in a few hours in putrefaction and death.

1247. I might add to these facts almost illimitably, but I need not; except to say that, though in the account of the Black Hole at Calcutta we have an extreme case, yet cases, not unlike it, in their general character, are of every-day occurrence, all over our country. The blackest places among us are our own sleeping-rooms. Of these, however, in addition to what has been already said (1201), I shall speak freely in the sections on "Deaths from Charcoal," and "Ventilation."

1248. Our school-houses, lecture-rooms, vestries, conference-rooms, concert-halls, town-halls, factories, and even the rooms we occupy in our daily domestic employments and duties, all come in for a share in this destruction of health and life. I do not, in fact, see how it is possible, as things are now arranged in civic life, wholly to avoid it.

1249. Many years ago, a severe disease prevailed every year in the village of Newton, Upper Falls, in Massachusetts. At length the principal individual there — a shrewd man — set his head at work on the subject. As the result, he told the people that, if they would have their sleeping-rooms larger and cleaner, and would keep them well ventilated, and would, at the same time, keep clean their cellars, pantries, and wells, the fever would not trouble them. The suggestion was followed out in good faith; and from that day to this — now twelve or fifteen years — no cases of epidemic disease have existed.

QUESTIONS. — Is carbonic acid gas very destructive when inhaled? Is it of the utmost importance that we should know our danger in this particular? How much carbonic gas may be safely admitted to the lungs? Must we avoid, with the greatest care, all proportion of it beyond one per cent? What important inquiry — sometimes made on this topic — is mentioned and answered? What very striking chemical law about gases is mentioned? Practically, however, is there great danger still? What illustrations of this are presented? Will you state what is said of wells — of the Grotto del Cane — of the Black Hole of Calcutta, etc.? What general principle do these facts go far toward proving? Why does the carbonic acid remain so long sometimes in a well? Why in the Grotto del Cane? Why in the Black Hole of Calcutta? Are there cases to be

SECTION VI. — OTHER INJURIOUS GASES.

1250. There are several other gases to which we are sometimes exposed, which, though not so injurious — because less frequently applied, or because applied in small quantity — as carbonic acid, are yet more or less inimical to life and health. Carburetted hydrogen, sulphurous acid, and sulphuretted hydrogen are the principal.

1251. Carburetted hydrogen is more or less offensive to the smell, and greatly poisonous. It results from the spontaneous decomposition of vegetable substances. Hence it is found about our wells, sinks, pumps, and cellars. Some of our towns and villages are lighted by a gas which is either very much like this, or the very same thing. It is what the miners call fire-damp, whose explosions, till Sir Humphrey Davy invented the safety-lamp, were so destructive of human health and life.

1252. There are few persons to be found who have not seen small bubbles rising from stagnant water, — such as the common mud-puddles, — when suddenly agitated, in a hot summer's day. These bubbles are bladders of carburetted hydrogen. They are highly inflammable, but the flame is very pale.

1253. Those who have been passing along the streets of our cities, soon after the escape of a quantity of the gas which is used for lighting them, will hardly need be told that what it is so dreadful to inhale is really and truly poisonous. Breathed but a very short time, it often causes nausea, giddiness, and great nervous and general prostration.

1254. A wealthy New England farmer, one fine September day, sent in great speed for his family physician. On arrival, he found two or three members of the family exceedingly sick, with a species of typhoid dysentery; and other members of the family "getting down." The alarm was very great all over the neighborhood.

1255. The family physician was young, and, at his special request, an older physician was called. Local causes of the disease were suspected, and a search made accordingly; not, however, without some *grumbling*, especially on the part of the "female head of the establishment."

1256. The cellar was first penetrated. Most evidently, it

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found which resemble them all over our country? Should we wonder, then, at the destruction of human life? What is said of our school-houses, lecture-rooms, halls, factories, etc.? What important anecdote is related to show the power of human control in this matter?

had not been cleaned for years. It was, as it were, full of putrifying cabbage, potatoes, apples, turnips, and other vegetables, to say nothing of cider, beer, half-putrid flesh and fish, and animal matters still more offensive. In short, it was a great manufactory of carburetted hydrogen.

1257. "We need not go farther," said the consulting physician, when he saw the putrifying heaps in this grand receptacle of a rich agricultural family. But they did go farther. They examined the sink and the well, which were in close contact, — the latter replenished daily by the former. Its contents, moreover, were greatly limited, even when thus aided by the sink, for there was a severe drought. What water it contained, moreover, had little if any circulation.

1258. To cap the climax of causes of disease, they found the vault, and even the barn-yard and wood-yard, so situated in a natural concavity, instead of occupying an elevation, that the essence of the united streams of filth must inevitably have been added to the scanty stock of well-water before mentioned, whenever the slightest shower fell; and, unless purified by passing through the earth, as the common belief is, must have increased its power to contaminate the blood and solids, and to excite disease.

1259. It is almost unnecessary to say, that, after clearing out above and below, without and within, the sickness abated; and no other person, far or near, beyond the family first afflicted, ever contracted the disease. Not, however, till several in the family itself had paid the forfeit of their lives; nor till every person, of but ordinary observation and sound sense, began to believe that, even if God sends diseases as judgments, the putrid vegetables and carburetted hydrogen gas had here an agency, as second causes.

1260. Some suppose that the burning of lamps and candles is one source of this gas. There are so many other known and established sources of impurity about our dwellings, whenever cleanliness and ventilation are neglected, — some of them tending most directly to the production of this particular gas, — that it would be idle to refer it to any cause which is at all doubtful.

1261. Sulphurous acid is occasionally found in our dwellings, especially where anthracite coal is used in imperfect fixtures. It is also inhaled in some of our manufactories, where bleaching is demanded; as in the case of straw-bonnet making. It

may easily be detected by its acid smell, and is very unhealthy.

1262. But, poisonous as carbonic acid, carburetted hydrogen, and sulphurous acid may be, they are none of them half equal in virulence to sulphuretted hydrogen. This gas, so well known by its extremely unendurable smell, is as deadly as it is offensive. Carpenter, in his Principles of Physiology, tells us that air, impregnated with one fifteen-hundredth part of it, if inhaled, will kill a bird in a very short time; and that a quantity but little more than double, viz., one-eighth of a hundredth part, "will kill a dog."

1263. To those who have ever been present when a putrid or semi-putrid egg was broken, or a common vault exposed, no particular description of this gas will be needful. It is also well known to predominate in the gases which are found in the alimentary canal of debilitated men and domestic animals; and its sudden ejection, with great noise, was once supposed to be an indication of high health.

1264. But may we not take courage, and indulge the belief that humanity does really advance, when we find the recipients of such errors as the last mentioned beginning to grow ashamed of themselves? Why, it is not yet fifty years since many good men would have indorsed the opinion above, as well as those which declare nothing to be useful for human food that does not contain a little poison, and no one perfectly healthy who has not, in his intestinal domain, fewer or more living animals.

1265. When sulphuretted hydrogen gas, even in a diluted state, is inhaled by human beings, it lessens the force of the circulation, enfeebles the muscles, stupefies the brain, and induces a general prostration of the system. It requires a long time to restore to their usual strength and elasticity of body and mind those who have been severely affected by it. It is, moreover, very penetrating, and can force its way through every living tissue of the body.

1266. It is a general rule that injurious gases are offensive to the smell. The only exception, in the case of the four gases which most oppress the lungs, is that of carbonic acid gas. This has little if any smell. Thousands insist that their atmosphere is pure, because it has no bad or offensive exhalation in it; whereas, it is certainly possible for the air to seem wholesome and agreeable, while it is very deadly. The man who descends into a well filled with carbonic acid gas, seldom,

if ever, suspects any danger, from even the smell, till he swoons away and perishes.

SECTION VII. — INHALING DUST OR EARTH.

1267. The notion was once very prevalent that dirt is healthy, especially in certain chronic diseases. But this is utterly a mistake. It is neither healthy to the outside nor to the inside. It is unhealthy even to the skin, and should be removed as soon as is practicable. But it is still more injurious to the lungs; and we should avoid inhaling it with still greater solicitude.

1268. Perhaps it is not surprising that mankind should have made the mistake of supposing dirt to be healthy. They observe that those who have much active exercise in the open air, where they are exposed greatly to dust, are more healthy, as a general rule, than other people; and they hastily infer that they are healthy as a consequence of their dirt, at least in part, — whereas, the truth is, that they are healthy in spite of it. They owe their good condition to the sun, to exercise, to air, and to general cheerfulness.

1269. Dust, when inhaled, adheres more or less to the lining membrane of the windpipe, the bronchial tubes, and perhaps the air-cells of the lungs. If other causes are already operating to produce irritation of these parts, the additional effect of the dust may rouse a latent predisposition to fatal disease. In general, however, considerable time elapses, and many and various transgressions are committed and repeated, before the full penalty is inflicted. Space is thus given for repentance.

1270. It should also be stated, in passing, that, though a

QUESTIONS. — Are there not other gases besides carbonic acid which are injurious? Which are the three principal ones? What is the origin of carburetted hydrogen? Is it very poisonous? Does it ever explode? For what purpose is it used in the arts? Is it ever found in mud-puddles? What anecdote is related of the family of a wealthy New England farmer? What lessons of cleanliness may be learned from this anecdote? What is said of burning lamps and candles? How and when is sulphurous acid developed? May it always be detected by its smell? What gas is the most poisonous of all? In what proportion, with common air, will it kill birds? In what proportion will it kill dogs? On what authority is this given? Is it ever found within the human body? What facts are alluded to as indicative of human progress? Is it not a general rule that all bad gases are offensive to the smell? What remarkable exception to this rule? What fact is stated, at the close of the section, to prove it?

small portion of dust adheres to the lining membrane of these tubes and produces irritation, yet this irritation is always in proportion to our feebleness and natural predisposition to disease. In very strong and healthy people, most of this dust will be removed, either by absorption or expectoration.

1271. Some of the German physiologists and hygieists are opposed to the use of carpets, on account of the cloud of dust which rises whenever we tread on them. This may be refining a little too much; and yet it is certainly true that carpets retain a vast amount of dust, as well as not a little foul air. It will be a happy day to society, both on this account and many others, when they can be laid aside, and a suitable substitute provided.

1272. Some have supposed that the dust we inhale never reaches the lungs, but stops at the larynx and in the windpipe. This notion has been received, because, in hacking or coughing it up, it so often appears to come from the very top of the throat. But so do many other things which we well know come from the deep interior.

1273. The truth probably is, that, while in most cases of coughing and hacking, a large proportion of what is expectorated comes from the top of the throat, yet, in the act of coughing, a portion of that which is rejected may come from the interior of the lungs, though we should not be able to perceive it. And it is not at all improbable that a part of what is hacked up from the top of the throat has gradually worked its way from the tubes lower down.

1274. I have alluded (1270) to absorption. Now, if it could be actually proved that we never throw up dust from the deep interior of the lungs, either by coughing or otherwise, yet even this would not prove that the dust we breathe never goes there. It is highly probable that the absorbents in the lining membrane of the lungs have full power to take up the dust we breathe, and carry it into the circulation, to be got rid of in the usual way and manner. Unnatural as this may seem, it is often abused Nature's dernier resort.

1275. The strange saying that every one, during his life, must eat his "peck of dirt and his pound of tow," had its origin in times of great ignorance,—whether it refers to the demands of health, or to demands of some other kind. To breathe dirt, or to eat it, would be about equally injurious.

1276. For our laborers in the open air, as well as for some of our mechanics, I know, as yet, of no device, which will es-

sentially relieve them. The greater the necessity, however, that they should breathe dust, more or less, while gaining an honest livelihood, only enhances the obligation to do *what they can* to prevent it, and to counteract its depressing tendencies by a stricter obedience to such other laws as are within their power.

1277. For our laborers in cotton mills, woollen factories, glass factories, etc., etc., it is fondly hoped that human ingenuity will yet find out something to remove the dust, and substitute in its place the pure and perfect atmosphere of high Heaven. Is such a hope futile?

1278. The proprietors of an ivory-comb manufactory in Meriden, Conn., some fifteen years ago, contrived to blow away the dust as fast as it was formed, so that the operatives need not inhale it. Why not as well contrive to blow away cotton dust, woollen dust, etc.? Of the necessity of doing something of this kind, let the following anecdote testify.

1279. A young woman in Northbridge, Mass., who had long labored in a cotton mill, gradually lost her health, and was obliged to leave her work and apply for medical aid. For a long time she was "nothing better." Her disease seemed wholly unyielding. At length, a very active emetic removed a quantity of cotton, which, when thoroughly dried, weighed four ounces; and she gradually recovered.

1280. This cotton, of course, came from her stomach, and not from her lungs. She had long been in the habit of swallowing the small ends of thread which she had frequent occasion to bite off. But we learn two or three things from it. 1. The power of the system to endure abuse, and postpone a retaliation. 2. The certainty of punishment in the end, even though there should be postponement. 3. The necessity of doing something to exclude the dust from both the stomach and the lungs.

QUESTIONS. — Is dirt inhaled ever healthy? Why, then, has a belief of this kind obtained currency? What becomes of dust or dirt when inhaled? Are we sure it ever goes farther than the very top of the windpipe? What could become of it, if it did? Do the German physiologists — some of them — object to the use of carpets? On what ground? Is dust in the lungs ever absorbed?

What strange saying is spoken of (1275)? What must they do, who, in order to gain a livelihood, are compelled to work in the dirt, and must inhale some of it? Is there any better hope for those who labor in cotton mills, etc.? What is related of an ivory-comb factory in Connecticut? Relate the anecdote of the young woman in Northbridge. What may we learn from such a curious fact?

SECTION VIII. — THE DUST OF METALS AND MINERALS.

1281. The dust of metals and minerals is much more injurious, when inhaled, not only to the lungs, but to the system in general, than common dust. It adheres to the lining membrane of the windpipe and lungs; perhaps pierces it. The irritation must therefore be considerable — so considerable as, in the end, to occasion ulceration; and, when there exists the slightest predisposition to bronchitis or consumption, may end in those diseases.

1282. Among the numerous employments which must expose those who follow them to the inhalation of metallic, mineral, or fossil dusts, are stone-cutting, brick-making, brass-working, tin-making, smith-work, preparing drugs and medicines, axe-grinding, engraving, iron-filing, lime-working, paint-grinding, and paving.

1283. I have seldom, if ever, in my whole life, found a stone-cutter who was healthy, provided he had very long followed his business. And so, in fact, with the operatives in most of the other employments above mentioned. Their position of body while laboring, it is true, has influence, many ways; but not greater, as I think, than the dust they swallow.

1284. Axe-grinders I find to be, almost universally, very great sufferers from their employment. Here the irritation may have two or three causes. 1. The position of the body in grinding is bad. 2. The particles of steel which are inhaled are very hard and sharp. 3. The particles of grindstone, though not very sharp, are nevertheless quite irritating. Axe-grinders seldom live many years, if they persist in their employment.

1285. The dust of pure metallic substaces, though irritating, is not, so far as I can learn, actually poisonous. It may excite the surprise of some, when we affirm, that neither lead nor copper could produce poisonous results, if they were entirely pure, and not corroded nor oxydized. Even arsenic, poisonous as it is, at least in some of its forms, is not pure metal, but a mere oxyde.

1286. In this latter form — that of an oxyde — several of the metals are not only irritating, but absolutely and greatly poisonous. And then, too, not a few of the compounds which are formed by the union of these oxydes with acids are very injurious to the lungs, if not to the whole system. This is particularly true of the oxydes of lead and copper. Both red lead

and white lead are oxydes of lead; and are, as every one knows, very active and troublesome poisons.

1287. Perhaps the fumes of white lead are as deadly as any other, and I have never known an individual who could withstand them long. Many a strong man has encountered them in the full belief that, however it had been with thousands of others who had made the attempt before him, *his* constitution was too good to give way under an agent as deleterious even as lead itself. But he has always, in the end, been numbered with the slain.

1288. While residing in Roxbury, near Boston, many years ago, I was in the habit of visiting the lead factory in that vicinity, and inquring into the health and condition of the operatives. I found the facts in general as I have stated above (1286, 1287). Most of them were indeed aware of the general danger, and yet seemed to hold on, in despair of getting work anywhere else, till it was too late.

1289. The overseer, who was not confined wholly to the shop, and who seldom breathed the fumes of the lead so much as a quarter of an hour at a time, assured me, one day, on inquiry, that he was not at all injured; and yet, not two years afterwards, he perished.

1290. A case little less singular, and nearly as instructive, happened in Western Connecticut, many years ago. A man who worked in lead, though he had not yet suffered, was afraid of consequences, and left his business for farming. Eighteen years afterward, he died with all the symptoms of lead disease. How true is what Solomon says of deferred punishment, — a point to which I have so repeatedly solicited attention.

1291. The fumes of copper — *i. e.* the dust of copper — are almost as dangerous to health as those of lead. I have had much conversation with intelligent overseers and laborers in copper manufactories, who all concur in the statements concerning the general unhealthiness of their employments. Some begin to suffer in a very few months; while others can go on, by virtue of a strong constitution, many years.

Questions. — Is the dust of metals and minerals more injurious than common dust or dirt? What reason can be assigned for this? What are some of the employments that most expose people to this form of suffering? Have not position of body, abuses in food, drink, etc., had some influence, as well as poison? What is said, particularly, of axe-grinders? Are pure metallic substances poisonous? Are not lead and arsenic? How then do metallic bodies ever become poisonous? Are red and white lead

SECTION IX.—CHLOROFORM AND ARTIFICIAL MIXTURES.

1292. The evil effects of using chloroform, except with the greatest caution, are now generally known. And yet the temptation, with many, is still great. Instead of reserving its use for the severer surgical operations, they are apt to resort to it under the smallest—I might even say the most trifling—operations, such as the extraction of a tooth, or the dressing of a common wound.

1293. So common, indeed, has this practice become, that, within the last ten or twelve years, I have been entreated by physicians, and surgeons, and dentists, to raise my voice against it, whenever and wherever I have opportunity. I have been assured that the frequent application of this agent was destroying their health. In fact, they sometimes refuse to administer it.

1294. Appeals to the reason and good sense of the ignorant, and even to those of the intelligent, sometimes fail. The hope of avoiding a little pain leads many to persist in a demand which their better judgment disapproves. As to injuring a medical man, by compelling him to inhale the poison he administers, they seldom think of that. We do not find much that is higher than self-love, among the sick or the suffering. Dr. Johnson, the great moralist, even tells us that "every sick man is a rascal."

1295. A fine-looking individual came toward me one day, staggering along as he came. As he approached me, to my great surprise I recognized in him a worthy acquaintance and valuable friend. "Doctor," said he, "I am drunk."—"And at this time of day?" I said; though half-afraid it was too serious a matter for joking. "Why," said he, "to tell you the truth, I am drunk on chloroform. I have had a tooth extracted, and, to avoid the pain, took chloroform." He was a young man of one of the best families in the country!

1296. Is it not a pity, that, to avoid the pain which is connected with the simple extraction of a tooth, a person should make himself intoxicated? I repeat that, if it were a capital operation, the case would be altered. But how many thousands

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both of them oxydes? Are the fumes—or dust—of white lead particularly injurious? Are the operatives in lead factories very liable to deceive themselves, and to hold on in their course till they perish? What is related of the overseer at the lead works, near Roxbury, in Massachusetts? What remarkable account is given of a painter who died eighteen years after he had left his employment? Are the fumes of copper as poisonous as those of lead, or nearly so? What facts in the case are related?

of people have had their ten, twenty—yes, thirty or fifty—teeth extracted without chloroform or ether; and have lived their appointed time, notwithstanding!

1297. All these narcotic or deadening things are hurtful in the end, as I have already intimated (1291). They are hurtful to the physician and to his patient; for the former inhales them, more or less, in spite of himself. Were it not for the foolish importunity of their patients, some of our physicians would hardly resort to their use once a year; perhaps not once in ten years. In fact, a few have never yet used them, to this day.

1298. The exhilarating gas, as it is called, which is so often administered in mere sport, may be a little less injurious to weak lungs than chloroform; but it were far better avoided. A few may endure its occasional use; but many are so constituted that they never ought to inhale it. Its effects are nearly as bad on their nerves as chloroform. And if but one in ten who take it were injured, while so little real benefit is derived from its administration, the propriety of using it would be questionable.

1299. Medicines, in these times, are often administered in vapor; though with what success I have not had very full information. In cases of delicate organization their use must be attended with more or less of hazard. The consequences might not always be immediately apparent, but would be likely to follow at a remote period, when the very administration of the agent was almost forgotten.

1300. In general, and with the fewest possible exceptions, the only proper substance to be brought in contact with the delicate internal structure of the lungs is pure atmospheric air, a very little carbonic acid, with a little electricity and watery vapor. All else is foreign; and, unless given on occasions as a mere choice of evils, is more or less injurious.

1301. Much of the chloroform and many of the other remedial agencies which are introduced into the lungs, might be spared, if people would but wait a little while. They are much more willing to transgress good and wholesome laws than to suffer the consequences till Nature is ready to rally. They no sooner feel the smart of the rod, or begin to fear they shall feel it, than they seek for something to deaden their sensibilities.

QUESTIONS. — Do people generally understand the danger using of chloroform? Do physicians like to administer it? Why not? What is said

SECTION X. — INHALING THE PRODUCTS OF ANIMAL PUTREFACTION.

1302. It is a point in dispute among learned men, whether the gases which are evolved by animal decomposition ever become sources of severe disease. That many forms of disease are either produced or aggravated by vegetable decomposition, especially under certain peculiar circumstances, is, I believe, settled beyond debate; but not so with regard to the gases and other emanations connected with the decomposition of animals.

1303. And yet we find it becoming more and more unfashionable, of late years, to have our burying-grounds or cemeteries within the walls or precincts of our cities, towns, and villages. And when they are so, many avoid a residence near them; or, above all, refuse to use the water procured near them. Has not this a meaning?

1304. But there are other circumstances, tending to render the views of those who doubt the injurious tendency of animal decomposition not a little suspicious. There are numerous facts on record which have a bearing on the case.

1305. In Watertown, Conn., about thirty years ago, a most severe disease broke out in a family which had for some time been healthy, and at a season when no sickness prevailed in that vicinity. Several of those who suffered were young men at work on hire, who were immediately sent to their homes, a dozen miles distant. One of them died; the others recovered.

1306. The families that received the fugitives nearly all sickened in a similar way, and several of them died. Though they were in a densely populated region, no cases of sickness occurred beyond the families to which they belonged. There was a most striking similarity of the symptoms in all the cases; and I never could resist the conviction that they had one common local origin.

1307. In attempting, as the physician of these suffering families, to trace the disease to its origin, I discovered the following fact: In the house where it originated, a great number of lambskins, recently removed, with the wool on, had been left piled up till putrefaction commenced and made considerable

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of getting drunk on chloroform? May it not be sometimes used in capital operations? What is said of the exhilarating gas? Is it safe to inhale medicine in vapor? What is the only thing which is really fit for the lungs to receive? Might the use of remedial agents often be avoided, if people had a little more patience?

progress. It was said that, at the time the sickness commenced, the stench had become almost intolerable.

1308. Another case came also under my observation. Two or three members of a family were severely sick, and two of them were expected to die, though they finally recovered. The disease was peculiar; though, at the time, no one had suspicion of anything like animal poison.

1309. It was, however, well known and afterward recollected that, for several months before this sickness broke out, the water of the well had been bad, the odor being sometimes almost insupportable; and, on cleaning the well from the bottom, several toads had been found in a state of complete putrefaction, and in a condition the most highly offensive.

1310. A severe cutaneous disease — in two instances of using well-water of this description — afflicted every person that used the water, while those who refused to use it escaped. I could also mention several other cases, where suspicion rested on similar causes; but the truth was never ascertained.

1311. Of course, we cannot be quite positive that the diseases I have mentioned had their origin in the sources which were suspected; or, above all, that there were not collateral causes. Yet the evidence was such that, to this day, I have been a very strong believer in the dangerous influence of putrid animal emanations, — the anti-putrescent tendencies of the ammonia to the contrary notwithstanding.

SECTION XI. — EMANATIONS FROM PLANTS AND FLOWERS.

1312. Nothing is more common than for authors and lecturers to speak, with much assurance and not a little severity, of the mischief done to human health by having plants and flowers in dwelling-houses, especially in sleeping-rooms. We are told that, during the night, the carbonic acid predominates, and there is quite a surplus of it which remains till morning.

QUESTIONS. — Is it a disputed point among medical men how far animal putrefaction or decomposition induces disease? Why, then, does common sense so generally demand that burying-grounds should be remote from towns and villages? What anecdote is related of the supposed effects of putrid sheepskins? Could there have been any possible mistake in attributing the disease to this source? What anecdote is related of a severe sickness in a single family? Have putrid emanations been suspected, in some instances, to be the cause of cutaneous diseases? What was the evidence in these cases? May not other causes have had something to do in all these cases?

1313. The doctrine is true, without doubt. Yet it should not be forgotten that we can ventilate our rooms which contain vegetables just as easily as we can those which contain animals. Nothing is more easy than to throw open a window or a door, or even all the windows and doors. The vegetables will run no risk of catching cold! I speak now, however, of our parlors and sitting-rooms.

1314. As to our sleeping-rooms, the case is somewhat altered. We spoil the air quite fast enough during the hours of sleep, without calling in to our aid a mass of plants or flowers. But, if these are permitted, it serves to enhance the necessity of thorough ventilation, and renders attention to all the other laws of health so much the more imperious.

1315. And, after all, the quautity of carbonic acid which is furnished by a very large collection of plants and flowers, in any ordinary sleeping-room, during a single night—over and above what the plants themselves consume—is hardly greater than that which would be thrown off by a single dog or cat. Yet, how often do we find people exceedingly fearful about the ill effects of the former, while they entirely forget, or overlook, the latter?

1316. Not only is a cat or dog suffered to remain in the rooms of the healthy,—nay, sometimes cat and dog both, if not two or three cats,—but also in those of the feeble, and pale, and sickly. Thus, the father, who would resent the slightest attempt of a highwayman or ordinary thief to rob his child of but a single dollar, will employ a beast or two, in robbing him of that which is more necessary to him than money. The latter, to the feeble, is life-blood itself.

1317. But the sin of ignorance is, perhaps, excusable; it is most certainly to be winked at. God himself does not demand of us to act up to light which we have not. Yet, who does not know that dogs and cats have lungs, though they are smaller than our own?

1318. It was once believed, that, though the breath of the cat was unhealthy, the breath of the dog was healthy, and even salutary. I suppose the custom of permitting the dog, at times, to sleep with the feeble child, had its origin in this most mistaken belief. This belief, though in many instances shaken, is not yet destroyed. Dogs and cats both, not only sleep *on* children's beds, but *in* them (440).

1319. May we not hope that science and good sense will one day prevail? Must we always be children? Must we

always take the very course with our delicate, nervous, scrofulous, and consumptive children, which is calculated to hasten apace the very complaints we should do all in our power to harden them against?

1320. I am not quite sure, that a couple of canary birds will not evolve as much carbonic acid, in a single night, as would equal the superfluous quantity thrown off by a whole room-full of plants and flowers. Yet, of all who have spoken and written on this subject of pure air, who has ever so much as opened his mouth on the dangers of the former?

1321. As if anxious to atone for the comparatively trifling offences of the night, plants and flowers, give us during the day, a quantity of oxygen of their own coining; whereas the dog and cat, if within doors, and the canary birds that have committed the depredations all night, are permitted to continue to rob us during the day. Consistency, verily thou art a jewel!

1322. Nor do carbonic acid by night, and oxygen by day, complete the list of manufactured products which come under the head of plants and flowers. The aroma of these handiworks of the Creator have more influence on our health than we are aware. We might infer this from the very nature of the case; but we are not left wholly to doubtful inferences.

1323. An elderly man, of northern New York, who had been long afflicted with asthma, could not pass a field of rye in blossom without being thrown into a paroxysm. Does any one believe, that what is so powerful for evil to the diseased may not be potent for good in other circumstances?

1324. Thousands, who have been shut up in brick, stone, or wooden walls, for days, weeks, or months, have felt the reviving and even tonic influences of nature, as a whole, on emerging from their prison, and bringing under the array of their senses the green fields and a world of blossoms. Have the blossoms nothing to do with any sense but sight?

1325. Whether we should be justified in laying it down as a rule, that the fragrance of plants and flowers, — having its origin wholly or chiefly in certain aromatic properties of plants, and trees, and flowers, — to those whose sensations are not yet perverted, is always salutary, and even tonic and restorative, is not quite certain, but is worth at least a moment's consideration.

QUESTIONS. — Of what is it said authors and lecturers are particularly fond? Is not the doctrine true? Is not the evil, in all but sleeping-

SECTION XII. — TOBACCO SMOKE.

1326. Among the various dusts which we inhale almost everywhere, is the dust of tobacco. I do not now refer to the small amount received in snuff-taking, for comparatively few inhale it in this way; but to that which is received in consequence of so much smoking.

1327. Smoking tobacco, whether by means of cigar or pipe, is becoming almost as general, in this country, as it ever was in Germany or Holland. Is it too much to say, that the majority of our population is, in this respect, guilty? Most certainly this is true of the majority of our own sex, though I doubt whether it is so of the majority of our females.

1328. Smoking tobacco is no longer confined to particular classes, high or low, rich or poor, old or young. Everybody, or almost everybody, smokes, except females and infants. Why, the very small boys, by thousands and ten thousands, are found hanging to the end of a horizontal roll of tobacco, almost before they are weighty enough to be able to bring their feet fairly on *terra firma*.

1329. Is it asked, what this tirade has got to do with tobacco smoke? It has much to do with it. Smoke of any kind is not a nonentity, — it is a *something*. It is even a thing of consequence. Tobacco smoke is something, — it is tobacco. It is volatilized very finely; still, it is tobacco, and nothing else.

1330. That once white tobacco pipe is now as black as tobacco itself. How came it to be so? Bring it to your mouth or your nose, and you may know. That wall, at the corner of yonder fireplace, was once white; it is now covered with a dust which was deposited in smoking. Taste or smell that

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rooms, easily met? How? But what shall be done with our sleeping-rooms? Should all such vegetation be kept out of them? Should dogs and cats, with still more of solicitude? How many plants and flowers would it take to generate and throw off for others, in a single night, as much carbonic acid gas as would be furnished by a single dog? Is the sin of ignorance excusable?

What was once thought of the breath of the cat and dog, respectively? What practices had their origin in this superstition? May we not hope reason will one day prevail? What is said of the probable mischief done by a single pair of canary birds? Under what circumstances is oxygen generated for our benefit? Do dogs and cats and canary birds make a similar atonement for their transgressions? What other emanations from plants and flowers are there? Have these anything to do with health? What reasons have we for thinking so? Does the aroma of plants, when inhaled by the healthy, always conduce to longevity?

dust, and you will find it to be neither more nor less than tobacco.

1331. We have already seen (1215) what an extensive internal surface the lungs possess. Now, every smoker forces tobacco smoke to all the internal cavities of the lungs, and is the occasion — for anything he can know — of blackening four thousand square feet of membranous surface there, just as he blackens his pipe, or the wall near which he sits; or as soot blackens any other chimney.

1332. Nor is this all. Not only are the bronchial tubes and cells of the lungs compelled to endure this constant assault by the dust of tobacco, but all the extensive nasal cavities, the large hollows in the cheekbones connected therewith, and the hollows in the bones of the forehead just above the nose. In short, all these parts, for aught which the smoker can do to prevent it, as long as he continues to smoke, are liable to be converted into so many sooty chimneys.

1333. One might think, at first, that all these passages and cavities, thus changed into so many chimneys for tobacco smoke, must in a little while become black, like other chimneys. And such would be the result, no doubt, were not the fine dust of the tobacco smoke taken up by the absorbents of the lungs, carried into the circulation, and afterwards got out of the system through the skin and kidneys.

1334. But this effort of nature to rid the body of a foe, whose very presence, for but a moment, must be painful, though it saves the lungs, in part, from the injury they would otherwise receive, at the same time scatters the poison all over the system. It is not too much to say, that there is not a single fibre or particle of the body — not even the most solid bone — that is not more or less affected by it.

1335. Some may doubt whether, after all, tobacco is quite as poisonous as I have represented. I shall speak, hereafter, of the experiments of Dr. Mussey and others. But they are not alone. There can be no doubt that the oil of tobacco is one of the most virulent poisons in nature. One or two drops of it will destroy many of the smaller animals.

1336. It is indeed not a little surprising that days and months and weeks — and sometimes many years — should pass away, and the delicate machinery of the lungs and of the whole system should be poisoned and remain poisoned, and yet no more of active disease follow. But, then, we must re-

member the great fact, that sentence against an evil work is not (always) executed speedily.

1337. True, most tobacco-smokers — unless they have unusually strong constitutions — do suffer much while they are using their tobacco. They have hard colds, twinges of rheumatism, bilious attacks, or, it may be, fevers. Now, they can never know how much more severe these diseases were, than they would have been, had their systems never been under the influence of tobacco.

1338. But it is not they alone who smoke the tobacco — some ten or twelve millions or so of our whole United States population — who are poisoned by it. Would it were so. Few persons, of any age whatever, wholly escape. Who is there among us, that has never inhaled a particle of tobacco smoke? He must be very young, or very much a recluse. The tobacco smoke I have inhaled, when in the presence of smokers, has poisoned my whole system, for the time, as certainly as it has theirs.

1339. In one respect there is indeed a difference. Days and weeks and perhaps months pass, during which I am not thrown into the company of a smoker. Of course, in the meantime, my internal powers have time to rally, and to expel, in part at least, the poison I have unwillingly received; whereas his system has had no opportunity to rally. It is continually sustaining a load, and continually suffering. He is manacled by his habit, and reason and thought seem wholly dethroned.

1340. Still, as a general rule, to which there are fewer exceptions than I wish there were, we have all been poisoned, more or less; and have been poisoned, it may be, by our neighbor, — perhaps, professedly, our *Christian* neighbor. I do not believe there are five millions of people in the United States, old or young, who are in this respect entirely unscathed.

1341. It is a Christian law to love our neighbor, and our neighbor is our fellow-man. Does *he* love his neighbor, who gradually, though it may be very slowly, poisons him? Is it a Christian duty to love our families, — our wives and children? And do they love their families as they ought, who poison them by inches? Of one thing, at least, we may be assured, that, on this principle, whom we love most we too often poison most.

1342. How painful must be the thought, to a conscientious tobacco-smoker, — if such a person can be found, — that many professedly Christian men and women are not only poisoning

themselves, daily and hourly, but poisoning those they most love; I mean, their very families. For how frequently we find parents smoking in the presence of an asthmatic or consumptive child!

1343. But such thoughts as these, as I have before intimated (1337), in all probability seldom trouble the smoker; and this, if he *makes* any, must be his apology. And yet his ignorance does not save him, or his children, from suffering. The penalty for violating physical law must be executed. *Nature* knows of no atonement.

1344. But some men, it will be said, live on to old age, notwithstanding their tobacco. Yes, they do; to what we call old age. That is, some of them live to a more advanced age than others; for, as to absolute old age, we probably know but very little about it. If the transgressor—the wicked—does not live out half his days, there can be very few among us who live out the whole of them.

1345. I have known men who chewed tobacco long, men who drank rum long, and I have heard of those in Styria, who have taken arsenic long,—some are even said to have taken hemlock long,—and yet they lived to what is usually called old age. But I have known men who had gone through many hard-fought battles, and still survived, so as to be termed old soldiers. Yet, old as they were, they were not yet three score and ten; and were actually shot down afterward, ten years before their time. Do not powder and ball shorten life?

1346. The tobacco-smoker, like the rum-drinker, deceives himself. He does not perceive, if he has a naturally good constitution, that tobacco is bringing upon him any specific disease. But the united influence of several depressing causes operates, at length, to bring him to a sick bed; and now the effects of the tobacco are added to the rest. It is as if his enemy had slept till he found him crippled; and then, with a meanness not wholly unknown, had proceeded to make his own inflictions.

1347. It will still be said that many smokers appear to enjoy good health. So do many opium-takers, and rum and coffee-drinkers. But are they really as healthy as they seem to be? Or, if they are so for a time, do they continue so? "A new broom sweeps clean;" but how long? Medical men have always known that many of these same individuals have incipient, not to say troublesome, diseases. If they have sur-

vived during many a campaign, they are, at least, full of shot-holes.

1348. The inquiry is sometimes made, "Which is the worst, smoking or chewing tobacco?" The discussion of this question does not belong to a chapter on breathing and ventilation. I will however say, that many more persons smoke than chew, and that smoking is the most rapidly increasing. Both are great evils. Perhaps tobacco smoke penetrates more certainly every nook and corner of the system than tobacco juice, unless the latter is swallowed.

1349. One species of meanness attaches to the smoker of tobacco, which distinguishes him from most of the votaries of vice and crime. Few persons will be so mean as to prefer to steal from a poor man rather than from a rich man. And yet, in travelling on almost any railroad, or in any steamboat, which makes provision for second-class passengers, you will often find the tobacco-smoker so mean as to leave his own car, and go and puff his poison among those who, from their poverty and wretchedness, cannot help themselves; and who, as he well knows, are not allowed to complain.

SECTION XIII. — DEATH FROM CHARCOAL.

1350. Hardly a week passes,—perhaps hardly a day,—in

QUESTIONS.— One more kind of dust remains to be noticed: what is it? Is tobacco smoking becoming quite common? Do a majority of the males of this country learn to smoke? Is this habit confined to particular classes? Is tobacco smoke dust? How can this be made to appear? Does tobacco dust go into the lungs? Does it go into any other cavities of the body? What parts of the system wholly escape its influence?

What evidence have we that tobacco is as poisonous as in this section I have represented it to be? Why, then, does not he who uses it perceive, much sooner than he does, its evil effects? Is sentence against an evil work always executed speedily? Are they who do not smoke at all ever poisoned by tobacco smoke? Which probably suffers most, he who smokes, or I who only breathe the smoke of which he is the author? Are we not, then, almost all poisoned? Is this according to the Christian rule, Thou shalt love thy neighbor as thyself? Should we poison most those whom we *love* most? Do parents sometimes poison their own children? What apology have they but ignorance? Will ignorance save from suffering, in these cases?

What objections may be brought against the views of this section? How are they to be met? Does the smoker deceive himself? How is this? Does he sometimes deceive others? What have medical men long known about these transgressors of physical law? Does smoking do more harm than chewing? What act of meanness are tobacco-users sometimes guilty of?

which we may not find, in some of the lighter periodicals, and possibly in the columns of the graver ones, a paragraph of greater length or less, entitled, "Death from charcoal."

1351. The truth in the case is, that people very frequently burn charcoal in an open vessel or space of some sort, in a room which has no fireplace or chimney; and the reason is, that charcoal emits little or no smoke. Thousands do this, and yet suppose themselves safe, provided they set nothing on fire. They have not the slightest fear of an enemy which is not cognizable by the senses.

1352. Yet, one would think that the frequent recurrence of death from charcoal, as it is called, might lead them to suspect the presence of a foe, though unseen. Carbonic acid gas needs a fireplace, that it may be driven—or, as we say, drawn—up the chimney. Fire is even desirable, in order to give force to the ascending current. For, though without a fire some of the gas might ascend the chimney, a fire would make it more sure.

1353. It is not the burning charcoal alone, however, in these cases, that does the mischief, but the carbonic acid which is made both by the combustion and the breathing. Death, in these circumstances, generally happens in very tight rooms. The gas from the coal, having no means of escape except at the doors or windows (and these being closed and pretty tight), together with the gas which is formed by breathing or respiration, gradually fills up the room, as water would a vessel.

1354. As the vessel leaks, however, more or less, it may happen, in a room of considerable dimensions, that no suffering is experienced for many hours, especially if there be in the room but one pair of lungs. The person may feel perfectly well till he is in bed and sound asleep, and till everybody else is asleep in the house. Or, even in the case of two or three persons in the room, no suffering may be immediately experienced, if they retire early.

1355. After the lapse of an hour or so, more or less, a sense of suffocation comes on which may or may not awaken the sufferer. If he does not awake, and if no one hears any noise, he probably dies. If he awakes, and, in agony indescribable, rises up on his bed, his head being thus brought above the surface of the gas, he may escape. If there are two in the bed, and one begins to suffer sooner than the other, his agonies may awaken his companion; and both may be saved.

1356. In the present ignorance of society, however, all is hap-hazard. If any escape, it is by chance, in the way I have

mentioned, or in similar ways. Whereas, every child ought to understand the nature of these things, as early as he knows his alphabet. He ought to know that carbonic acid gas is formed by respiration and by combustion; and that it should never be inhaled, by night or by day, even in the smallest quantities.

1357. He should know better, in the first place, than to use fire in any way, where there is no chimney flue. If used, however, he should keep up a brisk circulation of the air, so as to be certain that no gas has accumulated near the floor. He must not sleep with fire in the room, or with a lamp or candle burning; and he must sleep, as well as wake, with doors or windows open, or both.

1358. A good service will be done to society, when the casualties of which I am speaking are called, "Death from carbonic acid," rather than death from *charcoal;* for, if this should not lead people to study chemistry, it would at least lead to more caution. They would inquire, what shall be done to ensure safety; instead of blundering along, as they now do.

1359. For one person, however, who is actually destroyed in tight bedrooms, cabins, mines, etc., by this gas, some scores and probably hundreds are more or less injured by it from day to day, till their health is seriously and permanently impaired. One night's suffering, even though the individual appears to recover from it the next day, and to subject himself to no exposure afterward, is doubtless an injury; but the system in due time appears to rise above it.

1360. But, when a person breathes too much carbonic acid nearly every day, if not every night, till he looks pale, loses his appetite, and begins to suffer from some particular disease to which he had long been predisposed, or which, perhaps, he inherited, but which better health and good air had warded off, it is time to look out for breakers ahead. He is descending an inclined plane, with a velocity that will be continually increasing.

1361. How many there are, whose vigor and whose years are much reduced by breathing carbonic gas! It is as if some pounds or ounces of their strength were shorn from them every day; and as if some hours, days, or years were clipped from their, at best, slender allotment. These various clippings, from a race who almost all transgress, would amount yearly to some thousands of lives, — perhaps ten thousand!

1362. It has been said by some, — perhaps hastily, — could it be so ordered, that, instead of an aggregate of slightest injuries, which might be equivalent, in a given year, say to a hun-

dred deaths, that number were to be taken, at once, away from us by this poisonous gas, mankind would begin to open their eyes. This might be so, or it might be otherwise. One thing is certain, that, as things now are, benevolence has a very wide range of action proffered her.

1363. Perhaps there is as much suffering from this source in school-rooms as anywhere else, except in sleeping-rooms. Some of our children are destroyed by it, sooner or later. More, however, — a hundred times more, — are made feeble, sickly, indolent, or vicious, for life. The best scholar is liable to be made worse, in breathing this gas. It predisposes to indolence: he is taken to be so, and ill treated; his self-respect is destroyed, and he descends the broad road that leads to perdition.

1364. Congregations in our churches sometimes suffer very considerably from carbonic acid gas. To keep the church cool in summer and warm in winter, people are hardly out of it ere it is locked up and the bad air shut up in it. Few sextons know anything about the evils of bad air; and some who are enlightened do not appear to care much about it.

1365. Even in our dwellings it is often regarded as very desirable to retain the air unchanged, no matter how loaded it is with bad gases. Were it not for this foolish notion, air-tight stoves would soon be set aside. Do not people know, when they retain a body of air unchanged in their parlors, that, along with the heat, they must retain the filth of the air? But I shall have another opportunity to treat on this subject, when we come to ventilation.

QUESTIONS. — Are deaths from charcoal a very frequent item of the newspapers? Why is charcoal more dangerous than any other fuel? Is charcoal less feared, as an enemy, because it cannot be detected by the senses? Why cannot people receive the facts of its danger, even though they do not understand the matter fully? What is the real cause of suffering in these cases? Is carbonic acid gas generated in any other way than by combustion? Is it heavier than other air? Why, then, does it not oftener fill up our rooms and destroy us? How do people sometimes escape the danger, even without help from others? In the present state of human ignorance, are our escapes mostly chance work? What, in their ignorance, should people do? Should they not be enlightened? What should newspaper editors do? Are not many slightly injured for one who is utterly destroyed? What are some of the external marks of suffering in these cases? What is said of the numerous clippings from the human constitution? Is there very great mischief done in school-rooms? What is said of churches? What of air-tight stoves in our dwellings and elsewhere?

SECTION XIV. — BREATHING HOT AIR.

1366. Besides the general enervating tendency of hot air on the living system, we must remember that, the more our air is heated, the less oxygen it contains in a given volume, because heat rarifies it. A pint of air, as we have repeatedly seen, is sufficient for an ordinary respiration; though the contents of an average inhalation are sometimes estimated at forty cubic inches.

1367. Suppose, now, a pint of air is inhaled by a person at 35°, and a pint by another at 85°. Is it not obvious that he who inhales the pint of cold air receives much more oxygen than the other? Heat that pint of air from 35° to 85°, and it will make considerably more than at first.

1368. But, to be a little more particular: suppose the air at 85° to be expanded in the above instance just one-fourth. In that case, he who should breathe the air at 85° for a whole twenty-four hours would receive one-fifth less of oxygen than if he breathed it at a temperature of 35°.

1369. The difference in twenty-four hours, supposing the quantity inhaled at every inspiration to be forty cubic inches, would be no less than thirteen and three-fifths hogsheads of air. Allowing the oxygen to be one-fifth of the whole mass, he who breathes the air at 35° receives and diffuses over the air-cells of his lungs one hundred and seventy-three gallons of oxygen more than the other. The difference in a year would be one hundred and twenty-four hogsheads. Are one hundred hogsheads of oxygen, inhaled in a year, a matter of no consequence?

1370. I do not mean to say that everybody should breathe the air at a temperature of just 35°, if it could be had; for occasionally we find lungs that cannot possibly endure such a low temperature; though I suppose that most persons among us might endure it a few hours. The general rule is: Breathe the air at as low a temperature as you can and yet not suffer any immediate injury. But, then, there are no parts of the world likely to be permanently inhabited, in which the mercury never rises higher than 35°. The productions of the earth must be scarce where the mercury should never rise but three degrees above the freezing point.

1371. Perhaps there is no country in which the respiration of pure air and an abundance of oxygen is more needful than in this. There are so many causes in operation to impair or en-

feeble the lungs, irrespective of pure air, that it behooves us to bestow a suitable degree of attention to the latter subject. And yet, nowhere else in the wide world is it more neglected.

1372. The people of Medina, in northern Ohio, having a severe climate and abundance of bituminous coal, have fallen into the habit of keeping their rooms heated about half the year to 80° or 90°. But I have satisfactory evidence that there is no part of the country in which the inhabitants suffer more from colds on the lungs, and other acute diseases, than these very persons who swelter in a heat at least twenty degrees too great.

1373. It may be said that such reasoning cannot be correct, since, if it were, we should suffer more than we now do from the great heat of our long summers. But it should be recollected that our summers, in the northern United States, are not so very long, after all. Then, too, the heat is not above 60° or 65°, even in summer, only a small part of the time; and, during most of the nights, it is quite below that point.

1374. Then, again, we do experience considerable suffering as the consequence of the great and long continued heat. Our summer and autumnal diseases, though for the most part produced by voluntary physical and moral transgression, are nevertheless rendered more severe by the heat than otherwise they would be. In hot climates the effects of heat, almost equally severe and longer continued, are still more obvious.

1375. How much it is to be regretted, that the mass of our people do not know the importance of breathing a cooler and denser air whenever they can. I do not mean to intimate that, if they did, they would immediately act up to their convictions of truth and duty; but only that many would be led to do more than they now do; and almost all who have any conscience would from time to time be convicted of sin, and would hence be more likely to be converted than if they remained in their ignorance.

1376. One of the worst circumstances which attends the heating of our rooms so high, is, that every extra degree of heat, not absolutely and indispensably necessary, weakens our power to generate caloric for ourselves, as well as our power to reject excess or accumulation. It is as if the calorific function acted like a careless, lazy, shiftless individual, that helps himself less the more he is helped by others. The needful heat of the body being supplied by external or foreign sources, the calorific in-

strumentalities grow idle, and seem to find pleasure in that very idleness.

1377. This point will be made clearer by an illustration drawn from the circumstances of every-day life. Let a person begin the morning of a clear winter's day by raising the temperature of his room, by means of a coal stove, to 60°. At that temperature he is, we will suppose, quite comfortable. But, attentive to his business, he suffers the stove to take care of itself, till lo! at 10 o'clock, the heat has risen to 80° without his perceiving any change. He is not a whit warmer than he was at 60°. He was comfortable then, — he is now only comfortable.

1378. Whence the change? With twenty additional degrees of heat, why is he not twenty degrees warmer; or, at least, *somewhat* warmer? The simple solution of the problem is, that, in proportion as the external heat has risen, the internal fire, so to call it, has gone down. The calorific powers are not only less active, but evidently weakened.

1379. There can hardly be a more fatal error than that of indulging in too much heat on account of native or acquired feebleness. Because the surface of the body is somewhat depressed and pale and cold, we are apt to crowd to the fire, or increase the heat of the room. But, as a general rule, this is diametrically wrong. He who thinks that, because he is a little chilly to-day, he requires five degrees of additional external heat, and proceeds to indulge himself accordingly, will, other things being equal, require six to-morrow, and seven next day.

1380. But what, then, is he to do? Must he remain pale and chilly? By no means. Let a little clothing be added, or a little active exercise; or, if this will not answer the purpose, — though doubtless it will, — let him go for a few moments to the fire, or near it, and warm himself slightly, and then rely on his exercise and clothing to keep what he has thus gained.

1381. Or, even if it were necessary to raise the temperature of the room a little, let it be in the smallest possible measure — one, two, or three degrees. Then, along with this, and the increase of dress and exercise, — for these last will, in any case, be desirable, — let there be also an increase of general cheerfulness. And lastly, as soon as the system resumes its wonted activity, and the skin its natural elevation, plumpness, and warmth, let him be sure to lower the temperature to its original point, if possible. By thus availing ourselves of the new impetus which is given to the system, at the beginning of

the return of vigor,—or, in other words, the reaction,—we may perhaps gradually raise the inactive calorific power, instead of lowering it.

1382. In short, nothing should be more dreaded, in connection with the whole matter, than permanent indulgence in unnecessary external or foreign heat; even one degree of it. Few things in the world do more to render mankind feeble and inefficient, both in body and mind, than this species of indulgence. It is so grateful that all, or almost all, yield to the temptation, and indulge it; and then reap in due time the consequences.

1383. Our greatest difficulty is with children. They require a good deal of external heat, at first, because their calorific powers have not yet been developed in any considerable degree. And yet, if this heat becomes a little too great, they suffer sooner and more than adults; since their power to throw off superfluous heat is always feebler in proportion to their power to generate it. We must avoid the least waste of their resources, with even greater care than we do our own.

1384. Some few feeble people there are, especially among the literary, who are in the habit of using the cold bath, either locally or generally, as a substitute for going to the fire, or adding to their clothing or exercise. They do it, partly to save time, and partly for other reasons. I have heard them say that fifteen minutes spent thus were as good as two hours of ordinary exercise.

1385. Others go further, and put their feet into a tub or pail of cold water when they are going to bed, or run through a snow-drift in their undress; or perhaps do so at any time of day, when they wish to start the blood, as they term it. All these cold baths, general or local, do good for the time, provided a reaction follows; but they are otherwise injurious.

1386. I have said that they do good *for the time.* This qualification is made, because I have known feeble people—ministers, teachers, seamstresses, painters, students, etc.—who, by pushing this matter, have lived at the expense of life, and have suddenly sunk down exhausted into disease or death. They expended their capital, when they should only have used the interest. It is not safe to tax nature—feeble nature, at least—too much.

1387. No physiologist, who duly considers the habits of the people of this country, with regard to external warmth, will wonder at the tendency, among the feeble of our own sex, and

females generally, to be cold, or at least chilly, especially at the extremities; and to have a collapsed skin. The habits which bring us into this condition keep us so. And we are thus, as a people, every day growing more and more feeble and inefficient.

1388. A slight reduction of the physical capital of an individual, when his capital is large and his business unembarrassed, is not so great an evil as in contrary circumstances. Still, the tendency in both cases is evil, and only evil, and that continually. It was in view of this downward tendency, no doubt, that Mr. Sullivan predicted the speedy extinction of our race.

SECTION XV. — BREATHING DAMP OR MOIST AIR.

1389. One serious evil connected with the habit of keeping our rooms highly heated, is, that we thereby exhaust the air of its moisture, and leave it too dry for the membranes of the lungs, especially in those who are feeble. The atmosphere of the driest and most elevated mountainous regions retains natural moisture enough for the lungs, even though they are weak and diseased; but air, like that in most of our rooms, deprived of much of its natural moisture, cannot be otherwise than irritating.

1390. It was formerly thought, by many, that stoves, especially closed stoves, had a peculiar effect upon the air to render it unhealthy. I am not aware that it makes any considerable difference, in this respect, what the fixtures are, pro-

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QUESTIONS. — Do the lungs have less oxygen in them the warmer the air is? How do you explain this fact? Tell us something of the difference between using air at 35° and at 85°. Is it desirable that everybody should breathe air at 35°? Is pure air in the lungs especially needful in the United States? What is said, for an example, of Medina, Ohio? Could we better endure too high a temperature, if our habits of obedience to all law, physical and moral, were more correct?

What is one of the worst circumstances of living in too high a heat? What illustration is used to make this point intelligible? Does the internal heat *go down* when the external heat *goes up* unnecessarily? When we are cold or chilly, what then are we to do? When we are but a little colder than we ought to be, — slightly chilly, — how should we raise our temperature? What should be the most carefully avoided in this matter of temperature?

How shall we manage children, especially very small children, in whom the calorific powers are feeble? How do certain feeble people use cold bathing? Are they gainers for the time? Are they always gainers in the end? Is the general condition of our country, as regards health, especially the condition of the female sex, at all to be wondered at? And are we to be greatly surprised at the prediction of Mr. Sullivan?

vided they do not attain to a red heat. Dry air may produce unpleasant sensations, and perhaps give us headache, whether the dryness comes in one way or another.

1391. I have alluded to the natural moisture (1389) of the atmosphere. A few grains of water, in the form of vapor, are usually diffused through every cubic foot of air. The higher the temperature, the more moisture is demanded, in order, as it were, to fill the interstices. When our rooms are excessively hot, instead of having more watery vapor in the air, there is actually less; much of what was originally there being dried up, which renders the air irritating to the skin, and especially to the lining membrane of the lungs.

1392. Hence the absolute necessity, would we maintain health, of having water in our rooms for the purpose of evaporation; whether heated by stove, furnace, or fireplace. It depends on the degree of heat which is maintained, and not much on the fixtures. Wherever there is fire, as a general rule, there should be water.

1393. Not one factory in fifty, in this manufacturing country, nor one school-room in ten, nor many counting-rooms, mechanics' shops, conference-houses, concert-halls, town-halls, churches, or sitting-rooms, have the slightest provision for replenishing the moisture of their air. It seems hardly thought of. A strange, not to say fatal, mistake!

1394. On inquiring, in schools and elsewhere, why water is not kept in the room for evaporation, I am often told that it exposes people to take cold. How such an opinion originated, I cannot conceive; but it has about as good a foundation as many other opinions which pass current in society, even though they have been handed down to us from past generations.

1395. Few things are more common in a dry atmosphere than chapped hands. But can our dry air produce this effect on the thicker, tougher skin of the hands, without injuring, in still greater degree, the more delicate lining membrane of the lungs? And if the lungs are at all inclined to disease, and especially to hemorrhage, may not such a dry air be likely to rouse it to activity, or hasten it to a crisis?

1396. Among the very few vessels of any kind kept in hot rooms for the purposes of evaporation, I have not found one in twenty of them right. They are, unnecessarily, too deep. Evaporation is slow or rapid, in these cases, in proportion to the extent of surface, and not to the quantity of water used. A

gallon of water, in a shallow pan, will be much sooner evaporated than a gallon in a deep one. Let this be remembered.

1397. The very common preference for a southern climate, or perhaps for a sea air, in certain consumptive cases, may have had its origin in the fact, that the moister air of the south, and of our seaboard in general, has sometimes proved favorable. I have observed, however, that those who go south in these circumstances, and do not *remain* there, are less frequently benefitted than they who remain.

1398. I have also observed, that going northward a little way, into an elevated or mountainous region, is sometimes quite as useful as going south. Both give temporary rest to the weary bodies and souls of those who resort thither; and a few recover. And he who recovers, though but one of a thousand, is reckoned as clear proof of the advantages of migration; while, of those who die, nothing is said *why* they die. The dead, I say again, tell no tales.

SECTION XVI. — METHODS OF WARMING OUR ROOMS.

1399. It may have been hastily inferred, from the tenor of the preceding section, that I have no special choice with regard to the methods of warming our rooms. But this is not so. All the methods of modern times have, indeed, their advantages, and some of them their disadvantages. None are worthy of being exclusively employed, while very few are so worthless as to be entirely rejected.

1400. The open fireplace, for general use, is the best. Not, of course, the monstrous fireplace of olden time, which seemed to occupy nearly the whole gable-end of a building, and, in case of necessity, could swallow nearly half a cord of wood daily; but a fireplace of reasonable dimensions and rational shape.

QUESTIONS. — Do we frequently render the air in our rooms too dry? How is this done? What was a very general belief formerly? Was the opinion correct? Does the atmosphere naturally have moisture in it? Is it known how much to a cubic foot? Are we in danger continually of drying this up? Should water, for evaporation, be always kept in our rooms? Is this duty often attended to? What apology is sometimes made for neglect? What sometimes causes chapped hands? Might not the same thing cause bleeding lungs? Of what shape should vessels be, which are used for the purposes of which I am speaking? Why should they be of this particular shape? What is said of going southward for health? What of going northward?

1401. In no one thing, perhaps, has there been more certain evidence that mind is on the "march," than in the changes which have taken place, within the last fifty years, in fireplaces. A very small quantity of fuel can now be made as useful and as healthy as a much larger quantity in former times. You will find fireplaces, in public places, and sometimes in private houses, which, while they are no worse in regard to ventilation, consume but a very small quantity of wood or coal.

1402. The fireplace is more manageable than the stove, and we can adapt ourselves more readily to its variations. If it is becoming too hot for us, we discover it by its increased glow or brilliancy, and retreat accordingly. Few of us are so absent-minded as to call for a servant, as we are told Sir Isaac Newton once did, to come and move back the fire.

1403. If the fire in a fireplace should be a little too low, we still perceive *fire;* and, under the expectation that it will ere long burn better, we often wait a little while before we attend to it, and then a little longer still, till it really burns somewhat better, or till we are called away by our needful employments. At worst, the heat from fireplaces is not apt to run to such a height as it often does in stoves.

1404. I am as well satisfied with a temperature of 60°, in a room where there is an open fireplace, or a grate, or an open stove, so that the fire may be fairly seen, as with one of 70°, when nothing appears but the naked fixtures; whether stove or furnace. And the explanation of the fact is found in the preceding paragraph.

1405. Whether, however, the explanation is admitted or not, the fact is undeniable. Who has not begun to imagine himself chilly, and in this way really begun to *be* chilly, in a room where no fire could be seen, when, with a blazing fire in sight, he would have thought no more about it?

1406. Another advantage of fireplaces and other open fixtures is, that, so far as the heavier gases manufactured by combustion and respiration are concerned, ventilation is more perfect. Carbonic acid, sulphurous acid, and sulphuretted hydrogen are all heavy gases; but, when a fireplace is used, and the chimney is open and free, with a good draught, they are driven away along with the smoke. Carburetted hydrogen has little to do with the fireplace, but escapes at the top of the room, if anywhere.

1407. Fireplaces possess other advantages. Their hearth or bottom being low, they send the heat into the room in such

a manner as to diffuse it far better than the stove. The heads of the occupants are not so much hotter than their feet. Heat, so far as it merely radiates, has a tendency to ascend, and to leave the floor comparatively cold. The fireplace, of course, is in this respect preferable.

1408. Of the economy of the stove, I suppose there are, in society generally, but few doubts. And yet I have mine. The whole expense for stoves, in the first place, — for improved stoves before the first are half worn out, — along with the fuel which has been used for the last fifty years, in this country, has been far greater than the expense of fireplaces of reasonable dimensions, and good wood and coal, would have been for the same time. This, moreover, leaves out of the account our increased bills for medicine and physicians, and our constantly diminishing strength and vigor of body and mind.

1409. But stoves, it is said, make us much more *comfortable* than fireplaces; and this objection will go far to neutralize all that can be said in favor of returning to the use of the latter. But are they more comfortable, in the end?

1410. I do not believe we are as comfortable, in regard to temperature, taking the year together, or at least taking the whole of life together, as we were fifty or seventy-five years ago. We certainly, as a people, had fewer colds then; and fewer chronic diseases, — neuralgia, scrofula, cancer, and consumption, — and we lost much less time by ill-health. And we had warmer fingers and toes, and better appetites.

1411. But the fire, all glowing with its radiating heat, applied directly to the eyeballs, is such a destroyer of the sight, say some, that, according to them, one should prefer almost any fixture whatever to an open fireplace or stove. In the evening, especially, when we crowd around the fire, the combined attack of the fire and the lamplight is enough to destroy the best eyes, they tell us, in the world.

1412. This objection would be worth more, if we were compelled to form a semicircle around the fire, and suffer the light and heat to attack the eye, all unprotected, as it then is, by the eyelids. But is there any such necessity? Can we not be satisfied when we know the fireplace is within our power, without encircling it, as if to prevent its escape? Can we not sit with our backs to it, or our sides?

1413. It is not designed, in the general tenor of these remarks, to denounce stoves entirely. They have their use. Even the air-tight stove, which, while it saves the hot air,

retains also its impurities, is sometimes useful. And then the family cooking-stove, such as that of P. P. Stewart, of Troy, New York, will always be more or less used. Stoves should be used somewhat as we use particular suits of clothes or dresses, — on particular occasions.

1414. Of the furnace I have said nothing of consequence, for a very plain reason, — that I have had but little experience in its use; that of a few years only. On the whole, I like it; but not quite as well as the fireplace. It is not so easy to adapt it to our variable temperatures of climate. Of heating by steam I know still less than of furnaces; but am prepossessed in its favor.

1415. Let me say, in closing this section, that, when we burn wood or coal in open fireplaces, or other open fixtures, we may save about half our heat by an arrangement, which will be mentioned in the progress of the next section; so that, in weighing the reasons for and against fireplaces, the truly wise need not long hesitate.

SECTION XVII. — VENTILATION.

1416. Much has been said, on this subject, within a few years past; and much remains to be said. Ventilation is a matter of immense importance. The proper ways and means for purifying, or, as the books on physiology say, *depurating*, the buildings we occupy, especially our dwellings, can hardly receive too large a measure of our attention.

1417. The process of ventilation is simple, yet complicated. It is simple in its principle, yet complicated in its application. We have but to introduce fresh or pure air, and remove that

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QUESTIONS. — Is one method of warming our rooms as good as another? Which, on the whole, is preferable? Has the fireplace, of late years, been greatly improved? What are some of the principal reasons for preferring it? Is it more manageable than the stove? Are we satisfied, when we can see the fire, with a lower temperature? What reasons are there for this belief? Is the fireplace better than other fixtures for ventilation? Does it send the heat in a room along the floor more?

What has long been thought of the economy of using stoves? What reasons are there for doubting the truth of this notion? But do not stoves render us much more comfortable? Why not? To what diseases are we more liable than we were before the days of stoves?

What says Physiology about fireplaces? Is not her testimony, after all, as well as that of Hygiene, against them? Is it intended by the author to denounce the occasional use of stoves? May not even the air-tight stove have its use? What is said of the use of furnaces? What of heating by steam?

which is old or impure. The new, fresh air is more dense; and, by means of its greater specific gravity, tends to get below and crowd out, or upwards, that which is more highly rarefied.

1418. When mankind lived almost exclusively in the open air, special efforts to ventilate were hardly needed. Boreas was the grand ventilator; and well did he fulfil his mission. And I have seen portions of our own country, within the last half-century, in which no ventilating tubes or flues were required. The crevices between the logs of which the walls were made not only permitted the ingress and egress of air, but at times admitted, without entrance fee, the rain and snow.

1419. Dr. Franklin, in some of his fugitive articles, relates a story concerning Methuselah. "It is recorded" of him, he says; but he nowhere tells us how we may *find* the record. He may have borrowed it; or it may have been one of the fancies of his own prolific and ingenious brain; nevertheless, it has a moral. The story is this:

1420. "It is recorded of Methuselah, that, when he had lived five hundred years, an angel appeared to him and said: Arise, Methuselah, and build thee an house, for thou art to live yet five hundred years longer. But Methuselah answered: If I am to live but five hundred years, it is not worth while to build me an house. I will sleep in the open air, as I have been used to do."

1421. But times are altered; and, if here and there an individual may be found who can sleep in the open air, it is equally true that the vast majority cannot sleep at all, at least with any good degree of soundness; and no wonder. For, if the bed on which they slept the preceding night has been opened and aired, — which is somewhat doubtful, — the sleeping-room has not, in all probability, received any other attention than that of re-arranging the furniture, and putting everything in a "new" condition.

1422. There may be a fireplace in it, with a passage for the bad air, but the far greater probability is that there is not. The window may have been left open an hour, or an hour and a half; but the fair presumption is that it has not been opened at all, except to open or shut the blinds. These last must be taken due care of, and all light fairly excluded, except while the process of re-arrangement itself is going on; lest it should affect injuriously the colors of the carpet, or excite the movements, in the summer season, of the flies and other insects.

1423. And, when night comes on, and the danger from the

sun and flies is over, the musquitoes must be excluded with all assiduity; and what is still more, alas! to be dreaded, the night air. Even if the room were air-tight, no door might be left open into a hall, nor any window admit, by the slightest elevation or depression, the pure atmospheric air, as God has given it, lest somebody, perchance, should take cold!

1424. Now, suppose a sleeping-room were occupied by only two persons, and was, withal, twice as large as that which I have mentioned at the beginning of this chapter (1201); and suppose the air, on entering it, at ten o'clock in the evening, to be perfectly pure, how long time would elapse before suffering must ensue? Why, in less than a single hour, most certainly.

1425. Few rooms, however, are perfectly air-tight; and it is well that they are not. Half the bad air, we will suppose, escapes; and a quantity of good air, equal to the same, finds its way in. This will retard the process of suffocation, somewhat. But, even at this rate, the bodies of persons, sleeping on the highest beds which Fashion herself ever makes up, would be entirely immersed in the deadly *choke damp* — alias carbonic acid gas — in less than three hours.

1426. Retiring to rest, then, I say, under such circumstances, at ten o'clock, what chemist or physiologist should be surprised, three hours afterward, viz., at one o'clock in the morning, to find in it, instead of two healthy individuals, two miserable and ghastly corpses?

1427. Is it not strange — I repeat the inquiry — that so little of obvious suffering, from this fertile source, is apparent among us? How can it be that half our population sleep six, eight, or ten consecutive hours, in a condition but little better than that which I have depicted, and yet not one in ten thousand immediately perishes? Nay, more; how is it that hardly one in a million dies, in these circumstances alone, unaided by any concomitants?

1428. I am not disposed to recommend to everybody, at once, to sleep with open windows; for I have lived too long, and observed too much, to have full confidence in the safety of such a direction. A man in Bloomfield, Connecticut, who had read my tract on Breathing Bad Air, being in feeble health, threw open his window, by night, and persisted in it, for many weeks.

1429. The result was his own complete restoration to health; and the improvement, unexpectedly, of the constitution of his wife. But a little child, that slept in the same bed, was so much

affected by the damp current which occasionally drove into the room, that it took a severe cold, and came near perishing.

1430. The precaution should have been taken, of hanging up something directly before the window, to break the force of the damp current. Many an individual, as I have already told you, has slept thus, for scores of years, and a few for a whole lifetime, with perfect safety.

1431. Something better than even this may be done. I refer not here to the plan of thrusting a crowbar through the wall, at the top of the room, as some have advised; but a much more architectural, as well as more efficient, movement. It consists in such an arrangement as shall admit a steady current of pure air into the chamber, and a steady egress of the air which has become impure. It consists, in one word, in scientific, that is, simple, ventilation.

1432. But, while the simple principle of ventilation is always one and the same as we have already been taught (1417), a little ingenuity is needful, and a little study of the law of adaptation. A sleeping-room, fifteen feet long by ten in width, with only one door and one window, and those seldom opened, does not need precisely the same ventilating apparatus and fixtures that are required in a kitchen, or parlor, with half a dozen doors, and as many windows.

1433. A sleeping-room requires a place for the admission of pure air at or near the floor. In many other rooms, it is sufficient if we provide merely for the exit of the bad air. The doors, if not the windows, let in enough of dense, pure air; and much of the bad air escapes in the same places at which the pure air enters. Provision must, however, be made for the escape of the carburetted hydrogen, which, from its elasticity, is formed, as a cloud, at the top of the room.

1434. Where a room has several doors and windows, some of which are opened and closed every half-hour or hour, and a fireplace in addition, there is little danger from any poisonous gas in the daytime, except the carburetted hydrogen. But in such sleeping-rooms as most of ours, in the United States, without fireplaces or stoves, — in short, without any means of ventilation through chimneys, — there needs to be an opening, both at bottom and at top.

1435. One method of ventilation is by means of a flue, or chimney passage, disconnected from those that belong to the fireplaces, running from the first story, in the body of the chimney, to the top of the house. This passage-way or flue may

receive the bad air from such rooms as have no stove or fireplace, by means of openings at the top of each room, with registers.

1436. One principal reason for having a passage for the impure air, separate from that which carries smoke from the fireplaces, is to prevent counter currents. And the reason why this passage or flue should be in the chimney, is, because the heat of the chimney, whenever there is a fire in it, will have a tendency to rarefy the bad air and strengthen the upward current.

1437. Some, I know, have no fear of counter currents. They say that, by the time the general current of rarefied air and smoke in the chimney reaches the base of the second story, or top of the first rooms, it will become so strong that slight additions, either of smoke or air from without, with the irregularity which accompanies, will make little if any impression.

1438. My remarks, thus far, have had reference chiefly to the escape of the carburetted hydrogen, which, as I have said, rises like a cloud to the top of our rooms. To facilitate the removal of the carbonic acid and other heavy gases, from which the principal danger after all is to be expected, there should be an opening at the bottom of the room as well as at the top; I mean, whenever there is no passage-way connected with a stove or fireplace.

1439. In this case, however, I would not permit the carburetted hydrogen, which is conducted away from the top of the room, to enter the same chimney into which the carbonic acid of the first room enters. It should be conducted, by means of a tube of sufficient size, from the top of the room to the ventilating flue of some other chimney.

1440. One dwelling in Boston, built at great expense, has a ventilating tube or flue extending from the top of each important room in the house to the top of the building. Here, under a kind of awning or dome, you may see the terminations or extremities of such a number of ventilating tubes, that they remind you of a large needle-cushion, thick set perpendicularly with needles. But I do not like such an expensive method of ventilation.

1441. Horace Mann has suggested the idea of having the partitions in our houses double, with a considerable intervening space, through which, by means of tubes, to conduct the bad air. But this is proposed in order to escape the necessity of conducting it away in the walls of the building, between the outside

and the lining, — as some have recommended, — where it is sooner cooled than it would be between the partitions, and the draught sooner checked. But my own method of separate flues in the chimney will doubless be found preferable.

1442. A considerable number of churches and school-houses, in the northern and eastern United States, have, within the last few years, been ventilated by wooden tubes of considerable size, at a distance from any chimney flue, and yet quite in the interior of the building. Some, however, have them in the walls or sides of the rooms. In many instances these are found to work well; but there are a few exceptions.

1443. A plan has recently been discovered, and I believe patented, by a man in Philadelphia, which consists essentially of a double fireplace, the interior layer of which is of cast iron. Between this iron fireplace and the inner wall is a space for the admission of bad air; which, being heated, ascends in the vacant space to the height of several feet, where the iron fireplace terminates.

1444. The superiority of this plan to the perpendicular flues in or near the chimney, of which I have freely treated, remains to be tested by experiment. The subject of ventilation is yet in its infancy; but its immense practical importance requires that it should be hastened to manhood as speedily as possible.

1445. There is much more of suffering in our schools, for want of a due regard to ventilation, than is generally supposed, The very young pupils first begin to yawn and give signs of distress, both because they have less employment than those who are older, and because they sooner breathe the denser carbonic acid gas. And they not only yawn, on the one hand, or become restless and troublesome to the teacher, on the other, but they all are excited to do positive mischief.

1446. Or, if they are too well educated in the school of obedience and good manners, to do anything worse, they soon fall into habits of picking their nails, or performing other vulgar movements, for the mere sake of relief. With the blood half-renewed they cannot be quiet; and to do something to relieve themselves is almost inevitable.

1447. Many a ferule is plied, and not a few rods are broken, in fruitless endeavor to reduce to order, and bring into subjection, where nature most loudly remonstrates. The teacher may be very comfortable, and so may not a few of the older pupils; while the little children are half immersed in the aerial poison.

1448. Every school-room, and indeed every other room where there is no natural or intentional provision for ventilation, is a Grotto del Cane to its occupants. It is so, to some extent, in our very best school-houses. Too often, they are something worse than this, and would almost rank with the Black Hole of Calcutta.

1449. A medical man in Hartford, Conn., begged and obtained permission of the committee, one day, to visit the public schools there, to learn, if possible, why the children who attended were so much troubled with scrofula and other glandular affections, and with diseases of the brain and lungs. He did not visit half a dozen of these schools before the mystery was revealed to him. The defective warming and ventilation was a sufficient cause, he said, without inquiring farther.

1450. The attempt has been made, for many years, to rouse public attention to this subject, whenever other arguments have failed, by means of ridicule. Children at school have been represented as sitting with their feet in the arctic zone and their heads in the torrid. Some have gone so far as to propound the inquiry, whether it would not be well to teach them to sit with their feet on the ceiling of the school-room, and their heads downwards.

1451. It is a source of much regret, to those who visit our public schools, and become acquainted with their actual condition, that the teachers, for the far greater part, are in such utter ignorance on the subject of ventilation. Or, if they have an imperfect idea of it, they confound it with a proper regard to temperature.

1452. Thus, on visiting a school in one of our cities, not long since, during a warm summer day, I found the air so impure that at first I could hardly breathe it. A strange sensation was felt, particularly in my head. Gradually, however, I became accustomed to it, and was able to remain half an hour, and to induce the teacher to get up, for once, a free circulation of air. On expressing my regret that provision had not been made by the committee for more easy and effectual ventilation, she exclaimed, with some surprise, "O sir, this is one of the coolest rooms in the city."

1453. If the time ever arrives when teachers and parents can be so trained as to know the nature and necessity of ventilation, it will, to the world we live in, be a great saving, not only physically, but morally. Few things retard more the wheels of human advancement than the constant use of bad air.

1454. It is said that most of the animals in our menageries are tuberculous. Men, in their ignorance, are little better off than if they were encaged in bad air. Is it too much to say, that pure air is seldom inhaled, either at home or abroad? In our dwellings, our factories, our shops, our schools, and our churches, bad air is the order of the day, — science and common sense to the contrary notwithstanding.

1455. Dr. John H. Griscom, of New York, in a discourse of his, delivered before the New York Academy of Medicine, has the following remarks: "To every school, especially every public school, in this city, State, and United States, there should be attached a medical man as one of its corps of tutors, who, by spending a few hours a week in instructing its classes in this interesting branch of science, would exert an influence for good, in the matter of public health, which would soon be felt over the length and breadth of the land, and with increasing power from generation to generation."

SECTION XVIII. — DISEASES OF THE LUNGS.

1456. The human lungs are subject to disease in various ways, some of which have been glanced at, incidentally, in the

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QUESTIONS. — What do we mean by ventilation? Is it both simple and complicated? How is it simple? How complicated? Under what forms of society is attention to the subject almost unnecessary? What did Dr. Franklin say of Methuselah? What are some of the errors connected with our sleeping-rooms? Why do not these errors of housekeepers and others destroy us much sooner and more frequently? Is it safe to recommend to everybody to sleep with open windows? What anecdote is related to show the danger of this? What precautions are recommended, in case of sleeping with open windows? How should pure air be admitted into a sleeping-room, — at top or at bottom? What rooms hardly need any ventilation? What is said of separate flues for ventilation in the chimney? Why should not the bad air pass off with the smoke? What gas escapes, chiefly, at the top of the room? What heavier gases must make their exit at the bottom? What is there remarkable in a certain dwelling-house in Boston? What has Horace Mann suggested? How has it been customary to ventilate our churches and school-houses? What invention by a man in Philadelphia? Is there a vast deal of suffering from bad air in our schools? For what are many ferules and rods plied or broken? What anecdote is related of the medical man in Hartford? Has the keen edge of ridicule sometimes been turned against our neglect of ventilation? How have children been represented as sitting? How is it said they should be taught to sit? What anecdote is related to show the ignorance of teachers on the subject of ventilation? Do other animals suffer from bad air, as well as men? What suggestions, on this subject, have been made by Dr. Griscom?

preceding pages. 1. We have a bad inheritance. 2. We compress and distort them by dress, occupation, etc. 3. We wear them out prematurely by compelling them to perform work which is unnecessary, both for themselves and others. 4. We irritate and poison them in a thousand ways, especially by bad air.

1457. On one of these sources of lung disease I have not, as yet, been sufficiently explicit. It is the "wear and tear" of the lungs, in the effort to remove from the system an unnecessary amount of carbon. Carbon we must of course have, for the purposes of thoracic combustion, as Liebig and others have well shown us; but, beyond a due proportion, it exhausts the vitality of the lungs, and leaves them in a state of predisposition to disease.

1458. For full proof of this fact, we have but to observe that those persons who live most on food and drinks greatly abounding in carbon, such as fat, sugar, pastry, butter, cheese, and alcohol, are, as a whole, most inclined to consumption. Wherever the climate will possibly admit it, this deadly disease always follows in the train of luxurious living.

1459. The result of this over-taxation of the respiratory system is a tuberculous condition of the lungs,—a condition which is much more prevalent than is usually supposed. From the best evidence which is acquired, both by sanitary and pathological investigations, it would appear that, in Great Britain and the United States, from one-fourth to one-third of all who are born are in this condition. This tuberculous state of the system predisposes to numerous diseases; but particularly to those of the lungs.

1460. Predisposition to disease, however, even of this kind, need not end in pulmonary consumption, or asthma, or any other more acute lung diseases. Predispositions do not always, and of necessity, harm us. The tubercles which result from inheritance, and which, till we begin a course of personal transgression, either in ignorance or voluntarily, would probably lie inactive or dormant if we never breathed bad air, or overworked our organs by too carbonaceous a diet, or in some other way.

1461. That the predisposing causes of lung disease, especially of scrofula and consumption, among us, are very numerous and strong, is admitted; still, I must insist that they can never amount to actual disease till they are roused to activity by exciting causes. The gun may be predisposed to go off ever so strongly, yet, till an exciting spark is applied, there will be

no explosion or discharge. But, then, the exciting causes of lung diseases are so numerous that it may be well to mention a few of the principal.

1462. 1. Certain diseases, among which are measles, small-pox, and scrofula. 2. Dusts of various kinds (see sect. VII). 3. Gases, emanations, etc. 4. Depressing passions and affections. 5. Excessive or protracted labor. 6. The ill-judged use of medicinal substances, of every kind. 7. Excessive or deficient use of the lungs. 8. Over-indulgence of the appetite, especially with rich food. 9. The incautious use of hard water, or of water which is in any way medicated.

1463. To this list must be added whatever tends unduly to exhaust the vital energies, particularly taking cold, night revels, late night studies, violent passions, hot food and drink, the use of mercurial medicine, much bleeding, especially at the nose, and much exhaustion by cathartics, or by lientery (1044).

1464. The term scrofula, which I have several times used, requires a word of explanation. By scrofula is not meant mere eruptions on the skin, nor yet canker in the mouth, nor merely sores on the neck, or elsewhere on the body. It may indeed appear, after some time, on the outside of the body, in the form of king's evil, or white swellings, or, as they are sometimes called, fever-sores; but, in general and in its essentials, it is a disease of what are called the lymphatic glands. It is characterized by the following appearances:

1465. First, there is a slender frame, with light and clear complexion and eyes, a long and lean neck, and narrow or thin chest and projecting shoulders, with all the marks of what is usually called a sanguine temperament. Sometimes, however, there is a dark or bilious shade, with dark hair and red cheeks, but this class of scrofulous persons is not large. In the second place, there is an unnatural brilliancy of the mind, with an inaptitude and unwillingness to labor much. Occasionally there is a dwarfishness, with diseased eyes.

1466. But we have other lung diseases, besides scrofula and consumption. Asthma is a source of very great suffering; and, though it does not often destroy people outright, yet it is not easy to say which is to be preferred, a sudden and quiet death, or a death, so to speak, which lasts almost one's whole lifetime.

1467. I have known asthmatic patients whose paroxysms have been so severe that they could not, for many days and nights, lie down on their beds; and this suffering was prolonged

for many years. One man, in Herkimer, N. Y., had suffered from the disease more or less for ninety-seven years!

1468. There seems to be, in these asthmatic people, a most remarkable tenacity of life. One of them, in Massachusetts, told me that in fourteen years he had taken six hundred dollars' worth of medicine,—chiefly, however, nostrums,—and yet he did not know that he was, on the whole, much altered by them. Certainly, said he, I am no better. Why the medicine, which is usually a sword with two edges, and cuts either the wrong way or the right, had not destroyed him, it is not easy to conjecture.

1469. The man who had suffered ninety-seven years from the disease, had taken medicine, more or less, every day of that whole long period. His name was John Williams; he was a clergyman, and was born in Rhode Island. Such persons are usually marked out as the victims of quackery; but it is very seldom that a person endures it ninety-seven years.

1470. Bronchitis, a disease of the passages which lead to the lungs, is usually set down as a disease of the lungs, and as having its origin in the same causes. It is a disease which, in our highly artificial state of society, is gradually extending its territorial limits, as well as becoming more and more fatal.

1471. Lung fevers, pleurisies, peripneumonias, and hydrothorax are, in these days, quite common; and we hear occasionally of pulmonary apoplexy. Portions of the lungs, also, at times, become hepatized, or transformed into a solid mass, not unlike hardened liver. Bleeding at the lungs is frightful, and, in rare cases, fatal. Goitre is hardly to be regarded as a disease of this country.

1472. Croup, like bronchitis, is rather a disease of the bronchial tubes than of the lungs; and yet the latter sometimes participate in the suffering. In fatality and frequency, the disease is probably increasing every year. And it not unfrequently happens that it fastens its talons most firmly on those who are predisposed to lung diseases.

QUESTIONS.—In what various ways may the lungs become diseased? May they become diseased by over-taxation in the combustion of carbon? Does this sometimes induce a tuberculous condition? Do tubercles lead to disease, especially to consumption? What are some of the exciting causes of consumption? What is scrofula? What are some of the signs of scrofula? What do you say of asthma? Is this more tedious than it is immediately dangerous? Are asthmatic people particularly apt to be imposed upon by quackery? What is said of John Williams, a very old man? What is told of a man in Massachusetts? Is bronchitis a troublesome disease? What other lung diseases are there? Can we say much of goitre? What do you say of croup?

SECTION XIX. — EDUCATION OF THE LUNGS.

1474. To educate is to develop. It is, as the Scriptures would express it, to train up. Merely to *instruct* is but a small part of education. The body may be educated as well as the mind and heart. The lungs may be educated as well as the rest of the bodily frame.

1475. It is in this point of view, and with this large idea of education, that it consists in rearing or training,—in the formation of character, either of soul or body,—that I shall proceed to speak of certain things as tending either to educate or mis-educate the lungs. These important organs may be educated wrong as well as right; and this in ways nearly innumerable.

1476. The mother or the nurse, during the earliest days of infantile life, is educating the lungs. I have seen this infantile education so misapplied as to render the child's breastbones, in shape, more like the keel of a vessel than like a suitable cavity for the lungs. Some undertake to tell us that the breast, in these cases, will come into shape again, but this is very doubtful. In any event, it is better to train up a child physically, no less than morally, in the way in which he should go, that, when he is old, he may not depart from it.

1477. Much may be done, in the way of developing and strengthening the lungs, by beginning early and persevering through infancy and childhood, in such measures as were recommended in section XVIII., chapter II. The lazy manner in which most children read, speak, and sing, at first, is in many instances perpetuated; and is even supposed by some to be innate or inherited.

1478. If the young were taught, from the first, to breathe freely, and to make it a part of their duty to expand their lungs; and, if what we believed to be a duty, were enforced by a steadily consistent example, we should have fewer lung diseases than now. In truth, I have very little doubt that it is in this way, principally, that the horrors of pulmonary consumption are to be removed from our otherwise happy and healthy country.

1479. Children should, from the very first,—whether in speaking, singing, or reading,—be accustomed to keep their lungs inflated. They should never be suffered to use these organs while *at the bottom of their condition.* It is as hurtful to the respiratory apparatus as it is to the bony and muscular

system, to be compelled to work when its vitality is below par; and, in either case, the drain upon the strength of the general system, and the tendency to general exhaustion, are very considerable.

1480. And yet, how few children are made to feel that, in in order to preserve the health of their lungs unimpaired, and even the general health, they must keep on hand, in the cavity of the lungs, a full supply of air? How many, in reading or speaking, especially the latter, mumble out a large proportion of their words (particularly the first or introductory ones); and all this just because they are too indolent to fill well the lungs, or to keep them well filled after they have been inflated. How many sing with the same carelessness, not to say recklessness, about air, as that with which they read or speak.

1481. Observe one of the flippant pupils of our public schools. He pauses, perhaps, when he comes to a comma, or at least when he reaches a semicolon; but how long? Not while he could count two deliberately; no, not even one. And what pause he makes is made by force, as it were, and seems measured, and compressed, and stinted. He hardly stays to take breath, but dashes on. Or, if he takes breath at all, it is only a little, not half enough to fill the space which ought to be filled and kept so.

1482. At the period even, or the interrogation, or exclamation point, he does not stop long enough to get breath. He seems to be in full pursuit of game; and thinks he is every moment in danger of losing his chance by delay. He catches a little air with a sigh, or effort, which can be heard across the room, half inflates the cavity of the lungs, and rushes along!

1483. Perhaps he is naturally short-breathed, by reason of feeble, delicate, phthisical lungs. Instead of compelling himself to a short effort only,—a single sentence, perhaps,—and taking special care to keep his lungs at the top of their condition, while he *does* read, he reads just as far as he can, till his breath is all gone; then catches a little, with a half-spasmodic effort, and drives on toward the goal.

1484. You may even observe a sort of natural—I would rather say *un*natural—declination or slope, all the way from the beginning of his reading to the stopping-place. He pitches his tune high enough, perhaps a little too high, as if conscious he should not hold out, and desirous of beginning so high as not to run quite ashore before he comes to the end of his paragraph. He goes down, down, with frequent renewals in part,

till he comes to the end; which, if at all distant, he reaches in a tone scarcely above breath.

1485. Now, the worst of all this is, not that it keeps up a most unnatural and wretched habit of reading, though one might think this was bad enough; but that it weakens the muscular powers of the lungs, both the voluntary and the involuntary; and, at the same time, gradually predisposes to disease. Every child who reads thus, will be thereby rendered more liable to severe colds, lung fevers, cold feet, and other extremities, and to consumption.

1486. This part of our early mis-education is the more to be regretted, if we set out in life with feeble lungs; and especially if we have the full benefit, all the way through, of the aid that good speaking, reading, and singing can do in arresting those downward tendencies, against which I have repeatedly cautioned those to whom the caution is necessary.

1487. The whole direction to be given in this case is, as I have, before now, more than intimated, to make all the varied exercises of singing, reading, and talking, so many means of well inflating the lungs, and keeping them well inflated. Some tell us that they who succeed in doing this will never have pulmonary consumption, and hardly ever any pulmonary diseases. The tubercles which are so often found lying between the cells of the lungs, not larger than pin-heads, being habitually compressed by full lungs, cannot be developed.

1488. The German physicians are even wont to say, that singing will cure pulmonary consumption, without any other aid. Certain it is, whatever may be our theories, that much speaking, and loud reading and singing, requiring, as they do and *must*, a good deal of inflation of the lungs, will do much to preserve this part of the human house in good repair, if not to break up incipient disease.

1489. It is usually said that we cannot cure pulmonary consumption. And yet it is something to postpone the disease indefinitely. It makes but little difference of what disease we die, provided we can live long enough before our time appointed fairly arrives.

1490. It is now nearly thirty years since I was supposed to be about to die of pulmonary consumption. There may have been some mistake about the character of the disease; but several veterans in the medical profession were with me in opinion. Yet I am still alive, and far better in health than I was at that

time. I do not say I am cured; but why should I care about that, if I can but *live out my time?*

1491. I had studied medicine, and knew my danger, and the best means of averting it. These means I knew I must employ, or die. I had proceeded as far as I could without painstaking. I had gone the full length of my tether. My mind was at length made up to pursue health and life; and to pursue them as a drowning man pursues the only piece of floating plank that can minister to his possible escape.

1492. But, it will be asked, perhaps, what particular course I adopted. 1. I determined, with God's help, to live. 2. I took the Heaven-appointed steps; in other words, I obeyed all the known laws of God, physical no less than moral. 3. I abandoned indiscriminate dosing and drugging with medicine. 4. I made a proper use of water, both internally and externally. 5. I adopted an unstimulating diet. 6. Above all, I took care of what remained—one side, the *left*—of my lungs.

1493. With regard to the special effort I made in behalf of my lungs, I can only say, now, that I took care to breathe pure air in the greatest abundance which was possible; and to exercise my vocal powers, in conversing, reading, etc., almost continually. I was especially careful to talk a good deal, and to talk loudly. And, when I was able to do so, by reason of increased strength, I fell into the habit of talking or lecturing publicly, to a very great and unusual extent.

1494. Fifteen years or more after my first effort at recovery, I fell in with a friend, who had been a member of a Bible class of which I had the charge, but who now filled one of the highest offices of the State. He said to me, at the close of a lecture: "What have you been doing with your lungs? Once your voice was feeble and squeaking; now it has great power. I am curious to know the cause."

1495. I told him that the principal thing I had done with my lungs was to use them. I had talked almost incesantly for many months of nearly every year. And when I talked, I did it with all my might. I used the whole lungs, and, more than even this: I took care, in speaking and reading, to work with the *bellows handles*, as they have been called,—the abdominal muscles.

1496. Let me say, in passing, it is a doctrine of immense importance, that everybody can and should sing. Not, of course, that everybody can sing well. Not every one can *read* well. With proper training, however, I do not know but as

large a proportion of mankind could sing well as read well. An old friend of my father used to say that every one, who could call his domestic animals, could sing.

1497. But, because there are some who cannot read well, after all their painstaking, do we therefore refuse to instruct them? Is not the effort so much the more necessary? Perhaps, too, the lungs of those who cannot read or sing quite so well as others, may be as much benefited by our efforts to train them in the way they should go, as their lungs would be who should rival the nightingale.

1498. Let me say, also, that reading aloud, in order to be most beneficial to the lungs, should be, as it were, set to music. An ingenious parent or teacher may comprehend my meaning far enough to take the needful hints. Good reading *is* music. And a proper graduation of the voice during the exercise should carry us — does often carry us — through four, six, or eight notes of a scale that might be formed, and made of essential service.

1499. All this, however, though of vast importance, would fall short of accomplishing the great work of educating the lungs to the highest pitch of health and power. They must have the pure air. And the reading, speaking, and singing, I have mentioned, will be doubly valuable if we are kept filled with the pure element, just as God gives it forth from his own great laboratory. Would that the Peripatetic method might be revived once more! Would that half we do, in connection with the family and the school, were done out of doors!

1500. Has geology nothing to tempt us abroad, where heaven's best aerial treasures are? Have botany, zoology, and anthropology no temptations? Have scientific agriculture and horticulture none? Has art no features we wish to study or explore? Is there nothing in the mechanical world, beyond the smoke of our own chimneys, and the limits of our own homestead?

1501. We are apt, some of us, especially the aged and the conservative, to place the golden age in the past. But if there is to be a golden age in the future, as prophecy would seem to imply, it must be in a future where high, bounding effort, amid heaven's own sunshine and pure air, expands and swells the chest to a size quite beyond the narrow contracted thoracic cavities of the great mass of those who now occupy our schools,

our colleges, our factories; ay, and to a very great extent our parlors and sitting-rooms.

1502. The latter glorious days of earth must contain human chests whose capacity will average more than three-quarters of a modern gallon. They must and will contain chests of which the owners will not be ashamed. They must be chests worthy of the name, in order to be the divinely appointed instrumentalities of raising high the everlasting song of the redeemed, whether in earth or heaven.

1503. For my own part, I expect happy results to our race, — especially in the way of invigorating the lungs, — from the almost universal custom of swimming once or twice a day; from sawing and splitting wood; and, by those who are equal to the task, from spading, shoveling, trundling the wheelbarrow, etc.

1504. The abundance of air-tight stoves and other traps, that now decoy men into air so much heated as to afford but a stinted supply of oxygen for the restoration of the vital fluid to its wonted purity, will also ere long give place to something more worthy of a rational race, and tending less directly to putrefaction and death.

1505. To improve the condition of feeble lungs, — to educate, as it were, this department of our system, broken down as it too often is, — several ingenious instruments and plans have been devised and scattered all over society. Those most worthy of note are Ramadge's air-tube, and Stewart's exercises. Ramadge is a distinguished medical man of the old world. Stewart is a mechanic of Troy, N. Y., — the maker of the family stove I have mentioned.

1506. Ramadge's air-tube is a small pipe, so constructed that a small valve prevents the air from going through it in one direction as rapidly as in the other. You place one end of it in your mouth, and inhale the air through it; but, when you wish to throw out your breath through it, the passage is slow and difficult. Your lungs, having been once filled, are therefore kept expanded longer than otherwise they would be.

1507. Stewart accomplishes the same thing, and much more, without any other instrument than that with which the Creator has furnished us. He requires us to inflate the lungs as much as possible, and then retain the whole mass of air in them as long as we can; and in the mean time to rise on our toes and then depress the body suddenly, with a jerk, in order, as he says, to shake

or force the air in their cavities into the remotest of their cells, and fully expand them.*

1508. Both these modes have their excellencies, but the last is the most natural, and can be practised by anybody, in any circumstances. The *tube* is never mislaid or lost. Every child whose lungs are feeble should be taught this exercise. Of course, the jerking motion should be repeated a considerable time.

QUESTIONS. — Is there such a thing as educating the lungs? Have the mother and nurse anything to do with it? Is consumption chiefly to be prevented in this way? What is meant by reading, speaking, and conversing, with the lungs at the top of their condition? Should great attention be paid to this? What examples are given to show its importance? Mention some of the usual errors in reading. Do our daily errors of this sort weaken the lungs?

What do the German physicians say? Can consumption be cured? How much, then, may we hope to do by timely action? What is related of the author's own experience in this matter? Is it unspeakably important that every one should learn to sing? Is it as certain that everybody can sing as that everybody can read? Are there not as many good singers, even now, as good readers? Should we sing more out of doors? Should everything be done, more than it is, out of doors? Is it desirable that the Peripatetic method of teaching the young should be revived? What is intimated concerning the study of geology, botany, etc.? Is there a golden age in reserve for us? Will it come to us till we have, as a race, enlarged our lungs? Must air-tight stoves first be banished? What is said of mechanical devices for improving the lungs? What of Dr. Ramadge's tube? What of Stewart's exercises?

* The same result may be accomplished in part by deep and long breathing; and holding the breath and counting as long as we can without taking new air.

CHAPTER VII.—THE LAWS OF THE SKIN, AND OF CLEANLINESS.

SECTION I.—SHORT ACCOUNT OF THE SKIN.

1509. The human skin is not a mere wrapper,—a mere envelope of the body it incloses. It is indeed all this; but then, like the lungs, the brain, or the stomach, it is an *organ*, performing various offices or functions. It is, like other organs, fearfully and wonderfully made.

1510. You have, perhaps, visited some of the huge factories of our country, as at Lawrence or Clinton, in Massachusetts. In the latter place is a large gingham factory, one room of which, nearly square, incloses a whole acre. The machinery—spindles, looms, and operatives—is very extensive. You view it with absolute astonishment!

1511. Now if, by some powerful microscope, like Humboldt's (which magnifies objects over three hundred thousand times), you could view but one single square inch of the human skin, while in full and healthful activity, you would be much more astonished than in viewing the gingham factory at Clinton. You would seem to see more machinery.

1512. You would, in the first place, be surprised to see rivers of blood, in great numbers, coursing their way in two directions; and, though running side by side in close proximity, yet never intermingling their contents, because inclosed in tubes, which, though thin and delicate, are yet amply strong for this purpose, except in the case of absolute disease.

1513. The rivers of blood are the arteries and veins. They are so small, most of them, that you cannot see them with the naked or unaided eye. The skin is, as it were, full of them. Pierce it with the finest needle, and you are sure to hit one or more of them. But the blood, as long as we are in health, is all inclosed in vessels, large or small. Not a particle of it is to be found flowing at large, like water in a sponge.

1514. Between the arteries and veins, at or near their extremities, are numerous little streams, called capillaries. The blood in the large arteries having been carried from the heart

to the extremities, and particularly to the skin, runs from them into the veins, through the capillaries; and is carried back through those veins to the heart.

1515. But the skin is very full of nerves, also. These are branches of the spinal marrow and of the brain. They have a remote resemblance, so far as mere shape is concerned, to the thick branches of a tree. They are white cords, but are so small in the skin as hardly to be discoverable by the naked eye. Their number is, as it were, immense.

1516. You will also see a multitude of what are called lymphatic vessels, and perhaps a number of lymphatic glands. Lymphatic vessels somewhat resemble veins and arteries, except that they contain a colorless fluid, called lymph. This fluid is also found in the lymphatic glands themselves.

1517. In every part of the skin, particularly where there are folds of this organ or flexures of the limbs, and at the roots of the hairs, are found more or fewer of what seem to be little membranous sacks, or bottles, with their open mouths on the surface of the skin. They are called sebaceous glands. They furnish a small quantity of an oily substance, whose object is to keep the skin supple.

1518. But, above all,—and what is of more consequence than all the rest,—the skin contains an almost infinite number of very small vessels, called perspiratory ducts; or, sometimes, simply vessels of perspiration. They begin underneath it, and run through its substance, usually in the spiral or screw shape. They are more spiral where the skin is thick and strong than where it is thin. They are so numerous, that their aggregate length in the human surface is estimated at no less than *twenty-eight miles.*

1519. All this machinery, moreover, is contained in the under or third layer of the skin,—that, I mean, which is usually called the true skin, or which, when tanned, forms the leather. But there is attached to the under side of the scarf skin, which is laid over this, a great number of very minute cells, containing the pigment, or coloring matter of the skin. Of course this pigment is dark in the African, light in the European, etc.

1520. The foregoing, I grant, is a very meagre account of the machinery of the human covering,—the skin. And yet, is it not amply sufficient to sustain the statement that every square inch of it contains more machinery than the largest room of one of our most noble factories?

1521. The skin is connected with the parts underneath it,

by means of that cellular substance of which something has been already said, in connection with the muscles (104). The cells of this membrane communicate with each other, and frequently contain more or less of oil or fat. In some few individuals this fat, both under the skin and between the muscles, accumulates in large quantity.

SECTION II. — THE GENERAL OFFICES OR USES OF THE SKIN.

1522. In general, it may be said that the great purpose of the skin is to be a handmaid to the lungs. Whatever these do, the skin aids in doing. When the former do their work well, the skin performs its part the more steadily and quietly; and the contrary happens when they do their part but ill. If the skin does its work well, the lungs are usually free and unembarrassed; if otherwise, they are liable to become diseased.

1523. This same relationship, usually called sympathy, exists, it is true, in some degree, between the skin and the lining membrane of the alimentary canal, and all its contiguous organs; particularly the kidneys and the liver. In truth, there is a mutual sympathy between all parts of the system which are lined with what is termed mucous membrane. Still, there is a closer bond of friendship — a stronger sympathy — between the skin and the lungs, than between the former and any other organs.

1524. We have seen, in chapter VI., that the great office or mission of the lungs is to keep pure the mass of fluids which the body contains, and of which it is very largely made up. This mission they fulfil; 1, by the agency they have in manufacturing blood; 2, by their power to renew or restore it; and 3, by their power to send the blood along in its proper channels to all parts of the body.

QUESTIONS. — Is the skin nothing more than a mere covering to the body? What comparison have I made, for the purposes of illustration? Do the statements concerning it seem to you extravagant? What is said of rivers of blood? Is the blood, when we are healthy, always found in tubes or vessels? What smaller vessels serve to connect the arteries and veins at their extremities? Does the skin abound with nerves? Has it also lymphatic vessels and glands? What is contained in these? What can you say of the sebaceous glands? What vessels, in the skin, are still more remarkable than any which have been mentioned? How many miles of them? Has the skin more than one layer or thickness? Where is the coloring matter found? What connects the skin with the parts underneath it? Does fat, in this cellular membrane, sometimes accumulate in large quantities?

1525. Now, one way in which the skin aids the lungs, in their work of renewing the blood and keeping it pure, is by burning up, as the chemists say, a part of its superfluous carbon. In other words, it constantly uses up or absorbs oxygen, and at the same time eliminates or throws off carbon. It does not accomplish this, of course, as fast as the lungs; but it does what it can.

1526. In doing this, moreover, it aids very considerably in heating or warming the body; for, though the lungs and all the living parts are probably concerned in the function of calorification, — or keeping up the heat of the system, — yet a very considerable share of the work has also been committed to the skin.

1527. But the skin accomplishes its great work of depurating or purifying the body, chiefly by the power it exerts of taking out dead and dying particles — so to call them — from the vessels in which they are contained, and of working them up into a new fluid, commonly called the matter, or fluid, of perspiration. Its quantity is considerable, — varying in an adult from two to five pints in twenty-four hours.

1528. When the skin is in a high state of health and activity, this perspiratory fluid is always passing from the body, in the form of a gentle mist or steam, which is invisible to the naked eye. Sometimes, however, it is in such quantity as to form a vapor, which is visible. In some instances it is condensed in drops or streams, greater or smaller, in which case it is called sweat. When we do not perspire at all, disease follows.

1529. As the result of those sympathies to which I have alluded (1523, 1524), the skin, in addition to the performance of its own work, is sometimes compelled to work for other parts, as it were, — for the lungs, or for the kidneys. And, in like manner, these last are sometimes necessitated to work for the skin. In either case, the increased labor, if long continued, is apt to cause derangement and disease. Many a cold, to say nothing of other complaints, has its origin in this very way.

Questions. — What is the general purpose of the skin? What is meant by the sympathy of parts with each other? How do the chemists speak of the manner in which the skin aids the lungs? What is meant by combustion, or burning, in the lungs? Does the skin have anything to do in heating or warming the body? How does the skin perform the great work of purification most effectually? Is the matter of perspiration always eliminated from the body, as long as we are in health? Is it

SECTION III. — SECONDARY OFFICES OF THE SKIN.

1530. The skin has the power of absorption. The term absorption has been partly explained (245) already, in connection with the subject of deformity. It is sufficient to say, in general, that, by absorption in the human system, is intended simply the power of imbibing or taking up.

1531. All parts of the body — at least all the soft or movable parts of it — appear to possess this power, in greater or less degree; for, were it not so, the waste particles could never be manufactured into the fluid of perspiration, sebaceous matter, etc. (1513). But the skin appears to possess an unusual degree of this power.

1532. Thus, if we rub spirits, or turpentine, or mercurial ointment over the surface of the body, or any part of it, a small portion of any one of these substances, and of many others which might be named, will be absorbed by the vessels of the skin. Even warm water, and other mild liquids, may be absorbed in very small quantity.

1533. It is said of sailors at sea, that, when destitute of fresh water, they have sometimes allayed their thirst by applying cloths, moistened with salt water, to their skins. The water thus absorbed enters and dilutes the blood gradually, without adding to their sensations of distress, as the swallowing of it, in any considerable quantity, most certainly would.

1534. By means of the nerves which abound in the skin, in which the sensation of touch appears to be situated, it is also a medium of communication with the surrounding world. Divest us of this envelope, and, though we might still see, hear, taste, and smell, we should be in danger of being lacerated, burnt, or otherwise injured, were it not that the sensation of touch in the skin is everywhere active. Of course it is more acute in some parts of this organ than in others, — such as the lips, the balls of the fingers, etc.

1535. Suppose I approach, incautiously, too closely to the fire. The nerves of the skin, — or, at least, the power that dwells within and controls them, — alarmed, as it were, at the danger of disorganization or destruction of their substance, send up an instantaneous report to the brain; and the result

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usually invisible? What do we call it when visible? What are the usual effects of irregularity or cessation of this process? Has many a cold, to say nothing of other diseases, had its origin in this very way? What dread diseases have we seen, in chapter v., are apt to be excited by colds?

usually is, that the endangered part is withdrawn or removed. So, if sharp points begin to press this organ, a remonstrance is sent up to head-quarters, and we change our position.

1536. The skin is a protection and defence to the parts underneath it, among which are innumerable vessels and nerves. This is especially true of the cuticle, or scarf-skin. This resembles, in its offices, the coarse, rough cuticle of many trees and plants.

1537. It may even be affirmed that the skin is ornamental. Some, I know, do not regard mere ornament as having much to do with utility; but why not? Is beauty no better for the eye, mind, and heart than ugliness or deformity?

1538. Were the skin to be removed, we should certainly be highly offensive to the sight. And, in viewing the drunken or the diseased, whose skins, on the one hand, are turgid and dark-colored, and covered with eruptions or ulcers, or, on the other hand, pale, or livid, or shrunk, do we not feel more or less of pain and suffering? So in regard to transparent skins and unnaturally red cheeks. Here is no true beauty.

1539. To be really ornamental, the skin, in young or old persons, should have a true flesh color. I do not say that the cheeks in some should not be slightly tinged, or the countenance in one somewhat darker than in another. Still, there should be no leaden, or livid, or waxwork faces. We should look as the Creator intended we should look, and as all would look, did they properly value and carefully obey all his holy laws.

1540. Now, in order to have the skin perform the various offices I have assigned it, in this and the preceding section, such as perspiration, calorification, absorption, sympathy, protection, etc., it must be made to obey certain laws, the most prominent of which will be mentioned in the sections which follow.

QUESTIONS. — What is absorption? Is this work done by the skin? Have all parts of the system more or less of this power? Has not the skin more than an average share? What proofs are given that the skin has power to absorb? Is the skin the seat of one of the senses? Which? Is it by means of the sense of touch in the skin, that we hold communion with the external world? Is touch more acute in some parts than in others? What examples are presented to illustrate this point? How is the skin a protection and defence? How and when can it be said to be truly ornamental? Where and when is it the contrary of all this? What must be done, in order to have the skin fully perform its varied offices?

SECTION IV. — THE SKIN MUST HAVE LIGHT.

1541. There are few of us who have not witnessed the effects of leaving a healthy potato, in the opening of summer, in a dark cellar, till it has shot forth stems many feet in length. I have seen some which, in these circumstances, grew to the length of eight or nine feet.

1542. But what is their appearance? Have they the dark, or rather deep, color which potato-tops have when they are reared in the full light of the sun, and in the open air? Can they endure the summer heat, or the severe storm, or the autumnal cold, without suffering or withering? Are they strong and hardy, — well stocked with vitality?

1543. Every one who has seen them will remember their white, flaccid, feeble appearance; and few are to be found who have not noticed their want of vitality and vigor. Nor can they be made vigorous and healthy, even though we extend to them the utmost care and cultivation, and persevere in our efforts ever so long. They are injured for life.

1544. So it is with many persons in every civilized country. So it is, in particular, with a very considerable proportion of each rising generation of females. They are secluded from the sun's light by blinds, curtains, gloves, veils, covered carriages, and the like, till they are almost as palefaced as the potato-stem in a dark cellar.

1545. And where the females of a country are thus blanched and palefaced for want of air, there you will find a vast amount of nervousness, and scrofula, and consumption. I care not how salubrious the climate may be, or however favorable to health the other circumstances. A waxwork face cannot long resist disease, in any country. Grant that neuralgia, scrofula, and consumption have other causes besides our education in darkness; so has the whitefaced potato-stem. Still, a large share of the evil, in both cases, is fairly attributable to the want of light.

1546. In alluding to blinds, curtains, gloves, umbrellas, etc., I did not by any means intend to oppose their use, in the proper place. It is the abuse of these things of which I complain; and this abuse is exceedingly common. That they have a legitimate use, no one I trust will attempt to deny. But so has the sun its uses. It was made to shine, and to shine on men, and women, and children.

1547. There may be error on the right side of the case.

Bring out a potato-stem which has been reared in a dark cellar, and expose it, at once, to the full glare of the sun's light, and what can you expect but that its feeble form will soon give way? So, let our potato-stem males and females suddenly expose themselves at Calcutta or Singapore, and what should be expected but sunstroke? Sudden changes are not always safe, even from darkness to light, especially to the feeble.

1548. Whenever the young shall be trained to walk in the light, physically no less than morally, their reward will be very great. They will find themselves in the possession of such constitutions of body as otherwise they might never have known, and as we, who are parents, never transmitted to them. Then, if they choose, they may even go bareheaded all summer long. I have known a few who did this. Whole tribes do this, even within the tropics.

1549. Not a few, among us, are very much afraid of the influence of the sun's light. Their young children's very fair skins, or perchance those of their female friends, may be a little browned or tanned by it, they fear. Now, while I do not suppose that any special benefit would be derived from blistering the skin by exposure,—to say nothing of its uncomfortableness,—I do not believe that a *little* exposure is likely to bring with it any serious evil. We have thousands among us, who, instead of being injured by a little tanning or browning, would be healthier, very much healthier, if they were tanned all over.

1550. I trust, then, that in speaking of going bareheaded in hot weather, and of other forms of exposure, I shall not be understood as recommending or indorsing what is sometimes called foolhardiness. If going bareheaded in hot weather is generally desirable, of which I have doubts, it is a habit which is to be begun early, or entered upon gradually.

SECTION V. — EFFECTS OF AIR ON THE SKIN.

1551. I have already shown (1521–1525), that the skin, as

QUESTIONS. — What is said of vegetation in a dark cellar? Is it in a vigorous or normal state, or is it feeble and delicate? Are there persons to be found in civic life, who are a little like them? What are the causes of a waxwork appearance in human beings? Are there not other causes of this appearance? May we not go to extremes in the matter? What is said of the danger of sudden changes? Do some persons appear to be afraid of the sun's light? Would not many of the feeble be benefited by it? What is said of going bareheaded, and especially of sudden changes?

a handmaid of the lungs — a sort of breathing apparatus — needs air. We have seen, also, that this organ, by its perfectly healthy action, produces changes in the blood analogous to those produced by the lungs in respiration; and hence we may say, as has often been said, that in a certain point of view we breathe all over. But breathing, whether performed by the lungs or the skin, requires air; and, the moment either is deprived of it, suffering commences.

1553. To secure the great point of furnishing the skin with plenty of oxygen, we should be in the open air as much as possible, both by day and by night. We should be as little in bad air as in darkness. Indeed, instead of wondering at the vast amount of disease among us, which has its origin in seclusion and darkness, and an impure atmosphere, the wonder, with me, is, that we do not have much more of it.

1554. We should not only be in the open air all we can, but it should be as cool as possible. They who live in hot rooms are preparing the way for ill health, by furnishing for it two avenues, — the lungs and the skin. For, though the human combustion in the skin goes on slowly, and some oxygen is received, it is yet true, that the small amount of it which the skin can appropriate is quite as indispensable as a larger quantity is to those organs that are able to imbibe more of it. And the cooler the air, the more, in a given volume, there is of the oxygen.

1555. Our dress should be as loose as possible. Most persons, I admit, require a good deal of clothing, during our long winters, both by night and by day. But, then, they have no need to wear it tight, except for fashion's sake. I have mentioned (409) the necessity of having our bed-clothing loose and porous; but it would have been quite out of place to mention, at that point, all the numerous causes why it should be so.

1556. We are assured by Dr. Dewees, that, if a lighted lamp or candle is plunged suddenly into air which has remained for some hours in contact with the human body, unchanged, as in an ordinary feather-bed when covered with thick comfortables, it is immediately extinguished, for want of oxygen to sustain the combustion. But it should be known to every living human being, that, where combustion cannot go on, the skin can never perform its offices. And I repeat, that, when the skin suffers in this or in any other way, the whole system suffers.

1557. Many use the same dress, or nearly the same, both for winter and summer; as well as the same amount of clothing

at all seasons, by night. This is wrong. I know the human system is very accommodating; but, then, all such accommodations have to be paid for, sooner or later, with large interest.

1558. Scrofulous and rickety children are said to be benefited by playing in the dirt; and consumptive persons, by laboring in it, breathing it, and smelling it. But neither the smell of the earth, nor the inhalation of dust, has any good effect, on adults or children. It is air, light, and exercise which are beneficial. They improve in spite of the dirt; and no wonder.

1559. Mr. George Combe, in his "Travels in the United States," calls the American ladies beautiful, because they have, so many of them, that blanched or waxwork appearance which is always produced by the want of sufficient light and air! It is not strange, perhaps, that a man should make one mistake in his whole lifetime, especially in his notions of the peculiarities of a foreign country. He who should not, must be made of something beside the ordinary materials.

SECTION VI. — COMPRESSING THE SKIN.

1560. In order to obtain but a faint idea of the evils of compressing the human skin, let us endeavor to think what would be the result if all the machinery in the gingham factory at Clinton, which I have mentioned, were compressed by a huge platform, let down upon it, into one half its ordinary thickness. Would there be no derangement and disorder? And would it not require much time to restore it to order again?

1561. But, if the skin has more machinery than the factory, is it no evil when that, too, is compressed — perhaps to half its thickness? Grant, indeed, that the compression would not ac-

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QUESTIONS. — Has it not sometimes been said that we breathe all over? Is this in any sense true? In what respects is it true? What follows, immediately, if the skin or the lungs are deprived of pure air? How shall we secure an abundance of pure air? When we consider how much of the time mankind are immersed in bad air, should we wonder that there is so much ill health among us? Should we keep as cool as possible? Why?

Should our dress be loose, both by night and day? Why so? Is there any intrinsic necessity of ever wearing our dress tight? Why, then, do so many wear it thus? What does Dr. Dewees say? What do you think about the propriety of wearing the same clothes both in winter and in summer? What has been often said about playing and working in the dirt? What is probably the truth on this subject? What does Mr. Combe say of the females of the United States? Is this opinion correct?

tually break so many looms and wheels, still, it would for the time as effectually cause derangement and trouble. Nor would the evil, in either case, end with the derangement of one particular department. When one portion of the machinery of a well-ordered factory is broken up, the other departments often suffer seriously as the consequence; and, in like manner, when we compress a portion of the human skin, greater or smaller, we injure, indirectly, other parts and organs.

1562. Take, for example, the custom of compressing the lungs by dress. In so doing, we not only impede the action of the lungs themselves, as was seen in chapter VII., but we compress several square feet of the skin, and thus do an injury which has been almost universally overlooked. But, in thus checking the proper action of several feet of human surface, we throw an addition of labor on other parts and organs that sympathize with it; and thus, perhaps, rouse into activity many diseased tendencies, which might otherwise have slumbered forever.

1563. Many among us vainly imagine that the present generation is so much wiser than the past, that there is no danger of the return of a custom so barbarous. But it exists, even now, to a limited extent; and is ready to return upon us, in all its wonted force, whenever the fashions of London, Paris, New York, and Boston, with their silly, interested votaries, the dressmakers, shall demand it.

1564. Against such a recurrence, let every mother and sister — ay, and every father and brother, too — enter their most solemn protest. Not one square foot of the human skin — no, not one square inch — can be permanently and greatly compressed, without inflicting more or less of lasting injury on the individual and the race.

1565. Tight boots, shoes, and cravats, though more or less injurious in their effects, and by no means to be recommended, are yet far more tolerable than compression about the chest. They affect the outposts of the fortress, but not the very citadel of life itself.

1566. And yet, let me say once more, it were far better for the skin, and even for the general health, if everything in the shape of tight clothing were wholly and forever abandoned; and if we were to substitute, in its stead, such garments as should not press unduly on a single square inch of the surface.

QUESTIONS.— What comparison is repeated, in order to show the evils of compressing the skin? What is said of compressing the chest by dress?

SECTION VII. — IRRITATING THE SKIN.

1567. It is not at all probable, that the effects of coarse flannel worn next the skin are as unfavorable to health as many have represented; though it is quite certain, that it produces so many temporary inconveniences that it were far better for most persons to lay it wholly aside, and substitute, in its stead, either such woollen flannels as are of softer texture, or flannels from cotton.

1568. Now, if there were no irritation of the human surface, I would not presume to devote a whole section to this single topic, — not even a short one. But, alas! *internal* irritation of the skin is tolerated among us, in almost every department of social life; and is producing a flood of mischief.

1569. Drinks, we have seen, are not digested. After being received into the stomach, they pass immediately into the circulatory system, and make a part of the circulating mass; especially of the blood. Now the blood (1512) courses its way through the skin. It follows, hence, that if the blood contains anything of an irritating nature, the skin must be irritated.

1570. Alcohol, in all its various forms of combination, — rum, brandy, gin, wine, cider, ale, or beer, — is exceedingly irritating to everything endued with vitality. When drank, it first irritates the stomach. The absorbents in the coats of this organ immediately take it up, and get rid of it with as much of dispatch as possible.

1571. It is soon in the heart and arteries, and is hurried from place to place, — kicked as a football hither and thither, — that it may be driven from the human domain as soon as practicable. Some of it escapes through the skin almost immediately; but a considerable portion of the maddening draught lodges in the skin, and of course irritates it. And this irritation greatly disturbs it in the performance of its proper functions.

1572. If this act of violence to the living human system were to be inflicted but once, the evil would not be so great. Even the delicate tissues, though *poisoned*, would soon recover. We should not then see so many skins discolored, thickened, and perhaps studded with carbuncles, or, as some would say,

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What great evil, in connection with this custom, has been chiefly or wholly overlooked ?. Is the present generation wiser than the past ? Under what circumstances may the follies of past times return upon us ? What solemn protest should be made; and by whom ? What is said of tight boots, shoes, cravats, etc. ? What important suggestion is made at the close of the section ?

with grog-blossoms. But too often it is repeated, till not only the skin, but organs still more vital, become seriously affected.

1573. And then, again, alcoholic drinks are not the only things which irritate the skin and prevent it from performing its proper offices. All medicinal substances, solid or liquid, if taken habitually, when no disease is present, have the same or a worse effect. Solid poisons are no more digested than liquid ones; though it sometimes happens that they are a long time in being dissolved and introduced into the circulatory system.

1574. Among the substances of this latter description, which have always been regarded as medicinal, and which are still reckoned as such by medical men, are tobacco, arsenic, opium, camphor, assafœtida, coffee, tea, alkalies, acids, and spices. No one of these is more deleterious to the skin, taken as a whole, than tobacco. It contains one of the most insidious, penetrating, and at the same time virulent, poisons, which can be found in civilized society. A few drops of this poison, used by itself, will destroy life almost immediately.

1575. Arsenic, it is true, is in some respects as deadly as tobacco; but we have no certain evidence that it is, as yet, very much used in this country, except in the case of stage-horses. It is much used as a daily stimulus by some of the inhabitants of southeastern Europe; and it is to be feared it may yet have a run in this country.

1576. Although I have represented tobacco as a prominent offender against the skin, yet several others in the list are bad enough; particularly those which, though far less poisonous, are in more constant use. Acids, as such, are I believe but rarely taken; and so of camphor and opium, except in a few instances. But the alkalies, — potash and soda, — with tea, coffee, and the spices, are continually operative.

1577. It may, perhaps, be laid down as a universal rule, that small quantities of these, or any other internal irritants, taken habitually and at frequent intervals, do more mischief, or poison more, in proportion to their quantities, than larger doses, taken less frequently and at irregular intervals.

1578. The effects, therefore, of the smaller irritants (1574) on the skin, taken as they now are, in civic life, cannot be otherwise than highly pernicious. And no one, who duly considers the subject, can help wondering why their use has not long ago been proscribed by all who lay claim to the character of reasonable and intelligent beings.

1579. Every one knows, for example, the effects of mustard,

saleratus, and pepper, when formed into a warm poultice, and laid, for only a short time, on the living arm. The contents of the human stomach, at the close of many a modern meal, thus applied, would inevitably result in a blister. And is the interior of the stomach and alimentary canal less delicate and irritable than the exterior surface of the body?

SECTION VIII. — TEMPERATURE OF THE SKIN.

1580. We shall see, in subsequent chapters, how the heat of the human system is mainly kept up. But, as the skin has an important part to play in the great work of human calorification, I must devote a few paragraphs to that subject.

1581. The inquiry is often made, "What is the proper temperature of the human body?" Or, in other words, "What is the degree of heat to which our rooms should be raised at seasons when the temperature is within our own control?"

1582. I have already spoken (458) of the difficulty of establishing any general rule with regard to things of this sort. One person will be quite uncomfortable if the temperature of his room is below 70°, while another will be a sufferer if it is above 65°, or even 60°. And I know of a few who appear to prefer a temperature several degrees lower still.

1583. Another thing should be noticed. The same individual will require a higher or lower temperature, in proportion to the different degrees of health and vigor which may happen to fall to his lot. In a state of general debility, greater or less, when the power of the system to generate heat is greatly diminished, a higher external temperature will be required, in the same proportion.

QUESTIONS. — What is thought of the irritation of coarse flannels worn next the skin? What might, in most cases, be substituted for them?

Is internal irritation of this wonderful envelope, the skin, much worse than external? What is meant by internal irritation? Are fluids ever digested? Do all the combinations of water and alcohol, in modern use, pass undigested into the circulation? What are some of these? If the maddening draught were inflicted but once, could the evil be comparatively tolerable? In what, then, does the difficulty chiefly lie, — in occasional heavy doses of poison, or in its more habitual use? But are there not other substances, solid or liquid, which irritate the skin internally, besides the various combinations of alcohol? Will you name some of them? What is said, particularly, of arsenic? What of acids? What of alkalies? What rule is laid down with regard to the comparative influence of small and large quantities of any known irritant or poison? What is said of mustard poultices? Can their effects internally be less severe and injurious than their external effects?

1584. Again, a greater degree of external heat is necessary to any person at night than in the morning. Thus, if we suppose a person to be comfortable at 60° in the morning, he will, in the same state of health, probably require about 65° at evening. The fatigues and expenditures — the wear and tear — of the day, which are always considerable and sometimes great, create a necessity for this allowance.

1585. Then, once more, a difference must be made where numbers are collected together — of different ages, sexes, and temperaments — some of whom cannot generate heat for themselves as well as others. In the same sitting-room or parlor, for example, one will require 65°, nay, perhaps 70°, when another would prefer 60°. The usual resort here is, and must be, to mutual compromise.

1586. This difficulty is best illustrated, by supposing a school of fifty pupils, whose desks are at different parts of a large room, and whose habits at their homes, as well as their power of generating heat, are very different. To know what to do, in a case like this, is no trifling task.

1587. The teacher, who is perhaps better clothed than his pupils, and who has abundant exercise, may be sufficiently warm at 60°, while his older pupils need 62° or 65°; and his younger ones, who sit constantly, with little exercise of body or mind, and are possessed of feeble calorific powers, need 70°.

1588. What, now, is to be done? Shall the younger pupils be suffered to remain a little chilly at a temperature of 65° or 62°; or shall the teacher and the older pupils deny themselves a little, and endure a higher temperature? I suppose there will be but one reply to such a question.

1589. It should be remembered that the teacher and older pupils of a school not only have power to generate more heat for themselves than very young children, but they have also more power to throw off any temporary excess of the same. But then, on the other hand, it must not be forgotten that, if the very young become but a little too highly heated, they suffer more in their inability to throw off every such excess than older persons.

1590. Nor must we forget that every degree of external heat, which is not positively and absolutely indispensable, is, in the same proportion, destructive of our natural capacity to generate heat for ourselves internally; or, in other words, tends to extinguish that flame which God, in his providence, has kindled within the whole physical domain.

1591. We must also recollect that, in the education of the young, as well as in the management of those who are older, almost everything tends to weaken our calorific powers. In the nursery and the parlor, at home and abroad, in school and at church, in the field or on the play-ground, our whole diet and regimen, for mind or for body, is effeminating rather than invigorating.

1592. The proofs of this position, most unhappily, are all around us. We heat our rooms unnecessarily high in the morning; and it is next to impossible to get back again. If we live in a temperature of 70° in the forenoon, when 62° might have sufficed, still we must have at least 70° the rest of the day, or we shall be chilly. Nay, we must, in these circumstances, even raise our temperature in the afternoon somewhat above 70°; for, when we have begun the day with a high heat, the power of generating it within us diminishes during the day very rapidly.

1593. Those, again, who wear most clothing, are under the strongest necessity to continue, if not to increase, the quantity. They have begun to throw cold water on the internal fire; and now they are uncomfortable in the use of clothing which before would have answered every purpose. Besides, the power to generate heat, in such circumstances, appears to diminish in a geometrical rather than an arithmetrical ratio.

1594. Before we can, as a people, have good, healthy skins, such as are worthy of sustaining the noble relation of handmaid to the still nobler lungs, there must be a radical reformation in nearly all our domestic habits. But this reformation must be based on nothing less firm and stable than the principles of science and Christianity. Other reformations there may be, as there always have been; but they will, in their effects, be only temporary.

1595. For example of what I here mean by temporary or pseudo efforts, some who have heard of Cardinal Cheverus and the Abbe de l'Epee, who dispensed with fire in their rooms all winter long, will be apt to say to themselves, "Well, if these men could dispense with fire all winter, in order to save money to do good with, *I* can;" and will actually make the attempt.

1596. They may or they may not succeed; but success in such a case I regard (at the risk of being paradoxical) as worse than failure. It is not in human nature to make such

demands on the calorific powers suddenly, without, in the end, weakening them.

SECTION IX. — SUDDEN WARMING.

1597. On entering a public school-room in one of our cities, on the morning of a severely cold winter day, I observed a little girl lying on a settee, with a pillow under her head, as pale almost as a corpse. When I made inquiry concerning her, I received from her teacher the following statement:

1598. She had come into the school-room just before nine o'clock, almost frozen; and, without the knowledge of her teacher, had placed herself in as close contact as she could with the stove, — which, in order to prepare the room for a very severe day, had been highly heated, — when a sudden fall was heard. She had been seized with convulsions; or, in popular language, had fallen in a fit.

1599. At the time of my arrival, which was half an hour after, she was slowly regaining her strength; but it required a forenoon, if not a whole day, to effect a complete restoration. Indeed, it will be found very doubtful, when we come to study more carefully this whole subject, whether she was fully recovered, even then. The loss from only one such paroxysm,

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QUESTIONS. — Has the skin much to do in the work of heating the human body? What is a very frequent and popular inquiry? Are general rules, on such subjects, easy or difficult? Do different persons require different temperatures? Does the same person require a different temperature in different circumstances? Do all persons require more heat, externally, in the afternoon than in the forenoon? Why is this? What may happen in the same sitting-room or parlor? Will the difficulty be still greater in large schools? What is to be done by teachers, in such circumstances? Do teachers and older pupils possess greater power to generate heat than smaller pupils? Is it to be remembered, also, that the same individuals who can best generate heat can best throw it off when in excess?

Must we avoid, with great solicitude, every degree of unnecessary external heat? Is the present education of the young favorable to strong calorific powers? Where are the proofs on this subject to be found? Is there great danger in beginning the day with too high a temperature? Is the same remark applicable to clothing? Is it not true that, the more we depend on external sources of heat, the more we may and must? What preliminary work must be done, in order to our having, as a race, good and healthy skins? Must all reformations, in order to be permanent, be based on science and Christianity?

What is said of the habits of Cardinal Cheverus and the Abbe de l'Epee? Is it advisable to imitate them? What fundamental and inviolable rule is laid down in 1592? Will it require great care to carry out the spirit of this rule, in all the details of practical life?

like that which follows from a single fit of intoxication, is often more serious and more permanent than most persons are aware.

1600. The very same day with the above, a little girl in the country, about forty miles distant, fell down in a similar manner, after sudden warming at a very hot stove; and with similar results. And not many years have passed since a stout and apparently healthy man, in Maine, fell dead instantly, under the same form of indulgence.

1601. The explanation of this seeming strange occurrence appears to be as follows. The vital energies of the system, which in the first case had been largely tasked in generating heat while coming a long distance to school, in the severe cold, had proved insufficient to resist the sudden influence of violent external heat, and the little girl had sunk under it.

1602. Now it is, I believe, very generally known, that such sudden warming, after the extremities have become quite frozen, is hazardous. It is likely to extinguish, wholly, the vital principle in the frozen parts, and to cause the latter to inflame, and perhaps to slough off. And so great is the danger, that very few well-informed persons will run the risk. They raise the temperature by degrees.

1603. Now we freeze at 32°, but of course are not quite frozen at 33°. Can it be so hazardous to go suddenly to the fire with parts cooled down to 32°, and yet perfectly safe when they are cooled to 33°,— a temperature but one degree higher? Is there such a difference between 32° and 33°? No one will believe it.

1604. There are various ways in which we are injured by going suddenly to the fire, when very cold. Sudden death, or even convulsions, will be, after all, but rare occurrences. The Author of our nature has so constituted us that we can, as a general rule, for the time, resist all such tendencies.

1605. I do not mean that we are entirely unaffected by them, even the hardiest of us. I have felt a degree of stomach-sickness, or faintness, from sudden warming, a dozen times in my life,— perhaps twenty. Others have doubtless had the same experience. But there is something, I say, still more frequent, and of worse effects.

1606. One kind of injury inflicted by sudden warming falls on the eye. They who have weak or inflamed eyes should be extremely cautious on this point. In truth, I think the strongest eyes in the world will be likely to suffer more or less in this way, if frequently abused.

1607. But, still worse, sudden warming, when we are excessively cold, aggravates all cutaneous or skin diseases; and perhaps, sometimes, may induce them. These skin diseases are very common among us, and are every day becoming more so. And, what may be worth relating in this connection, those who irritate their skins most, internally or externally, even by ordinary heat, are most liable to suffer from them.

1608. Chilblains, in these days, are becoming very common; and every one knows how much these swellings are affected by sudden changes of temperature of every kind. But it may not be known to every one that sudden warming, when we are extremely cold, sometimes actually induces them. Yet such is the well-established fact.

1609. But, though the eyes may be injured, skin diseases aggravated, and chilblains either induced or aggravated, or both, there is an injury still greater and more frequent than any of these, which is always inflicted by sudden warming, to which your attention is particularly solicited. It makes us tender and delicate, and renders us extremely liable to take cold.

1610. I was once nearly frozen to death on the Chesapeake Bay, in Virginia. Among the injurious consequences which followed from suddenly warming myself when I came to a fire, was an increased susceptibility to cold. Until that time I had never worn anything in the shape of under-clothing. Now I was obliged to wear additional clothing; and, even with this precaution, I was almost continually cold. In truth, I am not sure my skin has ever recovered, fully, its tone, to the present day. I have heard one of the most popular and credible physicians in Boston speak of a similar experience with the above, with similar results.

SECTION X. — CLEANLINESS.

1611. We have seen, elsewhere, that from the surface of the body there constantly issues a steam or vapor, which is called the fluid of perspiration. We have also learned, that, from certain little glands, imbedded in the substance of the skin,

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QUESTIONS. — Is sudden warming ever injurious? What anecdote is related to illustrate this point? Has sudden warming, when very cold, ever caused death? How does this sudden warming affect the eyes? Has it any effect in aggravating or inducing skin diseases? Does it have anything to do with chilblains? Does it produce an evil still more serious? What is that evil? What anecdotes are related by way of illustration? Does not this topic, of sudden warming, demand the careful consideration of all, but especially the young? Will you reflect on the remarks made at 1601–1610?

a sebaceous or oily matter also exudes on its surface, to render it supple and pliable and healthful.

1612. These two fluids, by their intermixture, and their tenacity for dust, to which the surface of the body is everywhere more or less exposed, are liable in due time to render the skin foul; and, if too long neglected, to leave on it a species of coating or glazing. It becomes, as it were, varnished over.

1613. To meet this tendency, and to check, or at least neutralize, its effects, there are several provisions made. One of these is evaporation. Where the air has free access to the surface, much of this residuum is carried off by evaporation. It also aids in the consolidation of what remains.

1614. Another thing to be noticed, is, the friction of our clothing. This natural means of cleanliness is, of course, most efficient where the material is coarse. Hence, one reason why coarse, heavy flannel, next the skin, is productive of less evil than we should presuppose. By means of its friction, it corrects in no small degree its other evil tendencies.

1615. Again: the coating or varnish on the skin, of which I have spoken, is most effectually broken up by habitual exercise; especially when that exercise is abundant and varied, like that of the farmer and housekeeper. Hence one reason, no doubt, why the last-mentioned employments give us — other things being equal — the smoothest, most beautiful, and most healthful skins.

1616. Absorption has also a tendency to counteract the causes of filthiness of the skin. A healthy person will have the power of absorbing much more of this filth than a sickly one; but, in all persons, the power of absorption is considerable. The thought, that, in order to get rid of the dust on our skins, it must be carried back again into the circulation, is by no means very agreeable to the pure-minded; but is it not a just one?

1617. Now, there are persons among us who do not find it easy to avail themselves of any of these circumstances, except, perhaps, the absorption; and this they are inclined to shrink from. There are the sedentary, the indolent, the slovenly, and the ignorant of our own sex, and the sedentary, the fastidious, and the over-sensitive of the female world. All these should study carefully the laws of cleanliness. Let us consider some of them in detail.

QUESTIONS. — Is there a constant tendency to filthy accumulations on the surface of the body? What are some of the principal causes? What

SECTION XI. — ON BATHING.

1618. Bathing, in a more extended sense of the term, may be local or general. It may be occasional or habitual. It may be used in a great variety of forms; and in variety, almost equally great, of temperature.

1619. With such a broad definition of the term, it must be conceded that we are already a bathing people; and may therefore, at first view, be thought beyond the necessity of practical instruction on the subject. But it is local bathing only to which in this country we are most addicted. It is the wetting of the hands and face, and occasionally of the neck, breast, and feet. To which we might, perhaps, add a few occasional bathings, or rather swimmings in the mill-pond or the river, Saturday evenings of the summer.

1620. But these bathings, so far as the purposes of habitual and thorough cleanliness are concerned, are hardly worthy of the name. The last mentioned are too irregular to subserve, in any good degree, any other purpose than that for which they are generally employed; I mean, as an amusement in swimming. As for the local washings, though they may do some good, they are far less wanted, in the case of the parts to which they are applied, than in many others.

1621. It is truly surprising to find out, for the first time, how few persons pay any attention, from day to day, to general bathing, on fixed principles. In some parts of the country, the proportion of these last is hardly one in a hundred; and this, too, notwithstanding all which has, within a few years, been said about it. I once hazarded the opinion, in New Bedford, Mass., that more persons of that commercial place had circumnavigated the globe, than had ever washed themselves all over in cold water.

1622. The necessity of daily bathing has of late years been opposed, by a few would-be scientific men, on the ground that, in washing our skins, we remove the oil which Nature has furnished as a protection and for other purposes.

1623. This is the most flimsy reasoning imaginable. Should this oil remain till it is rancid, acrid, and poisonous? How long are the glands in furnishing a new recruit, when the old is

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counteracting agencies has Nature provided, to meet in part this tendency? How does evaporation have this effect? How does our clothing? How exercise? Does absorption tend in any respect to cleanliness? What classes of persons need to study most carefully the laws of cleanliness? Why these more than others? Have they not claims on us all?

removed? And, if there is no necessity of change, why were the sebaceous glands furnished? The Creator might have so ordered things as to give us a supply at the outset: why should it not last for life?

1624. An objection quite as strange, and little more defensible, has been originated in a more respectable quarter. It is said that general bathing is unnatural, — that man is not a fish, — that we do not have water furnished by the Divine Hand, sufficient for all, not even for one-fourth of us, — and hence that our efforts to procure it would, by most, be too expensive.

1625. That man is not a fish, is of course admitted; but that bathing is unnatural to him, any more than clothing and dwellings, is stoutly denied. Everything pertaining to art is unnatural, if this is. Our very nature takes in art; in other words, is intended to be directed, controlled, and modified by it.

1626. Whenever man can live in the open air, without houses, clothing, artificial heat, or cookery, it may be time to talk about bathing as unnatural or injurious. But such a return to barbarism, it may be fondly hoped, is not very near.

1627. Some of the animals below man — several birds, even — are addicted to the habit of general bathing. Is bathing unnatural to them? For, if so, should they not be informed concerning it? Or has instinct, in this instance, failed to perform her office?

1628. It is also frequently said, that, though bathing may be necessary in hot climates, or perhaps in midsummer in our own, it is not needed in cold climates, especially in midwinter. But this idea is diametrically opposed to plain matters of fact. All the causes which render it desirable to bathe the human body, for the sake of a clean skin, are peculiarly operative in cold weather, and in cold climates. Evaporation and exercise are diminished at this season, while the filthy accumulations are not diminished, but in many instances increased.

1629. It is said finally that, though the feeble and sickly may need bathing, it is unnecessary to the healthy. Grant that the sick need it most, still its preventive effects are not to be overlooked. Rightly managed, it is a tonic to every living fibre. Jeremy Taylor says, "Cleanliness is next to godliness;" but it would be a strange affirmation, that godliness is only necessary for the sickly.

QUESTIONS. — Define the term *bathing*, in its most extended sense. In what sense are we a bathing people? To what do our bathings chiefly amount? Are they of any practical value as regards health? Is it not

SECTION XII.—TO WHOM BATHING IS MOST NEEDFUL.

1630. Among those who stand most in need of bathing, for the sake of cleanliness, are the studious and sedentary. By the studious, however, I mean just now, not so much those who mingle with their studies a reasonable amount of active exercise in the open air, as those who sit from morning to night, as it were poring over their books and papers, and scarcely know whether they are in the world or out of it. I mean, then, in other words, mere book-worms.

1631. By the sedentary, I mean, also, those who continually sit at their employments; and whose employments, themselves, afford but little muscular exercise. They become mere living statues. Labor, in these days, is so much divided that the sedentary are becoming a very numerous class. It embraces millions of our own sex, and hundreds of millions of females.

1632. Both the book-worm and the statue sit much of their time immersed in bad air. It may be bad, because deprived of oxygen, its life-giving principle, and loaded with carbonic acid. It may be worse, still, by being loaded with poisonous animal, vegetable, or mineral effluvia. All these evils are aggravated by a very high temperature.

1633. It has been already stated that we are apt to have all our rooms too highly heated. Now, none are more liable to this error than they of whom we have just been speaking. They are careless or absent-minded; they often use stoves; and, ere they are aware, the heat is ten or twelve or fifteen degrees higher than it ought to be. And yet they seem not to know it, unless they are told of it.

1634. This excessive heat, as has been abundantly shown, puts out the internal fire of the human system almost as fast as if that were its sole object. It especially deadens the activity of the lungs and the skin. The active efforts of both these will diminish, day by day, and the skin will become greatly enfeebled, if not actually diseased.

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truly surprising to find how few persons practice general bathing, on principle? What opinion was once hazarded in New Bedford? Has the necessity of daily bathing been, of late years, opposed? On what grounds? Are these objections very weak? Which of these is the most specious? Do some of the animals, below man, practise general bathing? What is said of the necessities of mankind in cold climates? Is it insisted, by some, that general bathing is only useful to the feeble and sickly? What is the proper reply to this objection? What does Jeremy Taylor say of cleanliness in general? Can we keep clean without water?

1635. And yet, in the midst of all this error and the consequent deterioration, should a due regard to the laws of God, physical and moral, lead to occasional cold bathing, the recuperative powers of the system will be most fully and immediately manifested, and the result will be most happy.

1636. Among the sedentary who need bathing, are the shoe and boot maker, the painter, the gilder, the clerk, the accountant, the dress-maker, the milliner, the printer, the grocer, the stone-cutter, the druggist, the brazier, the turner, and the manufacturer of lead and worker in copper. Nor do the hatter, brush-maker, bookbinder, chemist, collier, miller, baker, cook, currier, glass-worker, lawyer, clergyman, or teacher, need it much less.

1637. Those who are of sluggish temperament need it much more than those whose temperament is active and sanguine. The middle-aged require it more than the young; and the aged more than either. Females, except the small proportion of them who have sufficient exercise in the open air, need it, other things being equal, much more than males.

1638. They who, while their employments are studious or sedentary, at the same time eat excessively, will need bathing much more than the abstemious. This necessity will, of course, be greatly enhanced by excess of clothing; and by all things and arrangements which exclude air from their skins, either by night or by day.

1639. They who use exciting drinks of any kind, or high-seasoned food, or are in the daily habit of using drugs, especially those which are more generally regarded as harmless (but which, for that very reason, are working out a deleterious influence with the more certainty in the end), are among the individuals who must use the bath, more or less, or perish.

1640. There is one thought, here, which must be hazarded. Are not the very individuals who are here said to need bathing least, because already well endowed with vitality, among the very persons who would gain most by its use? If the others perish without it, would not those live more highly with it, in the same proportion?

Questions. — What two considerable classes of mankind stand in most need of bathing? Who are here meant by the studious? Who by the sedentary? What adds to the general evil condition of the book-worm and the statue? Who are most liable to the error of keeping their rooms too highly heated? Why are they thus liable? What does this excessive heat do to us?

SECTION XII. — THE LAWS OF BATHING.

1641. If a person has never been bathed, from the veriest threshold of life to maturity, his efforts to "wash and be clean" will be much more effectual, if, for once, he use soap and warm water, and *shampooing*, as our eastern brethren call it, into the bargain.

1642. But, after one good, thorough warm bath, and considerable scraping and shampooing, neither soap nor warm water will be needful for the purposes of mere cleanliness. Plain cold, or at least cool, water, will be quite as efficient; and, if well managed, quite as healthful.

1643. With regard to those who have been bathed daily, from the earliest infancy, it is quite sufficient to continue a practice which was so well begun. To such, of course, mere water is sufficient. Mr. Wells, the distinguished teacher of a boarding school in Boston, for boys, many years ago, never allowed his pupils to use soap or warm water. The daily use of cold, or at least cool, water, was deemed quite sufficient. He even regarded soap as injurious.

1644. But, in order that the bath, while it renders us cleanly, should at the same time be healthy in all other respects, we must be careful to secure what is called a good reaction. This condition is usually manifested by an increase in cheerfulness, and by a gentle glow on the surface of the body.

1645. The first application of cold water to the skin, in the most vigorous, usually causes a temporary retreat of the blood and other fluids of the body from the surface towards the centre. But this should be temporary only. To have everything exactly as it should be, the blood should return quickly to the surface, and should even bring with it an increase of circulatory and nervous activity.

1646. In the event of a full and healthy reaction, not only should the skin resume its wonted activity, but the mind, as I have before intimated (1644), should do the same, and there should be an increase even of cheerfulness. In some, the re-

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Of those who follow sedentary employments, who are they that most require bathing? Who, of those that engage in the like employments, need it next most? Do those of sluggish temperament need it more or less than the active or sanguine? Do the aged need it more or less than the young? Do females need it more or less than males? Do the gluttonous need it more or less than the abstemious? How is it with those who use exciting drinks? How with those who are greatly given to drugging and dosing themselves?

action goes so far as to produce a temporary excitement or exhilaration.

1647. It is a good sign, in these circumstances, if the reaction is wholly spontaneous, evincing the possession of a considerable stock of constitutional vigor. But, even if the reaction can only be sustained with a moderate degree of friction with the hand, with coarse mittens or towels, or with a brush, it may be sufficient.

1648. Nor need we give up all hope of securing a reaction just because the efforts to rouse the activities of the surface exhaust the individual himself. A friend, with a stout hand, and strong arm, and a good stock of vital force, might volunteer his aid, and more than make up the deficiency. I have known the happiest results follow from such efforts.

1649. But should it happen that, after every precaution, the application of the water is followed by paleness, dulness, inactivity of mind and body, with a degree of chilliness, it is not likely to be useful, and may for a time be abandoned. Three months — in some instances even less — have been known to produce an entire change in the constitution, so that a reaction after bathing inevitably followed.

1650. Some rather feeble persons have vainly supposed they could get a better reaction by using warm water instead of cold. But this is a mistake. It seems more agreeable when first applied, but in general is not so faithfully and promptly followed by a return of the blood to the surface. In general, the colder the water, the better is the reaction.

1651. In general, too, the cold room is preferable to the warm one. But there are exceptions to the universality of this rule. There are persons who really require a warm room to bathe in. A still larger number will do well to step from the bathing-tub into a warm room, for the purposes of friction and dressing.

1652. When the constitution is sufficiently strong, and there is no nervous disease or local difficulty to render it inexpedient, the cold shower bath may be used. But long experience has led me to doubt the uniform good effects of cold shower bathing. To our effeminate race, especially our females, it is very often too violent. Nor is it quite according to the analogies of Nature. She deals most in soft-descending showers and gentle rains. The tornado and the deluge are her strange works.

1653. There are some cases and circumstances, I admit, in which the shower bath is not only preferable, but absolutely

indispensable; and many more still, in which, for the sake of convenience, or in view of other circumstances, it is admissible. I find it convenient to use it myself, in summer and at home; but I often interdict its use in the case of others.

1654. When the shower bath is not indicated, I prefer the hand bath. By this, is meant the rapid application of the hand, wet with water, to the whole surface of the body. It is truly surprising to observe how rapidly the hand may be thus carried all over the surface.

1655. In truth, the hand bath may be made almost a shower bath, if we desire it; or it may be as remote from the shower bath as the north is from the south. By long habit and a little tact, the whole skin may be moistened in less than half a minute, — perhaps one-fourth.

1656. Many prefer a large sponge or a wet towel. Of course, there is no objection to this method of applying the water. But, whether we use the hand, the sponge, or the towel, we must never forget to follow the application of the water, and a hasty use of the towel, with a great deal of friction. Or, if we cannot perform this part of the work for ourselves, we should employ somebody else to do it. Whatever else is dispensed with, the friction must not be.

1657. Mrs. Farrar, in her "Young Ladies' Friend," assures her readers that the cold bath in the last-mentioned form may be taken without letting fall a drop of water on the carpet beneath. This is certainly true; though for myself I prefer a little more freedom of action. On this account, a common bathing-pan to stand in is a very great convenience.

1658. In general, it is well to commence the practice of daily bathing in the summer season. Many persons may indeed begin with safety at almost any season of the year, especially if they "have faith." Yet, since faith is sometimes wanting, and often weak, I prefer that a beginning should be made in warm weather.

1659. Much, in beginning to bathe, depends on the *manner* of beginning. Those who are either feeble in body or weak in faith, should begin with great moderation. They may even do well to begin with what Dr. Franklin would call an *air* bath. It is perhaps sufficient, at the first effort, to remove the clothing, rub the skin for some time very briskly, and then replace it.

1660. The second day or the third, a little water may be applied to the chest. The next day — or, if you please, not till

the next week — the water may be extended to one arm or to both. Gradually we may extend our conquests along the surface, till in a few weeks we find ourselves in the habit of bathing or wetting the whole body.

1661. Let me say, once for all, that, so far as securing a good reaction is concerned, much depends on going through with every part of the *operation* with great briskness. I do not say with such vigor and alacrity as to produce exhaustion, but with a celerity that seems to beget both activity and vigor.

1662. I have spoken as if the warm bath, for the purposes of cleanliness, were quite inadmissible. It is not so, however. If used at the moment of retiring to rest, it is about as useful as the cold bath; though perhaps, with a few exceptions, less remedial in its effects on the general system.

1663. With the vapor bath I have had very little experience. Were there no other objections to its use, — I mean now for the purposes of cleanliness, — it is, at least, less simple, and therefore less accessible and convenient, than the hand bath, or even the common shower bath. And, as for medicated vapor baths, their use is generally confined wholly to remedial purposes.

SECTION XIV. — ERRORS WITH REGARD TO BATHING.

1664. We meet, occasionally, with certain individuals, who tell us they cannot bear the cold bath. With every possible effort, they cannot, so they affirm, procure a reaction. I once

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QUESTIONS. — What is said of the use of soap and water? What of shampooing? Is cold water, for the purposes of cleanliness, generally sufficient? What is told of Mr. Wells, a teacher? Did he regard soap as injurious to the skin? What is meant by a reaction? In bathing, in cold water, is a reaction indispensable? Is it desirable that the reaction should be spontaneous? How far may force be profitably exerted? May we not sometimes have assistance in getting up a reaction?

When we fail to get up a reaction, after the use of cold water, may we not succeed with warm? What is said of bathing in cold rooms? Is the shower bath to be preferred? Where this is inadmissible, what is next best? What do you say of the sponge, or the wet towel? Is a good deal of friction, after bathing, strongly insisted on? What does Mrs. Farrar say? In what circumstances are bathing-pans useful? What is the most suitable season for commencing the practice of cold bathing? May not the strong and healthy begin at almost any time? What is said of the influence of faith? Relate the anecdote given to illustrate it. What gradual methods of beginning to bathe are recommended? Is great briskness strongly insisted on? May the warm bath be used in any circumstances? What is said of vapor bathing? What of medicated baths?

met with such a person in southern Massachusetts. It was a feeble woman, of middle age. She had been using the bath for a long time, and was nothing better for it, but rather worse. And the neighbors, who knew little of her errors, were ready to denounce the whole thing.

1665. On inquiry, I ascertained that, instead of making a brisk application of water, and thus securing the benefits of reaction, she had remained in a large tub several minutes, and had been almost as deliberate in applying the brush. In short, she had bathed, but had not secured anything like reaction. She was cold, languid, and melancholy after her bath, when she should have been active and cheerful.

1666. She was now directed to a more rational course. She was told not to take her bath at rising, but at ten o'clock; to have help about it; and even then to go briskly through the exercise. The result was her final restoration; but it required considerable time.

1667. A pertinacious adherence to the custom of bathing at the very moment after rising, has, no doubt, been injurious to many a feeble individual; besides bringing the whole matter into a good deal of disrepute, with unintelligent people. The early hour will do for most persons; but, for some among us, and perhaps most, the middle of the forenoon, or the time when we are at the top of our condition (166–168), is preferable.

1668. An individual who was affected with chronic liver complaint, and who had long been a great sufferer, was directed to warm bathing. "O," said she, "I can't bear it. It gives me cold." — "Have you tried it?" I said. "Yes, repeatedly." — "At what hour of the day?" — "At any time convenient." I no longer wondered at the result.

1669. This bathing "at any time convenient," whether in hot or cold water, will not answer the purpose. There must be some principle about it. They who use warm bathing early in the day, and expose themselves immediately afterward, and in all sorts of ways, must expect to take cold, and suffer as the consequence. So must they who take the cold bath, when they are over-heated, over-fatigued, or over-exhaused.

1670. Some, I well know, are so strong and vigorous that they can bathe in warm or cold water at almost any hour of the day, and under almost any circumstances, without suffering material inconvenience at the time. Still, it is not so, generally.

1671. With regard to those, even, who seem not to suffer, it is seldom, if ever, that they escape the penalty to the end. If

they appear to do so, it is usually in virtue of some more flagrant transgression, whose punishment precluded or postponed the penalty attached to the less flagrant.

1672. The errors committed by the inexperienced, in almost every department of human life, and their consequent penalties, should be pointed out by parents; and children should early be taught, in this particular, the relation of cause and effect. The more the young learn to regard themselves as under law, physical as well as moral, the greater the probability that they will yield to the moral law and its requirements.

1673. How many individuals among us pass through life, from a very early age to three score and ten, on crutches, or with infirmities that no crutches can reach, either because they were not properly instructed in their first years, or because they did not follow out their instructions! Of one thing, at least, we may be sure; which is, that we must give them our instructions ere they will follow them.

1674. My allusions, here, are principally to those who injure their health, perhaps for life, by going into cold water when over-heated, or under other improper circumstances. I have known not only lameness, but blindness, fastened upon boys, that remained with them till death closed the scene, as the consequence of these imprudences.

1675. One thing should be understood by all who have the conduct of early education, and the care of forming early character. It is, that no one should ever go into cold water to remain long while his vital energies are deteriorating; or during what has sometimes been called the ebbing of the tide of life. Above all, he should avoid it when at the very bottom of his condition. We should venture into the water at such times only as our warmth, strength, and mental energy are on the increase.

1676. It has been said by Dr. Rush, and indorsed by men of more science than he, that a little increase even of the perspiration — provided that increase has recently commenced — is beneficial. Thus, the hydropathic physician, who has got up a good degree of heat on the surface of his patient, ventures to pour upon his heated body a pailful of the coldest water. So also the Russian, after his warm bath, plunges, without hesitation, into the snow-drift or the coldest stream; but it is to remain there only a moment. More than that might prevent a reaction, and be followed by the most terrible results.

QUESTIONS. — Are there persons among us who tell us they cannot

SECTION XV. — MEDICAL INFLUENCE OF BATHING.

1677. There are certain benefits to be derived from the application of water to the human body, both externally and internally, which may perhaps be called their medical or remedial influences, which have been hitherto greatly overlooked; but which deserve and must receive a share of our attention.

1678. Although it is true that the study of the effects of water when taken internally, do not properly belong to the present section, yet it seems necessary to say, somewhere, that every drop of pure water which is received into the stomach, whenever liquids are demanded, and which is received in a proper manner, is so absorbed and applied as to become what medical men are wont to call a *tonic* to each fibre of the living system, not excepting the firmest tendons and bones.

1679. Precisely so is it with every drop of water which is applied judiciously to the externals of the body. It becomes, either by direct influence or by sympathy, positively tonic or invigorating to the whole system. We have even heard of the happiest effects being sometimes produced, when water has been applied to the human system, drop by drop.

1680. When, however, we apply water drop by drop, the good effects which follow must be the result of a sympathy which exists, first, between the skin and mucous membranes; and secondly, between one part of the system and another, generally. Thus, it is as true physically as it can be morally or socially, that, if one member suffer, all the members suffer with it; and if one member rejoices, all the members rejoice with it.

1681. But when we come to general bathing, the effect is more immediate and direct. For the human surface embraces an area of twelve or fourteen superficial feet; and, if there is as much machinery in it as I have represented (1511–1518), the amount of influence which may in this way be exerted is very great; and if that influence is good, or tonic, or invigorating, it becomes a matter of no trifling importance.

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bear the cold bath? Are they, or are they not, mistaken? What striking case is mentioned in proof of this? A second case is given: will you relate the story? Must we be governed by principle in this matter? What is the best and safest time of day for the warm bath? What the best time for the cold bath? Give the reasons, in both cases. Do we often escape the penalty of physical transgression? What is said of the early instruction of the young in physical law? Do not many suffer, through life, for want of proper instruction? What is said by Dr. Rush about bathing? What remarkable custom does this explain?

1682. Besides, there is a general law concerning its application, which is very remarkable, and which, like many other things and laws in "the house I live in," shows the marks of a Divine hand, if not of a loving Father. This law is, that when, by cold bathing, we succeed in getting up a reaction in the system, not only is there a general good influence diffused throughout the whole domain of life, but there is a particular tendency of the invigorating and otherwise favorable influence to such parts of the system as, in any way, happen to be enfeebled or crippled.

1683. Thus, suppose I have weak lungs. Now, my lungs are lined by mucous membrane, and hence have a powerful sympathy with the skin. When, therefore, my skin glows under the influence of a happy reaction after cold bathing, — when it thus rejoices, as Paul would say, — while there is joy in every portion of the great bodily confederacy, there are special demonstrations of joy in the grand citadel of the lungs. In other and fewer words, they are invigorated.

1684. Or suppose the weak part is the stomach, or the bowels; while the lungs, eyes, ears, etc., are stronger. In that case the excess of vigor in the skin is transmitted to the lining membrane of the stomach, or the alimentary canal. In short, the general law is, that the sanative or remedial influence, in these cases, falls with peculiar force on the weaker part or member of the confederacy.

1685. And herein, as I am confident, is a great and important, and yet highly practical, truth. Physiologically, no less than theologically, we are a fallen race. Now if, by aid of water, everywhere abundant, — nearly as abundant as the air we breathe, — we can gradually lift up our race, though it should be but a little way, towards the point whence they came, who will not rejoice in it? And who will not be struck with the simplicity of the instrumentalities which Heaven has appointed for this purpose?

1686. Thus we see, in another point of view, the wisdom that works out various ends which are glorious, from simple and often single means. Bathing, while it benefits the skin through the great law of cleanliness, at the same time invigorates it; and through it the whole living system. And, in view of that importance which even common sense has attached to the sound mind in the sound body, as well as that which revelation has attached to the sanctification of what is

designed as a fit temple for the Holy Ghost, it is almost entitled to be regarded as a portion of the great and GLAD TIDINGS.

SECTION XVI. — POISONING THE SKIN.

1687. In the remarks which were made on "irritating the skin," I have already dwelt at considerable length on abuses of this organ, which do not come very far short of poisoning it. In truth, according to the best writers on this subject, — Orfila among the rest, — many substances, which I have only called irritating substances, are really and truly poisonous.

1688. The best authors subdivide the poisons, as a general class, into irritating, acrid, narcotic, and putrefying poisons. My remarks, in the present section, will be chiefly confined to irritating substances, especially to those which are wont to be applied externally.

1689. It was once the custom, even among civilized men, to paint the human face. In most cases, the rouge or paint, which is applied is a poison. If it is not an oxide, either of lead or bismuth, it includes a sufficient portion of these, or of something else which is akin to them, to render it inimical to human health and life. For these poisons, as we have seen (1532), may be absorbed, and doubtless often are so.

1690. Is it said that the effects must, in such cases, be very slight, — hardly worthy of so grave a notice? The objection would have more weight were there but a single application of the paint. But, when used at all, is it not in general used frequently? And has it not been clearly shown (1577) that the danger of small poisons, habitually applied, either externally or internally, is much greater than has usually been supposed?

1691. But there are other ways of poisoning the skin. A friend of mine had measles, which, in consequence of mismanagement, left him predisposed to an annual return of a cuta-

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QUESTIONS. — Is water, whether applied to the human system externally or internally, a tonic? Is it particularly so when applied internally? May the amount of influence which the skin exerts be very great? What important general law, concerning the effects of bathing in cold water, has been hitherto almost unnoticed? What illustrations of this law are given? Are we, then, fallen physically as well as morally? And do we see in the principles of hygiene in connection with bathing, one means of restoring man to a normal condition? Does not God, everywhere, work out great and glorious ends by small and simple means? Is the human body intended, in a religious point of view, to be a temple for the Holy Ghost? Why, then, is it not regarded by Christians everywhere as such?

neous affection, which was sometimes very troublesome. Once he became impatient of his sufferings, and called a physician, who ordered a wash of corrosive sublimate. The prescription was followed, but it brought on, incidentally, a severe erysipelas, from which he hardly escaped with his life.

1692. Now, it is highly probable that hundreds, if not thousands, in our country, are destroyed, and tens of thousands injured, every year, by applying poisons to the skin. Sometimes, indeed, the application is made by the direction of those who pretend to science; but who are, after all, obviously and greatly ignorant. Our age and country abounds with such men.

1693. In a few cases, the mischief is done by a single application. Much oftener, however, it is the result of a repetition of small poisoning over a somewhat extended surface; or of a still larger use of the poison on small portions or patches of the surface. Foremost, perhaps, in this work of slow destruction, are our ointments and plasters. Most of these, which are really possessed of much strength or activity, have poisonous medicine as their basis; and, when kept in contact for some time with the skin, what shall prevent their slow absorption?

1694. All applications to the skin should be made with the utmost caution, and under the eye and direction of some person who knows the general laws of the human system. If they are so simple as to be merely negative in their effects, why should they be applied? But if they really contain poisonous substances, in greater or less proportion, we should certainly guard, with great assiduity, against their absorption.

1695. The importance of these remarks is enhanced by the consideration that external applications to cuts, bruises, ulcers, etc., are of no possible efficacy in the end, except so far as they protect the already injured and denuded structure from further injury. Wounds, sores, and ulcers, can only heal, in a proper manner, from the bottom. And if it were advisable, by means of plasters or ointments to heal them at the surface, we could not do it.

1696. The vulgar notion that one plaster is drawing, another cleansing, another scattering, etc., is, in a physiological sense, wholly without foundation. We might as well think of healing a tree, or even of drawing a nail from a board, by the mere application of ointments or plasters, as of healing wounds, ulcers, etc., on the human surface, in the same way.

1697. How strange it is that, while the belief in the remedial effect of ointments and plasters is so strong in the world, it should so seldom occur to the vulgar mind to inquire whether these supposed virtues may not, like the other side of a two-edged sword, be sometimes turned against us? Who does not know that the common blistering ointment will sometimes produce strangury? Could it do this, except by absorption? And why may not the poisonous properties of other ointments be absorbed, as well as the poisonous cantharides?

1698. Dr. Mussey and others have seen children thrown into convulsions by the application of strong plasters, especially such as contained tobacco, to the surface of children, to cure eruptions. The tobacco, or other poisonous substances, either directly or indirectly affected the brain, and induced the convulsions. That life is sometimes extinguished in this way, I have not a doubt.

SECTION XVII. — INFLUENCE OF THE MIND ON THE SKIN.

1699. All the depressing passions and affections tend to cause a retrograde or centripetal tendency of the general mass of the human fluids and forces, especially of those on the surface, or in the skin; while it is equally true that the elevating passions and affections have the opposite tendency. In the former case the skin is pale, shrunk, and flabby; in the latter, it is plump, warm, glowing, and energetic.

1700. As an illustration of this, let us look at the skin of a person under the influence of fear, especially of one who is habitually so. You will find it cold, pale, soft, inelastic, and thin. Where the hairs pierce its surface, there will be little eminences caused by the attachment of the hairs to the skin, which keep it elevated at these points, while the rest of it is shrunk. It is this collapsed appearance, except at the roots of

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QUESTIONS. — Are irritants sometimes truly poisonous? By whose authority do we say this? Why is painting the face objectionable? Is it said, by way of objection, that so little poison can hardly do any mischief? What is the proper reply? What other ways are there of poisoning the skin? What is related concerning a friend of the writer? Will small plasters, long continued, sometimes do more mischief than any other? Should there be great caution used in this whole matter? Is it best to trust to ignoramuses the lives and health of our children and friends; or go to men of science? Do plasters or ointments, applied externally, have much effect? What is it which is mentioned as being *very strange?* What is said of the experience of Dr. Mussey and others?

the hairs, which has acquired for it the vulgar name of *goose-flesh.*

1701. Now this same shrunk condition of the skin is found —at least in a degree—in all who are habitually under the influence of grief, envy, anger, hatred, despondency, melancholy, fretfulness, etc.; while the opposite condition is observed in the case of their opposites,—courage, joy, love, hope, cheerfulness, etc.

1702. Some of the depressing passions, it is true,—such as anger, for example,—may give plumpness to the skin for a very short time. But this result only accompanies its greatest intensity; for anger long indulged induces the same pale, sunk, anxious centripetal appearance of which I have spoken.

1703. I do not intend to affirm that the momentary influence of fear, grief, etc., on the one hand, tends greatly to derange the functions of the skin; nor, on the other hand, that the momentary influence of love, hope, joy, courage, etc., will greatly improve its condition. It is the habitual influence of the elevating passions and affections that is to be sought, as it is the habitual and permanent influence of their opposites that is to be avoided.

1704. Perhaps there is no one thing that should be sought more assiduously than a good temper. A sour, fretful, uneasy, suspicious temper is as unfavorable to health as it is to social happiness. Nor is it too much to say, that an individual who is possessed of this general trait of character is more liable to disease than one who is habitually confiding, quiet, hopeful, and agreeable.

1705. Let us consider, for a moment, the physiological condition of a person who is habitually fretful and unhappy. The nervous system—and of course, the brain—is in a state of irritation; the heart is painfully affected, and this affects the circulation in general; the lungs act less energetically, as we have seen that its yoke-fellow, the skin, does; and the work of digestion is far less perfectly performed. Can such a condition be other than unfavorable?

1706. When I speak of habitual fretfulness, a word of explanation may become necessary. There are two sorts of fretfulness, as there are two sorts of excess in drinking or eating. One of these reminds us of Etna, or Vesuvius, that sends forth its showers of lava occasionally, and, "straight is cold again." The other is constant, unremitted, and without

end. It began early, — perhaps with life, — and will only end with the individual.

1707. For is it not true, that there are not a few among us always fretful, unhappy, — worrying, — from the beginning of life to the end? Is any thing right with them — just as it ought to be — in this world? May we not even indulge the grave suspicion that nothing will be just right with them in the world to which they are hastening?

1708. In short, it is not too much to affirm, that he who would use every means of having a healthy skin, — who would obey the whole law, physical as well as moral, — should keep himself in the perpetual sunshine of gospel cheerfulness. He must ever have in his soul the peace of God, which passes understanding.

1709. One thing in this connection ought to be far better understood. The sources of disease, morally and physically, are much oftener to be traced to wrong habits in very small matters than most of us are aware. The Mississippi does not burst out a Mississippi at once; neither does deep-seated disease, physically or morally. It is fed by thousands of small streams, — some so small as hardly to attract our notice.

1710. The practical inference, in this case, is of immense importance. If the larger streams, physically and morally, are made up from the smaller, how exceedingly important to parents and teachers that they should give a right direction, at the earliest possible period, to the numerous tributaries of health and excellence!

SECTION XVIII. — HOW TO PREVENT COLDS.

1711. It was not my original intention to speak of the means of preventing particular diseases, but rather to explain

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QUESTIONS. — Should there always be a centrifugal tendency in the human system, in order to insure health? Do the elevating passions and affections tend to this? What, then, is the effect of the contrary passions and affections? What illustration is given, in the known effects of fear? What other passions and affections have the same effect upon the skin that fear does? Has not anger a different effect? Is it occasional effects that are spoken of, or those which are habitual?

What should be sought most assiduously? Do the depressing passions render us liable to disease? What is the general physiological condition of a fretful person? Are there two kinds of fretfulness? Which is the worst for the health? Why is it so? What is said of the sunshine of gospel cheerfulness? What important truth is suggested with regard to education? Does the Mississippi burst out, a Mississippi, at once? What is the natural and unavoidable inference? To whom is it peculiarly important?

and enforce those principal laws of health, by observing which disease may be prevented generally. But there are various reasons which render it necessary, in speaking of the skin, to say something of colds; or, as the books on disease call them, *catarrhs*.

1712. A cold is a disease; as truly so as small pox, fever, cholera, or consumption. Like other diseases, too, it makes inroads, greater or less, upon the constitution. It is, moreover, liable to be repeated. He who has recently had small pox, or measles, or scarlatina, or typhus fever, or indeed almost any acute disease, is not likely soon to have it again. But the more colds we have, the more we seem inclined to have.

1713. Nor is this all; nor is it the worst. Colds, besides being of themselves troublesome diseases, by inducing debility pave the way for numerous other diseases, such as pleurisy, peripneumony, bronchitis, fever, consumption, and probably bowel complaints. And, when they do not lay the foundation of a new disease, they often, by repetition, excite or arouse to activity many a sleeping predisposition.

1714. It is estimated by some, — though, I confess, rather loosely, — that we have in the United States, every year, at least two hundred millions of colds. This is only an average of about eight a year to each individual. If any one thinks this an exaggerated estimate, let me ask him to suspend his judgment till we come to 1720.

1715. Then half our people die of fevers, and one-fourth, or nearly so, of the various kinds of consumption. A large proportion of the remaining one-fourth die of bowel complaints. Now, must it not be highly desirable to know the art of preventing a disease, which, besides being a serious evil in itself, is liable to induce, hasten, or aggravate those complaints which destroy more than three-fourths of our entire population?

1716. But you will say, "Can the art of preventing colds be acquired?" It has been done; and is it not true that what man has done man may do? But suppose the habit were not *entirely* broken up; suppose the number of colds to be reduced but one-half. Would it be a matter of trifling importance to prevent one hundred millions of colds a year? Would it be a trifle to prevent thirty-seven thousand and five hundred consumptions, and a hundred thousand fevers?

1717. But, before I attempt to teach the art of preventing colds, I must say briefly what a cold is; for what I am saying on the subject will be wholly misplaced, unless it can be seen

distinctly that taking cold is, for the most part, dependent on the condition of the skin; and that, to prevent colds, we must, among other things, keep the skin healthy.

1718. Whenever the skin fails to do its work, either partially or wholly, a cold may ensue. And this cold may, and will fall on some part which sympathizes strongly with the skin, and is lined with mucous membrane. In general, too, it will fall on that particular portion of the sympathizing system which is most inactive, feeble, or debilitated.

1719. Thus, suppose I have weak lungs. When the skin, from any cause whatever, ceases to do its work, or even ceases to do a considerable part of it, the lungs, as if by way of neighborly kindness, endeavor to afford aid. This is done by performing a greater amount of their own labor, — that is, they do more, for the time, in the great work of depuration. But they soon get enfeebled and obstructed, and, instead of being able to work for their neighbor, the skin, they cannot perform well their own work.

1720. In this crippled condition of the lungs, or rather in the feeble attempts which they make to relieve themselves, consists what we call a cold. But, if the weak part of the system is the eyes, or the stomach, or the bowels, or the throat, or any other part lined by mucous membrane, the cold may fall on that, instead of the lungs. Thus, in truth, we have colds on the stomach, colds on the bowels, colds on the eyes, etc., as well as on the lungs.

1721. If these things are so, the practical and highly important question, How can colds be prevented? is easily and quickly answered; for, if they come as the consequence, either of improper action of the skin, or of a cessation of that action, all we have to do, in order to prevent them, is to keep the skin in proper condition; or, in other words, to keep it under law.

1722. But, though the answer to the question is easy, it is not so easy to do what that answer indicates. It is no trifle to obey all the laws of the skin. There is, however, no alternative. Either this must be done, or our colds must continue. They will, at least, only diminish in frequency in proportion as we obey more and more the laws of the skin.

1723. What these laws of the skin are, may be gathered from the numerous sections of this long chapter. They relate to light, air, temperature, compression, irritation, cleanliness, state of the mind and heart, etc. My limits will not permit me to repeat what has been already said; nor is it necessary.

1724. Some of us, in order to obey the laws of the skin, would be compelled to change almost all our habits, if not even betake ourselves to a new calling. Others, however, will find little difficulty but the want of resolution. Some will finish the work in a very little time, — perhaps in one or two years. It has often been done in two years. But others there may be who will require for the purpose six, eight, or ten years; especially the aged or diseased, or those whose employments are unfavorable.

1725. But even those who cannot so far exchange their employments, or their habits, as to emancipate themselves entirely, may accomplish very much. They may render their colds less frequent, and, when they do come, less severe and protracted. The effort made for the purpose, and made perseveringly, will be more than repaid.

1726. I have said that, in order to prevent colds, we must obey the laws of the skin. But, to be perfect, — to be steeled forever against their recurrence, — to be perfectly safe, it were desirable that perfect obedience were early secured. I will only add in the present section a very few items.

1727. Those who would avoid colds must not muffle themselves, especially their faces and throats, every time they go into the open air. I do not say that none of the vast number already diseased should be allowed to break the force of a stream of air lowered in temperature to zero, or fifteen or twenty degrees below it, either by a respirator or a muffler. I am writing for those who, as yet, deem themselves healthy.

1728. After brisk walking, or other exercise, during which we have worn more than a needful amount of clothing, we must beware of throwing off a part of it, and sitting down in a temperature which is very low, or in air which is damp, especially if we have been in a free perspiration. Better to keep on our clothing till we see how matters are going with us. It would be safer to add clothing, in such circumstances, than to diminish it.

1729. Those who would be perfect, in this matter, should avoid sitting with wet feet after exercise, or sleeping in damp clothing. While a person is exercising in the open air, if not over-heated or over-fatigued, it may be safe for him to have wet feet. Indeed, some will go with their feet wet all the forenoon, without injury, if they keep in motion; but the philosopher Locke, who recommended that children should have holes in

their shoes, would hardly have justified the practice of sitting with wet feet.

1730. Those who are accustomed to warm clothing should not exchange it for that which is extremely thin, when they are about to go abroad in the cold air, unless they are to walk. Thousands of young people, especially females, might trace the consumption, neuralgia, or fever, which destroyed them, to some act of recklessness, like that which is implied by the foregoing.

1731. In general, we are quite too much afraid of the sun and rain to enjoy that hardihood which is indispensable in a climate as much exposed to colds and consumptions as that of the United States. The late Gen. Dearborn, of Massachusetts, would have no such thing as an umbrella in his family, if he could help it. He thought it safer, on the whole, to be occasionally a little wet, than to exclude ourselves from every drop of rain, — nineteen times in twenty, with the almost entire certainty of being some time caught without one, and of suffering severely as the consequence.

QUESTIONS. — Are colds diseases? What is the name given to a cold in books? Do colds injure us constitutionally? When we have had a cold, are we more or less liable to have a second? Do colds ever lay the foundation of other diseases? Of what particular ones? Do they ever excite other diseases which but for them might have slumbered? What is the estimated number of colds in the United States annually? What part of our population die of fevers? What of consumption? What of bowel complaints? Is a very large proportion of these diseases either induced or aggravated by colds? If, then, by preventing colds we prevent these, is it not highly desirable to do so?

But can the art of preventing colds be actually acquired? Has it been done? Would not much be gained to the individual and to society by reducing the number of colds one-half?

What *is* a cold? Why do we have our colds seat themselves sometimes on one part, and sometimes on another? Are they apt to fall on a weak organ? What is the general rule for those who are ready for the great work of prevention? Is obedience to the laws of the skin perfectly easy? Would not some of us be obliged to almost unmake ourselves and build entirely new? Is every degree of effort in this direction more than repaid?

What is said of muffling the face when we go out? Are there no exceptions to this rule? What is said of the safety of throwing off our clothes after walking abroad? What of sitting with wet feet? May the healthy, during the forenoon, go with wet feet, provided they keep stirring? What did the philosopher Locke say? Is it hazardous to exchange warm vestments for thin ones when we are going to ride in the severe cold? Are thousands of lives lost in this very way? Are we vastly too much afraid of the sun and rain? What story is told of Gen. Dearborn, of Massachusetts?

CHAPTER VIII.—TEMPERATURE AND CLOTHING.

SECTION I.—THE BODY ITS OWN FIREPLACE.

1732. The human body, in health, is generally at a temperature of about 98° or 100°. Some slight allowance must indeed be made for distance from the heart, and for other circumstances; though the difference is not very considerable. Thus, the stomach, liver, and lungs, which are centrally situated, may have a heat of 100°, while the remoter parts, the limbs, are not more than 98°, and perhaps have a temperature still lower.

1733. Some small allowance must also be made for age. The temperature is slightly lower, both in infancy and advanced age, than it is in youth or middle life. So, also, in feeble constitutions, the temperature may occasionally fall a degree or two short of that of the more vigorous. It may, in the diseased, in a few instances, be found as low as 96°.

1734. One more circumstance—one of great importance, too—must, for a moment, have our attention. After active, vigorous, and cheerful exercise, provided it has not been too greatly prolonged, the temperature may be expected to rise a degree or two; at least, in persons of a sluggish temperament.

1735. It is sufficient, then, for all practical purposes, to say that the general temperature of the body is 98°. We may also state, as a general rule, that it maintains this temperature by its own efforts. At least, it is true that no outward or foreign circumstances can greatly and suddenly change it.

1736. The man, for example, who is so strong and vigorous as to get up a temperature of the internal central parts of his body at 100°, may be able to maintain it so all day long, at home or abroad, and in cold or heat. If the external heat is too great, as may sometimes happen, he has a proportionate power within to throw it off.

1737. When the steamboat Mayflower was wrecked on Lake Erie, a few years since, it became necessary for some person to stand at the helm for a long time,—a task to which only one man was found equal, on account of the intense cold. This man was able to remain at his post nearly the whole time for

thirteen hours; and, though his extremities were slightly frozen, his body remained at about 98°.

1738. Now, the temperature of the atmosphere at the time was very low,—not much, if at all, above zero. And yet, despite of the fact that he was giving off heated vapor, or steam, all the while, so that his whole exterior seemed to smoke like a coal-pit, his body kept up its heat. How could it do this? What hindered the mass of his solids and fluids from cooling down to the temperature of the surrounding atmosphere? A dead body, placed at the helm of the vessel, near the helmsman, would have cooled down to zero immediately. This man, afterward called the "iron man," had gigantic physical powers.

1739. It is impossible to resist the conclusion that the living human body has a self-heating power,—a power to generate and maintain its own heat. Or, in the language of the books on Anatomy and Physiology, it has a calorific function. This function, like all other functions of the body, may be strong or weak, elevated or depressed. If strong and vigorous, we are warm; if feeble or debilitated, we are languid or chilly. Still, were a thermometer to be applied, the heat would remain about the same.

1740. Now, it is believed that, during the great and complicated processes whereby we are constantly built up in early life, and renovated at all periods, a degree of heat greater or less is generated in all parts of the body. The old doctrine was, that the lungs were the great central fireplace; but the doctrine is beginning, by many, to be doubted.

1741. But, whether this is or is not so,—whether heat is chiefly generated by the lungs and skin, or by the processes of nutrition and waste in all parts of the body,—of one thing we are certain, which is, that the stronger the lungs, and the more vigorous the whole physical system, the better the calorific function is performed and maintained.

QUESTIONS.—What is the general temperature of the human body? What are some of the circumstances which may slightly vary this temperature? Does active exercise have a peculiarly good effect? Does the body maintain its own temperature? Do they who have great power to generate heat have also great power to throw off any excess of it? What anecdote is related of the steamboat Mayflower? What part of the living system, according to former doctrines, is the great fireplace? Is it not more probable that heat is generated in all parts of the body? What is the conclusion, then, of the whole matter?

SECTION I.—INFLUENCE OF AIR AND EXERCISE ON TEMPERATURE.

1742. Suppose a person has been sitting at his desk or work-bench, in a temperature of 65°, all the morning, from seven to ten o'clock. Without any variation at all in the external heat, he at length becomes slightly chilly, and walks abroad in the air to perform some errand, or make a call on a friend.

1743. In pursuance of his plan, he is in the sunshine and open air, and among cheerful faces, say fifteen minutes. Perhaps he is in haste, and walks very briskly. He returns to his desk quite another man. Without being thrown into a perspiration, he has gradually become warmer and in better spirits; and now the heat of his room remains quite sufficient for the remainder of the forenoon.

1744. But why is a temperature of 65° sufficient for him from the hour of ten to twelve, when at ten it was insufficient? The sun has risen higher, and it is warmer out of doors, to be sure; but, then, that can have made no considerable alteration with him in the house; as the temperature, in the case supposed, remains at exactly 65°. Why, I say again, the change?

1745. The sunlight, which, as Solomon says, is pleasant to the eyes, has not been without its influence; neither has the cheerful conversation, or the consciousness of having done some good. The better and healthier position of his limbs, and of his whole frame, has done something. Yet, after all, the great benefit has been from breathing better air in open space; and especially from active and agreeable exercise. His lungs have, as it were, quaffed nectar; and his limbs have held high carnival.

1746. And thus it will be with any one who emerges from a cheerless, inactive position, even though the temperature at first is ample. By a dependence of only two or three hours on mere external resources, he not only generates less heat than he would have done in other circumstances, but his power of generating heat has been diminished. The open air and the active exercise in a measure restore this power.

1747. It is otherwise with him who leaves his room for exercise, for the first time, at the close of the day, when the current of life is at ebb, and when it is rendered unnaturally low by ten or twelve hours of inactivity and of breathing bad air. In these circumstances, the exercise may be too much for him; that is, may be disproportioned to his strength, at this hour, and may perhaps reduce his temperature lower than it otherwise would have been.

1748. Many not only go out for exercise at evening, but make that exercise too violent. Like those who, having eaten no dinner, vainly expect to make all up by eating largely at supper, they exercise too violently, and perhaps too long, in order to make up for previous neglect. They forget that their expenditure should be in proportion to their capital. Going into purer air, of course, does not hurt them; as that gives strength at any time.

1749. Is it not quite possible that we do not yet understand *all* the reasons why exercise in the open air is so much more invigorating, even at the same temperature, than that within doors? Let him answer this question, if he can, who has made the experiment of leaving a room which was perfectly healthy and temperate, and walking abroad in the same temperature, and in similar circumstances, in all other respects, except the influence of the open air and the free movements of his muscles.

1750. May it not be made to appear, that the principal difference between the dwelling, or shop, and the open space, in regard to temperature, so far at least, as that part of the year in which we build fires is concerned, is, that we breathe an atmosphere out of doors, not only containing a full proportion — I might even say *more* — of oxygen, and less adventitious matter, whether dust, emanations, or gases?

1751. He who is abroad most certainly inhales less of carbonic acid than he who is within doors, as well as fewer animal exhalations. And it is this carbonic acid gas, after all, that is our deadliest foe. It is almost ever present, except when we are out of doors, and, being nearly destitute of sensible properties, at least, till it becomes greatly accumulated, is seldom suspected.

1752. Would that the public mind could be duly impressed with the importance of this subject. What we want is light and facts, and a disposition to follow truth, wherever it shall chance to lead us. Who shall gather up and present these needful facts? And who shall induce the mass of our citizens so to live as to keep up, most freely and effectually, the fire that the Divine breath has lighted up within them?

1753. Who shall do, for our whole country, what Dr. Griscom is doing for the city of New York? This eminent man, in a recent public address, has told his fellow-citizens that, in the year 1853, no less than 13,734 children under ten years of age (or more than fifty-eight per cent of all the deaths in that

city) went down to the grave, not because the rum-bottle was put to their lips, but "when the stimulus of a little oxygen would have saved them, and would have prevented the sickness of ten times that number."

1754. I have formerly quoted (1186) the saying of Mr. Thackrah, that man subsists more on air than on food; and have said that I was *almost* ready to indorse it, because it was almost true. Dr. Griscom assures the people of New York, who are undoubtedly made up essentially of the same material with the rest of mankind, that "it is as incumbent on them to return thanks to God for the air they inhale eighteen times a minute, as for the food they eat three times a day, since, without the former, the latter would be useless."

SECTION II. — INFLUENCE OF THE SKIN ON TEMPERATURE.

1755. Most persons have heard the story of Alexander and the Scythian ambassador. The former, having inquired of the latter how he and his countrymen could go almost naked in their frozen climate, was asked, by way of reply, how he and his people could go with naked hands and face? "Because we are accustomed to do so," said Alexander. "Think of us, then," said the Scythian ambassador, "as being *all* face."

1756. Whether or not this long-told story is true, there is, at least, much truth in it. To a very great extent, we are creatures of habit; and may doubtless be trained to almost any kind or quantity of clothing we please, even in this cold and uncertain climate. There is even room for the belief that habit might reconcile us to entire nudity.

1757. But this is not to say that our race would be gainers by it; far enough from that. For one who should survive the hardening — not to say foolhardy — process, many would probably perish. At least, we are warranted in such an ex-

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QUESTIONS. — What great principle is it the leading purpose of the first four paragraphs of this section to enforce? Is it not made sufficiently clear, in this reasoning, that our temperature depends much on our exercise? Have not many other things some influence? Is it as invigorating to the calorific powers to go abroad for health at evening, as in the morning? Why not? Is it one great advantage secured when we walk out, that we avoid much carbonic acid? Why is it that carbonic acid gas, so deadly a foe, is so little suspected? What do the public most need in this whole matter? What is Dr. Griscom doing for New York? Should we be as thankful to God for that which we are, as it were, eating and digesting eighteen or twenty times a minute, as for that which we partake of only three or four times a day?

pectation, by facts recorded everywhere in the history of mankind.

1758. Many savage nations, who actually expose themselves in this way, are known to perish prematurely; and few even pass beyond the bounds of the merest infancy. It is indeed true, that, if they inherit such a stock of vitality as to survive the first efforts at hardening, they are occasionally hardened still more by it. If not, they droop and die; and the tribe remains, in point of numbers, either stationary, or gradually but surely becomes extinct.

1759. I have represented the lungs as being a highly important agent (1740, 1741) in the great work of heating the body, and the skin as its auxiliary, or handmaid. A feeble or collapsed and unwrinkled skin cannot accomplish much in any way. It is the plump, warm, and energetic skin that does the work. I will not, indeed, say the *thick* skin; for many skins are thick because they have no energy. They become engorged or filled with fluids, while they have little power to propel or discharge them. On the other hand, there are skins to be found, which, though not very thick, do yet perform a great amount of work.

1760. If we examine the skin of an almost naked North American savage, when, during a cold winter's day, he is pursuing his enemy or his prey, we shall discover no such thing about it as mountain, hill, or valley, in miniature; or what is vulgarly called goose-flesh. On the contrary, we shall find his cutaneous envelope as tense as his bow-string, and nearly as plump as it would be at any other season.

1761. But I wish, on this point, to be distinctly understood. The savage skin is not thick nor engorged, on the one hand; nor soft, delicate, and yielding on the other. It is an active, energetic skin. All its functions or offices are performed with an alacrity and vigor which, except in rare cases, is, in civilized life, but little known.

1762. It is true, that at times he protects himself by warm fires, but this is not because he cannot keep warm otherwise. It is an indulgence. The savage is as fond of animal indulgences as the more cultivated man. It is from the necessities of his condition in life that he does not so often yield to them. His indulgences are the exception, rather than the general rule; and do not go to establish his character.

1763. It is not an occasional dance around a blazing fire, an occasio al sweltering over warm fires, an occasional plunge

from a warm or hot bath into cold water, or an occasional surfeit or fit of intoxication, that forms even the essential physical character or standing of mankind, whether savage or civilized. It is rather the daily or general course of life.

1764. In contrast with the savage, let us on a cold winter's day examine the character, physically, of a citizen of rank, say in New England. If he has access, three-fourths of the time during each twenty-four hours, to rooms heated to 70° or 75°, or 80°; has one, two, or more suits of warm clothing; is accustomed to feather-beds and thick comfortables by night, and to three, four, or five highly stimulating meals of food daily, with other occasional indulgences to eke out the "fever of digestion," he may, for the most part, and for a short time, be found with a warm skin.

1765. And yet there will be a softness about it, — an effeminacy, so to call it, or at least a want of due elasticity, — of which the savage knows nothing; and it will be liable at times to special collapse and inaction, in the form of colds and their consequences, with many other evils which we every day have reason to deplore, and which bring into the streets of the United States, yearly, a hundred thousand funeral processions and a million of mourners.

1766. A hundred skins of red men, sifted as they have been by disease and vice and war, till only a few, like tall trees, are left in each tribe; or the skins of fifty Mayflower emigrants, after the other fifty who were feebler have perished, would probably do more work, in the way of generating heat and depurating the blood, than twice that number of our modern, attenuated, half-effeminated human coverings.

1767. In view of such considerations as these, may we not see very plainly the force of the suggestions which have been made, from time to time, under various heads, with regard to the necessity of keeping up a good centrifugal tendency, in this highly important portion of the living human machinery? A good, well-developed, healthy, active, and strong skin, is one of the greatest physical blessings which can well be bestowed on our race.

1768. The fashionable female, young or old, whose attenuated, half-transparent skin has been represented, by some who ought to have known better, as very beautiful, should be regarded as among the most pitiable of her sex. Her supposed beauty is really a deformity; and her supposed health, disease. What though her cheeks may rival the waxwork repre-

sentations of the very goddess of beauty herself? She ever has a cold skin, so inelastic that it seems to shrink from the merest touch, and fade at the approach of the softest zephyr. It is not a depurator of the system, but a repository of its filth. It is not a safety valve, even; it is, much more, a mere scavenger of the physical department. It is, still more, — and still more appropriately, — its charnel-house.

1769. We want no such delicate beings, male or female, as those to whom these passing allusions refer. We want in the animal ranks no sensitive plants. They are everywhere subject to scrofula, neuralgia, colds, obstructions, cancers, consumptions. Woman, more than man, should have a skin which can generate caloric, especially in emergencies, in very great amount, and with no little force and power.

1770. For, as is woman, so is man. She cannot have a transparent skin for many successive generations, without transmitting the same deformity to the race. Let her remember this. Her skin may, and should be, delicate; I care not how much so; but it should be such a delicacy as God its Creator intended, and not that delicacy which is imposed by the force of conventional law.

1771. Let not those who, being roused by these suggestions, would gladly train themselves or others in the way they should go, rush hastily from the extreme of an almost mad effeminacy to that of rash exposure, under circumstances at once unfavorable and improper. Let them study the subject, and then act; but let them act wisely.

SECTION IV. — INFLUENCE OF THE STOMACH ON TEMPERATURE.

1772. Important as is the influence of the cutaneous system on temperature, that of the digestive apparatus is scarcely, if at all, less so. Indeed, there would seem to be a sympathy between the two, so that if one acts energetically the other does;

QUESTIONS. — What story is related of Alexander and the Scythian ambassador? What lesson does it teach us? Are we not, very largely, creatures of habit? Can we be trained to almost any habits whatever, as regards dress? Is there no danger in efforts at hardening? How is it with savages, who expose themselves in a manner which to civilized men is surprising? Do many of them live to old age? What kind of skin is most efficient in generating heat? What is said of the skin of a North American savage? How does his skin compare with that of a civilized man? What curious comparison is made of the skins of different masses of human beings? What is said of a modern fashionable female? What cautions are thrown out concerning education and physical management?

and if, on the other hand, one of them suffers, the other suffers also. At least, such a sympathy exists, and manifests itself in a greater or less degree.

1773. And how could it be otherwise? The great systems of mucous membrane — the membrane which lines all those internal surfaces of the body that open to the air — are appended to, or rather associated with, the skin; and have, to some extent, no doubt, the same general powers. Certain it is, that when we have a languid digestion, or great inactivity of the alimentary canal, whatever the cause may be, we are liable not only to have cold extremities, but also a pale, cold, shrunk or collapsed skin.

1774. The contrary is also equally true. When the cutaneous system, — the skin or surface of the body, — in any considerable portion of it, is deranged or diseased, or is even pale, wan, or inefficient, the alimentary canal in its general functions, or the functions of certain parts of it, either by themselves or their connections, such as the liver, the stomach, or the pancreas, is likely to become a sufferer.

1775. It hence follows, as a legitimate deduction from these premises, — and with nearly all the certainty of mathematical demonstration, — that, when the digestive system, and in fact the whole alimentary canal, are in the best state, then will the skin best perform its office; and, among the rest, its calorific duties. So, too, the lungs, as having a powerful sympathy with the skin, and also with the whole system.

1776. What, therefore, tends to give permanent health and vigor to this extended canal, so as to enable it to perform well its varied offices, but particularly its part as a calorific or heat-generating agent, is worthy of our attention. In this view we should understand well the doctrines of chapter IV. But there are certain inferences from those doctrines which may be necessary in this place, even though their presentation should involve a little repetition.

1777. Many suppose children who go barefooted, and have red cheeks, are of necessity strong and healthy. They may possibly be so. Generally, however, it will be found that a state of the alimentary canal accompanies these appearances which favors the development and growth of intestinal animals, or the production of acidity, lientery, indigestion, scrofula, etc. Yet no person, young or old, with these diseases hanging about him, will have very vigorous calorific powers.

1778. Others encase themselves and their families in flannel

and wash leather, and keep as much as they can within doors, at a heat of 80° or 90°, burying themselves in feathers by night. Along with this, they allow the young, if not themselves, to be almost constantly nibbling at high-seasoned and very rich food. Such persons, and especially such children, must be expected, by all who know anything about the laws of health, to be habitually cold and languid.

1779. Children, thus encased and thus fed, who attend school, will never be satisfied with 62° or 65° at the school-room. They will either be chilly, or crowding to the fire. How can it be expected that they whose stomachs have been greatly indulged, and who have been almost destroyed by hot air at their homes, can sit in a school-room of ordinary temperature, and not be chilly and uncomfortable?

1780. Children, in many families, eat for breakfast a bowl of bread and milk. This is plain food, we say; and so it is. If the milk is eaten by itself and eaten slowly, and the bread, too, by itself afterward, the processes of digestion will go on well enough, and a good supply of caloric will be generated. But, if the bread is soaked in the milk, and that and the milk *swallowed*, rather than *eaten*, little heat will be generated by the digestive process; and the children will be chilly, especially at school.

1781. I have supposed, in the latter case, that the milk and bread are at the temperature of 60° to 80°. The process of eating will slightly raise it. It may reach the stomach 10° higher than it was received into the mouth. This will not overtax the calorific powers of that organ in bringing it up to 100°—its own temperature. But if the food is at 50°, or even below, as often happens, and is swallowed rapidly, the stomach is enfeebled, and there will be chilliness afterward. I have observed this a hundred times, both in children and adults.

1782. In raising the mass of bread and milk, in the stomach, from 45° or 50° or 55° to 100°, a call has been made on the rest of the system for help; which, by withdrawing vital energies from parts which had none to spare, has left them cold. No wonder, if we reflect but a moment on the subject, why so many children that attend our schools incline to be chilly there.

1783. No small portion of the food which children eat at their morning meal, if not actually milk, is of a soft or half-liquid character. In the preceding century, milk porridge, bean porridge, and water gruel were very common dishes. These, with bread of some sort, usually very plain, and per-

haps hasty pudding, stood in the place of our modern bread and milk, and with the same effects on the stomach and skin and the general sensibilities. "May I go to the fire?" was the almost incessant inquiry for a long time after nine o'clock, and "Take your seats," had arrived.

1784. Hot drinks at breakfast, whenever and wherever used, have an effect not unlike bread and milk, only not quite so bad, because the temperature is high,—sometimes nearly as high as that of the stomach. It should be distinctly understood, even though the reasons may not all be easily and readily comprehended, that no person who hurries his food down too rapidly, even though he should use no liquid at all, will be as warm while the process of chymification is going on, as he whose food is well masticated and insalivated.

1785. Dr. Jarvis says, that "flesh, containing more carbon and hydrogen, supplies more fuel to the fire than vegetable matter." "Meat, therefore," he adds, "warms a man more than bread." Suppose it were so. Would he therefore have us take meat, just for this purpose? Alcohol, he assures us, furnishes a large amount of carbon and hydrogen, though, he adds, "these soon burn out, and their fire is exhausted, and the body is afterward cooler than it otherwise would have been." Is it not so, in a good degree, with animal food?

1786. Good bread, made of coarse meal, and—after the first years of infancy are passed over—well-selected, ripe fruits, most undoubtedly afford us the best *proportion* of nutritive properties on the one hand, and of fuel for combustion in the system on the other, which could possibly be found. They keep up the most steady and permanent fire. Pies, cakes, pastry, butter, cheese, eggs, flesh, fish, and fowl, render the internal flame more unsteady than plain food, and do not nourish us as well as that does,—whatever may be thought to the contrary. The more we adhere to the plain diet, the better the state of the digestive system, and the better the fire is kept up.

1787. One thing ought to be known, which is generally overlooked, even by physiological writers and lecturers. If our food contains too large a proportion of carbon, it seems to extinguish the flame within and to leave us cold and uncomfortable. The vital energies being withdrawn in too large degree, in order to aid in getting rid of the superfluous carbon, cannot be spared, of course, for the work of calorification.

1788. In order to have the digestive system do its part in

the great work of calorification, in the best possible manner, we should live under the habitual influence of all the elevating affections and passions. We must be full of faith, love, hope, joy, peace, courage, and general cheerfulness. But of this I may possibly say more hereafter.

SECTION V. — INFLUENCE OF THE BRAIN ON TEMPERATURE.

1789. I have sometimes awaked in the night, on account of the cold, and have at first found it quite impossible to sleep again. In those circumstances I have fallen into a train of thought so interesting that I forgot the circumstances, and was surprised to find — from the clock or bell — that an hour had passed away so suddenly; and that, without any additional clothing, I had been quite warm and comfortable. Had the activity of the mind, or of its material apparatus, nothing to do with this change?

1790. It has also seemed to me that the favorable change was brought about soonest, and most effectually secured and made permanent, when "the thoughts of my head upon my bed" were benevolent, rather than selfish, ones. If any one should suspect me as refining too much in this matter, let me urge him to suspend his decision, till he has the unpleasant necessity of making the experiment for himself.

1791. On the other hand, let me mention an experiment which most persons have made for themselves; but of which they may have taken "no note." Few are trained to make experiments on their own minds, — little aware, perhaps, that it is the grand laboratory of the great Author of our natures to which we are daily and hourly invited.

1792. Most of us, as I suppose, have, at one time or another

QUESTIONS. — Has the digestive system much influence in the work of generating heat? Why is this so? With what sort of a skin is feeble digestion accompanied? With what sort of digestion is a pale, chilly skin, on the other hand, accompanied? Is it so, then, that whatever habits or single acts tend to invigorate our digestive system, tend to make us habitually warmer? Are children who go barefooted, and have very red cheeks, usually healthy? What is much more frequent? Are those people habitually the warmest who cover themselves most thickly with clothing? How will these mummied children be, as regards warmth, at the schoolroom? Is the morning meal, usually taken by children, one of the best for enabling them to generate heat? Are hot drinks favorable or unfavorable in this particular? What does Dr. Jarvis say of a stimulating diet? Wherein lies his mistake? What food actually furnishes carbon — as fuel for the system — in best proportion? What sort of a diet extinguishes the internal flame?

of our lives, fallen asleep at irregular hours; it may have been on a chair or sofa, or it may have been on a bed. Half an hour, or an hour, or a couple of hours afterward, we have awaked cold. And yet the temperature of the room has remained about the same; and I know of no way of accounting for the change, except by supposing that the mental activity has diminished. If so, however, the brain has an influence on temperature.

1793. Another circumstance must be mentioned, as it may have escaped the notice of the experimenter. The degree of chilliness we feel, on thus awaking from a casual nap, will be somewhat in proportion to the state of the brain at the time of falling asleep. If the mental apparatus had, for a time previous, been but moderately used, the chill will be less than when it had been previously overtasked.

1794. Allowance, too, must always be made for the state of the stomach, for the fatigue of the body or mind, for the general health, for the hour of the day, and many more incidental circumstances. Under great fatigue and excessive hunger, the chill will be greater; with a stomach only moderately filled, but not quite empty, and a good state of health, the chill will be less. It will also be less, early in the day than late in the afternoon and evening.

1795. We are now prepared to account for many of the irregularities in the temperature of those around us. We may see one reason why so many have cold feet, cold chills, cold perspiration, etc.; and why so many thousands are exceedingly sensitive with regard to the slightest changes of wind or weather. We may be able to trace out a part of the causes why so many of our young people, in civilized society, seldom have warm extremities, and seldom, if ever, sleep soundly.

1796. They who are accustomed to gratify their stomachs with delicacies at irregular hours, and to suffer from chilliness night or day, must remember that it may be because their brains, in blind and mistaken pity and mercy, send down to the abused and suffering digestive system that energy which should have been employed in its natural and appointed way, viz: in strengthening for their calorific work the other parts of the system.

1797. They who read almost incessantly, should remember that they have other parts of the system which need the energies they are using up at the fountain-head, and should forbear. A Louis XVI., while in prison and awaiting a speedy death,

may possibly be pardoned for reading one hundred and fifty-seven volumes in five months and seven days, besides instructing his son; but they who read at this rapid rate, expecting to live long, or to live comfortably while they do live, deserve almost anything else rather than pity. They do their utmost, though ignorantly, to extinguish the fire God has enkindled within them; and must expect to pay the heaven-appointed penalty.

1798. Reading light works, such as affect the imagination more than the judgment and the mental faculties in general, are much worse, other things being equal, in their tendency to draw upon the energies which should go to sustain the internal fire, than books of a different description. Why this is so, may be a question of difficult solution; but the fact is undeniable.

1799. Nothing is better established than the fact that you will find such persons, everywhere, suffering with cold feet, crowding around the fire, or immersed in feathers or down. Or, if they venture out of doors, they muffle themselves up in such a manner that the pure oxygen of the atmosphere is doled out to them in a most stinted and adulterated manner.

1800. Above all, reading such light works late at night, when we are at the bottom of our condition,—at ebb-tide of the system,—and when we ought to be at rest, both in mind and body, is of most pernicious tendency. It is bad enough to read, at such hours, those works which are unexceptionable in their character; but still worse, if possible, to read useless trash or mere nonsense.

1801. They who sleep but little are more liable than others to have the internal fire burn dimly and feebly. This is a matter of common observation. Those who retire early and rise early are warmer than those of opposite habits,—that is, provided everything else in their habits is equal. They are the warmest both by day and by night.

1802. Whether they who sleep too long—I mean, now, those who expand or stretch their sleep unnaturally—are the colder for it, during their waking hours, is not quite so certain. Reasoning from analogy, however, and from the few facts I have been able to collect, touching this point, I am of the opinion, most decidedly, that they are so.

1803. The capital error of modern education is, that it attempts to develop and expand and elevate, heaven high, the intellect; while the physical and moral departments are almost wholly neglected. In other words, we endeavor to educate the

intellectual at the expense of the physical and moral nature. Of course, a failure should be expected.

1804. All this is at the expense of the calorific powers. Man is a threefold being; and, to have either or any of these departments of his nature healthy and vigorous, so as to be able to generate heat with great energy, when circumstances require it, the whole must be developed and cultivated in harmony. But this work is seldom, if ever, done. There is a want of due harmony, and hence a want of due strength.

1805. What we call our great scholars are, in general, neither more nor less than great valetudinarians. They may not always be called so, I know; for they may not have any discoverable, or at least obvious, disease. But they are pale; their skin has an inefficient character, if not a centripetal tendency; and they are cold and languid at the surface, and comparatively powerless in the interior.

1806. It should be added, that what are called our great thinkers, but who, after all, are unworthy of the name, since they think quite too rapidly to think healthfully, almost universally extinguish the internal flame, and droop or die early. Man is, indeed, made to think, but he is also made to feel and to act. It is not, however, weighty, solid thought that cripples the calorific powers, so much as wild scheming and airy speculation.

1807. It may excite a smile, but it is, nevertheless, an assertion that can be sustained by facts, that it is the individual whose triple nature is best balanced by a proper and harmonious education, who has the best and happiest temperature. The savage is not an exception to this rule; but, if we consider that, though low in the scale of character, he is nevertheless more in harmony than most of us are, it need not surprise us to find him in the possession of energetic calorific powers.

Questions. — What experiment of the author's is here mentioned? What does it appear to teach? Has benevolent thought a better calorific effect on the body than selfish? Is it not a lamentable fact that we are not taught to analyze our own hearts and minds, and note the current of our own thoughts and feelings?

Why are we so generally chilly after sleeping a short time? Has the degree of previous mental activity anything to do with this? Are there not many other circumstances in the case, to be attended to? What do these instructions prepare us to acconnt for? What, in particular, do they teach us in regard to young people?

How does indulgence in delicacies for the stomach affect our power of generating heat? Why is this so? How does incessant reading affect

SECTION VI. — INFLUENCE OF THE PASSIONS AND FEELINGS ON TEMPERATURE.

1808. The influence of the elevating passions and affections on the circulation of the blood has been fully shown (1124–1129). And whatever increases the vigor of the circulation of course warms us. Much, of course, which might otherwise have come under the present head, is there fully and freely discussed.

1809. It is, indeed, one of the plainest truths in the world, that, other things and circumstances being equal, they who are habitually full of love, hope, joy, courage, and peace must be much warmer than they who are habitually under the influence of hatred, despondency, sorrow, or discontent.

1810. Take, for example, the philanthropic L'Epee, or the benevolent Howard. Were not these men habitually warmer for their benevolence and piety? Or look at Cheverus, occupying his room without fire, all the winter, in a cold climate. Think you his warm moral nature had nothing to do with his physical temperature?

1811. Or, take the case of Paul and Luke, — those noble missionaries of the cross. Does any one believe that, while their fellow passengers who had escaped with them from shipwreck at Malta were shivering around the fire which had been built for them on the beach, they were as chilly as the rest? Yet they were made of the same material; and Luke was at this time an old man, — perhaps near seventy years of age.

1812. Or to take another and still more striking example. Can we doubt whether the great Founder of Christianity had the power of generating heat largely? If we have any doubts on this point, it seems to me they must soon be removed, if we attend closely to the general tenor of his life and habits. We shall have ample reason for believing he was as warm physically as morally.

1813. It is true, we have one example of an opposite kind. When all the disciples forsook their Master and fled, one of

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our temperature? What anecdote is related, incidentally, of Louis XVI.? Is reading light works worse for us, in respect of calorification, than other reading? What fact, of common observation, goes to prove this? What is said of reading late at night? What is said of sleeping too little? What is the capital error of modern education? How is it that we are educated inharmoniously? What is said of the health of great scholars generally? What is said of great thinkers? Who is best educated to generate heat?

them at least was "warming himself" at the fire, as we are told. And it is worthy of remark, that it was here, in his already fallen condition, that he fell still further, and added swearing and falsehood to moral cowardice.

1814. Should it be objected that the deduction I have made from the preceding facts is unwarranted, since they belonged to a day of miracles, I reply, that there is no reason for believing there was anything miraculous about *them*. I grant, indeed, most cheerfully, that, in their influence on the body itself, philanthropy and piety — kind feelings and a warm heart — can *almost* work miracles.

SECTION VII. — DRESS AND CLOTHING.

1815. Few things are more strangely perverted from their original intention than dress. It is not in the savage alone, but the civilized man, that reason is degraded and dethroned, and a tyranny established, to which, as rational beings, and above all as Christians, we ought not to submit.

1816. The three simple and legitimate purposes of dress are to serve as a covering, a defence, and a regulator of the temperature. Another purpose of clothing has been added by some, — that of hiding our deformities, or of improving our appearance.

1817. The first legitimate object of dress is easily and cheaply accomplished. In primitive times and countries, a single garment usually suffices. But even of this simple dress we have a large variety, from the apron of fig-leaves to the robe of royalty. Nor would it be easy to determine, on the score of experience, merely, which is preferable.

1818. The second great object is accomplished less easily. The materials best adapted to the defence of the skin are either animal or vegetable. Thus, we have wool, hair, and silk from the animal kingdom; and flax, cotton, and hemp from the vegetable world.

1819. Asbestos, a species of mineral, has been wrought into garments; but it is chiefly as a curiosity. Various articles

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QUESTIONS. — Does that which increases the force or vigor of the circulation necessarily warm us? Is it plain to mere common sense that the elevating passions and affections do this? What are some of these? What is said of Howard and other philanthropists? What of Paul and Luke? What of our Saviour? What of Peter, at the time of his fall? Was there anything miraculous in these cases? What will, in any age, almost work miracles?

have been made of iron and other materials, to cover portions of the human frame, as a protection in time of war; such as helmets, breast-plates, and the like. Minerals are also used, both by savages and civilized men, as ornaments. In ordinary circumstances, however, we derive very few materials for our clothing from the mineral kingdom.

1820. Some have smiled at the idea of using clothes as a defence. But they forget the susceptibility of our skins to heat and cold, and their liability to laceration. Grant that this susceptibility is the result, in no small degree, of mis-education; still, it can neither be overlooked nor forgotten.

1821. But the third and most important use of dress and clothing is to aid in regulating our temperature. Pure air, proper exercise, healthful food, and a good skin, all have influence. Yet, when all these have done their work, there is room enough for the influence of clothing and dress. Both may be made quite useful.

1822. The mild but damp air of spring, being a good conductor of electricity, either robs our bodies of their heat, or weakens their power to generate it, almost as readily and as rapidly as the severe cold of winter; and both alike demand, in greater or smaller quantity, warm garments.

1823. In hot weather, on the contrary, our clothing should aid in cooling us. For, high as the temperature of the air, in summer, may be, it is seldom as high as our bodies. Even when it is above 60° we feel uncomfortable. If the proper material is selected, it favors the formation and escape of vapor by means of perspiration, which also cools us.

1824. Particular circumstances may render extra clothing needful. Thus, the laborer on a canal or railroad, or in a glass factory or a mine, may be exposed, from time to time, to such drenching perspirations as will tend to weaken him, as well as expose him to take cold, and to suffer, in the end, from rheumatism, and perhaps from a consumption. Here flannel, worn next the skin, as an absorbent, may be useful, or even indispensable.

1825. In very early life, regard must be had to our constitutional tendencies. While many children require more clothing than adults, especially the scrofulous and consumptive, there are others who would be greatly injured by it.

1826. Then, again, much depends on climate. Quebec, it is said, is the best place in North America to winter in. The extreme southern portion is next best. Steady cold weather,

not *too* cold, as at Quebec, requires less clothing than eastern Maine, Massachusetts, and Rhode Island, — the battle-ground between the arctic and the torrid.

1827. Here is a noble field for the employment of the rational physician. It is not meet that a want of proper light on the part of a suffering community should confine him always to mere patch-work. The Boston Medical Intelligencer, of thirty years ago, had for its motto: "The best part of the medical art is the art of avoiding pain." In other words, prevention is better than cure.

1828. To this nobler work of prevention, in a more happy period of the world's history, will our medical men be called. How to adapt a child's clothing to his hereditary and constitutional tendencies, as well as that of an adult to his employment, and those of both to food, climate, and temperament, will be as much more agreeable employment to the physician than dealing out medicine, as it will be more profitable to his employer.

1829. The very general idea that, if temperance in all things, or at least a very general obedience to physical laws, would be a means of banishing physicians from the world, in the progress of a few generations, is, unhappily, erroneous. It may banish many acute and some chronic diseases, and perhaps all active medicine; but the time is very far distant when the present number of physicians, if not a number far greater, might not be profitably employed in the great field of prevention.

SECTION VIII. — FASHION AND TASTE IN DRESS.

1830. In deciding on the fashion of our dress, we should

QUESTIONS. — Is dress greatly perverted from its original design? Is this perversion confined to any particular class of society? What are the three great objects of dress? Has a fourth been sometimes mentioned?

What is the first grand object of dress? Is this easily accomplished? What do you say of the second? Have minerals ever been employed in connection with our dress? Of what kinds? For what purposes? Do we really need clothing as a defence? Why? What is the third grand object of clothing? Why do we need clothing in hot weather? Is extra clothing ever needed? Why so? What is said about the bearing of this subject on our employments? What of our tendencies to particular diseases? What of climate?

Does this train of thought open up a new field of labor to medical men? What was, thirty years ago, a motto? Would prevention and efforts at correct physical education, as the main business of a physician, be more agreeable to the physician than medicine and patchwork? Would it be more profitable to his employer? What mistaken idea prevails? Is this error likely to be soon corrected?

keep in view its legitimate objects or ends. We have elsewhere seen (1555) that our clothing should be loose and flowing; and, in general, of porous materials, both by night and day, as well as at all seasons. I have also given some of the reasons.

1831. The principal objection likely to be urged against those views, and the reasonings of the preceding section, is, that they stand opposed to all just taste, and utterly exclude it. Carried out into practical life, we are told, they will hide under a bushel the exquisite forms and proportions of the framework for the soul, which God has given, and set at nought all grace and symmetry.

1832. But the objection is more specious than solid. Beauty, I admit, though not deep, is almost a virtue. Adam and Eve, as Dr. Mussey is wont to say, were exceedingly beautiful, — why should their dress conflict at all with that primeval beauty? Yet our modern Adams and Eves do not occupy the same ground and sustain the same relations with those of six thousand years ago. They are fallen; and their dress must correspond to their circumstances.

1833. The usual argument, that, since God has arrayed the vegetable world in the richest of drapery, therefore mankind should adorn their bodies, is unsound. The analogy is imperfect. The beauty God has delegated to the lily and the rose is, as it were, their all; "in ages, they no more could know, or covet, or enjoy."

1834. Besides, this law of compensation would apply to other animals, as well as man. Will it be pretended — was it ever pretended — that these, too, could be improved by a careful, tasteful attention to their externals? Why not, as much as man and the monkey, according to the tenor of the foregoing argument?

1835. "The mind's the standard of the man," Dr. Watts says. But the heart, or spiritual nature, is much more so. Perhaps it is the Divine intention that the beauty of our race, in its fallen state, shall be, for the most part, internal or spiritual beauty, and that this beauty shall be heightened by contrast with the coarser and humbler-clad exterior.

1836. This critique on the general verdict of mankind is not to be construed into a defence of slovenliness or personal neglect. I have no objection to beauty of the exterior, in itself considered, even in a fallen race. All for which I contend

is, that the common argument, when closely scanned, is not well founded.

1837. Besides, we may bring against it the great Christian principle that the *certain* must never yield to the *doubtful*. "He that doubteth is condemned if he eat." If beauty of dress — if what is, in the abstract, deemed good taste — cannot coexist with the laws of hygiene, and is not sustained by the moral law, then let the former, by all means, give place to the latter.

1838. With regard to the effects of compression, irritation of the skin, and the exclusion of light and air from it, I have spoken freely in its proper place (1541–1579). The modern taste, which countenances and sustains the fashion of tight clothing, must be wrong. It is merely conventional, and the conventional law must yield to the physiological, — the lower to the higher law, — man's law to God's.

1839. Sumptuary law is sometimes objected to, on the ground that it conflicts with personal freedom of choice and individual taste. And yet, in the very next breath, the objector contends for the law of fashion. Now, I know well that all law is for the public good, and it is highly desirable to leave everybody to follow their own standard and taste as long as we can. And yet, I know of no reason why sumptuary laws may not be occasionally needful as well as any other. Can any such be shown? All law is God's law; the laws of hygiene — even the law of dress — as truly as any other, or it is no law at all.

1840. That sumptuary laws would derive additional strength from human enactments may be doubtful; but the same doubt hangs over all other human enactments. Must we therefore dispense with them? Why, then, dispense with sumptuary law? If human law is to be enacted at all, I see no objection to laws on eating, drinking, sleeping, or dress, whenever the public welfare seems to demand it; nor do I see it to be any encroachment on our free ageney.

1841. In short, I would make conventional law conformable, if not amenable, to the laws of physiology and morality; and any violation of the latter should be considered as a violation of the former. Tight boots, gaiters, pants, caps, and corsets, should be as truly liable to prosecution before the earthly magistrate as highway robbery.

1842. Our dress, of whatever material it may be, should unquestionably be loose and flowing. Would that it could be so contrived as not to compress a single square quarter of an inch

of that wonder-working organ,— that mighty safety-valve of the human system,— the skin! Would that it could be so applied, even in midwinter, as to leave a layer of air between it and the safety-valve!

1843. The excellent James Burgh, in his "Dignity of Human Nature," being aware of the sway which the tyrant Fashion exerts, takes occasion to lay down as a rule: "Neither be the first nor the last in a fashion." How much to be regretted that he should speak thus! Must the time never come when Physiology, and Hygiene, and Christianity shall guide us in the matter of dress, rather than the dandies and abandoned of the old world or the new? What is best for health, provided it does not absolutely offend good taste, is the only fashion that should control us.

1844. Let me quote, also, a few paragraphs from Dr. Cogan's "Philosophical Treatise on the Passions," under the head, "Power of Fashion," at page 174: "Fashion gives absolute sway to modes, forms, colors, etc., wantonly introduced by the whim of an individual with whom the majority have not the most distant connection, and concerning whom they are totally ignorant. It is capable of instantaneously altering our opinion of the nature and qualities of things, without demanding any painful exertions of the understanding, or requiring the slow process of investigation. With the quickness of a magic wand, it in a moment subverts all those ideas of beauty, elegance, and propriety it had before cherished.

1845. "Fashion will render that particular garb, which we once thought so warm and comfortable, hot and insupportable as the sultry *dog days;* and it makes the slightest covering, contrary to its pristine nature, remarkably pleasant in the depth of winter. The flowing hair or adjusted ringlets shall, at one period, be considered as becoming and elegant; at another, be rejected as an insufferable mark of effeminacy.

1846. "Fashion has power to influence our ideas of graceful proportions. It elongates or contracts the form of the leg in one sex, and of the waist in the other. It directs decency to *excite* a blush at being detected without any other head dress than that ordained by nature; and it is also able to suppress the blush of female delicacy at exposures which scarcely leave any room for the exercise of the most licentious imagination."

QUESTIONS. — What should always be kept in view when the subject of dress is considered? What leading objection is made to this? Is the

SECTION IX. — THE MATERIAL OF OUR DRESS.

1847. As a general rule, wool is the most valuable material of clothing which modern times afford; and perhaps, in the end, the cheapest. In truth, if cheaper fabrics were substituted, they would be, for the most part, less durable. But, whether cheaper or not, it is quite likely, in this highly changeable climate of ours, to be for a long time in large demand.

1848. One objection is made to wool, by certain writers on dress. "Why," say they, "a state of the world is fast approaching when wool, in any considerable quantity, cannot be had. Can it be the design of Providence," they add, "that an article which, in the last glorious days of earth, cannot be had in any considerable quantity, shall be in general use?"

1849. They refer, of course, to that state of things which the practical application of Christianity is likely one day to effect, when, the population being increased a hundred-fold or more, there will be little room or means of support for domestic animals. So that, if the use of wool were, in the nature of things, indispensable, how does it happen that, just at that period of the world's history when it is most needed, it will be most scarce?

1850. The objection which is embodied in the foregoing remarks has weight, but admits of a partial reply. Before the discontinuance of those causes in this world that prevent man from living out half his days, and before that corresponding increase of population which shall drive out everywhere the lower animals, that they may give place to man, the higher and nobler animal, the laws of health must be taught and obeyed to an extent which will practically exclude a large proportion of our present clothing. The supply will diminish gradually, in proportion to the demand.

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objection valid? Why not? Why is the argument on which the objection is based unsound? What does Dr. Watts say? Is slovenliness defensible? What is said of the safety of taking the side of doubt? What is said of sumptuary laws?

What is said of a comparison between conventional law and God's law? What are here called sumptuary laws? Should such laws ever be made? Is taste, in itself considered, at all objectionable? Are all laws the laws of God? What, then, shall we say of the laws of dress, and of hygiene generally? Why should it not be as proper to make laws in regard to eating, drinking, sleeping, etc., as anything else? What does Burgh say of the fashions? Wherein is he wrong? What does Dr. Cogan say? In view of such facts as those of Dr. Cogan, are we justified in believing that the standard of taste in dress is arbitrary and fixed?

1851. One or two things more are to be remembered. Portions of the earth's surface will be unfit for any thing but sheep, for a very long time. And then, in the mean time, it is more than probable that human ingenuity will devise some substitute for wool, of which we have, at present, no conception.

1852. Besides, cotton may, to a very great extent, be substituted for wool. And we have very little idea of the vast amount of this article which can be raised in the different countries of the world, when the public attention shall be turned to it more effectually; and when free labor shall everywhere be substituted for the comparatively unprofitable labor of slaves.

1853. This period is approaching, and may, even now, be much nearer than most of us believe. In our larger cities, a few shops may already be found where a tolerable supply of cotton cloth and other articles, usually raised by our slave population, may be had, which may be relied on as the product of free labor. The supply, it is said, is equal to the demand. Is there not reason to believe it will continue to be so?

1854. Cotton cloth, next to woollen, is the worst conductor of caloric, which is as yet very much worn. The cotton flannel, as it is termed, with its shaggy surface, or nap, has tempted many a purchaser to substitute it for his under-garments of wool. Nor have I known any who were fairly emancipated from wool ever to return to it.

1855. It is indeed somewhat irritating at first, to a few sensitive persons, but less so than woollen flannels. Many, who, on account of its irritation, cannot use woollen fabrics, have found themselves quite happy in the exchange. It gives still less trouble when we are trained to it from the earliest infancy.

1856. I wish it were possible, in the nature of things, to return to the custom of raising flax, and manufacturing linen for our households, as was customary little more than fifty years ago in most parts of New England. Linen was made as far back as the days of Solomon. The labor of preparing it is toilsome; but the results are highly favorable to general cleanliness, health, and happiness.

1857. It is not, indeed, very desirable to return to the use of this article, just as its use was when regulated by the wise Jewish king. We are a republican world now, and want linen for the common people, no less than for kings and princes. To any who possess tolerably strong constitutions, it is greatly

preferable to cotton for many months of the year; and to nearly all, a greater or smaller portion of it.

1858. Some make it their boast that they wear the same clothing in winter and summer. There is no sort of difficulty in forming this habit; but its attainment is not very desirable. Such persons usually pay a penalty in the end, justly proportioned to their folly.

1859. One of the usual forms of suffering which this transgression entails on the transgressor is, either a very torpid, or a highly delicate, skin. No person can wear woollen clothing exclusively, in our climate, throughout the year, without weakening his skin, in a greater or less degree; although the punishment may follow at a period so late that the transgression is forgotten.

1860. In truth, he who would have a truly healthy skin must be willing to pay the price; and not a little is done to this effect, when we keep the skin cool in the summer. They who compel it to use its somewhat diminished energies all the summer long, in getting rid of superfluous carbon, must expect to take colds in the autumn, rheumatism in the winter, or consumption sooner or later.

1861. Silk, as an article of wearing apparel, has been used chiefly for ornament. About twenty-six millions of dollars' worth of silk were consumed in the United States in 1854, according to the report of the Secretary of the Treasury. This is estimating it at the first, or wholesale, cost. The actual expense to the consumers must have been not far from forty millions. Now, twenty-five to forty millions are quite too much for us to expend in one year for a mere luxury.

1862. This article might be made valuable in our families, to a small extent. Not so much, however, by wearing it on the outside, as internally. It is a bad conductor of electricity; and hence, if worn next the skin during those portions of the year when the air is surcharged with vapor, it might prevent the too rapid egress of electricity, if not of caloric, from our bodies; and thus render us buoyant in our feelings, rather than dull, dispirited, and melancholy.

1863. Some persons object to the use of silk, on account of the cruelty involved in the work of procuring it. And it must be confessed that, to a sensitive mind, it would be much more agreeable to raise cotton, or flax, or even collect wool from the sheep. And it is certainly a material of dress which could be far better dispensed with than any of the others.

1864. Coarse cloths have been made, both in civilized and barbarous countries, from bark, woody fibre, certain animal substances, the hair of camels and goats, and from various other materials. They are useful both for a covering and defence, and some few of them are useful in regulating the temperature. They are mostly used in hot climates.

1865. Furs, on the contrary, have been chiefly employed to regulate the temperature in cold countries. Their expense, among us, is so great as to prevent their being very freely used in dress, except for ornament. They are remarkable for their non-conducting power, and hence retain the heat of the body better than any known material. The most common article among us of this kind is the buffalo skin, or robe,—much used in travelling,—and the tippet, of finer furs, for the neck.

1866. The best known material for covering the feet is the tanned skin of animals of various kinds, or leather. A few have substituted Indian rubber for leather, and a still smaller number gutta percha. But the two last substances are unfit for habitual use, though they may be worn occasionally. Cloth shoes are worn, more or less, by a few sedentary or studious people; but they are not very durable. It is highly probable that, in the progress of the arts, new discoveries may be made in this direction.

QUESTIONS. — What is the most valuable present material of clothing? Is it in the end probably the cheapest? What objection has sometimes been made to its use? Is this objection a very strong one? May we not, at least, use wool till we can devise a better article? May not cotton be substituted for wool much more than it ever has been? What obstacles lie in the way of its more extensive use? Is the period fast approaching when some of these obstacles will be removed?

Is cotton a bad conductor of heat? How will it compare in this respect with wool? What is said in particular of cotton flannels? Are these flannels sometimes irritating to the skin? Does not much, in this respect, depend on early training?

What is said of a speedy return to the usé of linen? Was not flax raised much in the country fifty years ago? Was linen in use in Solomon's time? Is it desirable, in hot weather, at least, to everybody else as well as kings and princes?

Is it well to wear the same clothing in winter and summer? Why not? Do the penalties for transgressions of this sort usually come long after the transgression? What are some of them?

What is said of silk, as an article of dress? Is it, or is it not, to be objected to, on the score of inhumanity? Is silk a bad conductor of electricity? Under what particular circumstances, then, may it be worn with great advantage? What other fabrics have been made for dress or clothing, in different countries? What is said of furs? What of shoes? What of the use of India rubber and gutta percha? What future discoveries are to be regarded as highly probable?

SECTION X. — QUANTITY OF CLOTHING.

1867. No error connected with the subject of animal heat is more frequent than that of using, both by night and day, too much clothing. Infants, and our numerous worshippers of fashion, with a few others in whom the vital flame is naturally feeble, may need a good deal of clothing. But most of us use from one-fourth to one-third more than is best for health, and some of us twice the needful quantity.

1868. Your attention was called, in a former section of this work, to the difficulty of reducing the temperature of our rooms after we have once had them too highly heated. Those who have long used too much clothing, experience, in endeavoring to lay it aside, a similar difficulty. Which error is adding most to the general stock of delicacy and sensitiveness, as well as to our long dark list of neuralgic, scrofulous, rickety, insane, and consumptive cases, is not very easy to determine.

1869. A certain literary and philanthropic individual, who had suffered many long years from dyspepsia, and become so sensitive to our changes of temperature that he could scarcely expect to live through another winter, came to the full resolution to try a foreign climate; and, strange to say it, took up his abode in Switzerland.

1870. Here the customs of the country not only permitted but required him to spend much more time than he had done, in the open air. The more he did this, the less sensible he became to the extremes and occasional sudden changes of temperature, to which even this charming but cold country is subject.

1871. The final result was singularly happy. Instead of crowding to fireplaces and stoves more and more, and adding either more or thicker flannels at each recurring season, for acclimation, he gradually became emancipated from his slavery, and his health was considerably improved.

1872. This, though an extreme case, is a fair illustration of what we see all over our country, especially above 40° of north latitude. A million of colds, at the lowest possible estimate, are among the fruits of this error, every year. Then, again, these colds are introductory to millions of other diseases, and premature deaths.

1873. In general, the more clothing we wear in order to retain heat, the more we think we *must* wear. And the contrary is equally true; that, the less we wear, the less we appear to require. The reason is, that the more we imprison the

caloric by our clothing, the less the calorific powers of the body are called into action to generate it. Then, the less the demand made upon the human system to generate caloric, the less is its power to perform this work, whenever it is really required. And the more languid or lazy the calorific function becomes, the more chilly we are.

1874. Such is the natural course of things, whether we are strong or weak; but the results are not so perceptible in the former case as in the latter. A slight diminution of our capital, whenever trade is large and profitable, is hardly felt by the man of a hundred thousand dollars' worth of business; while, to the man of ten thousand or five thousand, the diminution of a single hundred may be a serious embarrassment.

1875. "The destruction of the poor is his poverty," says Solomon; and, in like manner, the destruction of the feeble is his feebleness. Slight influences do not immediately disturb or derange the man of firm health; but with the sensitive and delicate they are a constant drawback upon their happiness. Their very debility thus begets debility; and their very feebleness is a source of their feebleness.

1876. But to know the truth on this subject is not sufficient. Many an individual, who has become fully conscious that his shattered, delicate system was a mere weather-cock, and has learned the way of escape, has continued to be a sufferer. To resolve and re-resolve is not enough. There must be a steady and persevering conformity to the strict laws of hygiene, if we wish to attain to anything valuable.

1877. The difficulty of making changes, in regard to dress or anything else, is greatly enhanced by that minute division of labor which now prevails. When the farmer — with the aid of his family — was at once farmer, mechanic, manufacturer, and almost merchant, too, he was not condemned to labor all day under the full influence of those debilitating circumstances which, in these days, so often crowd around the laborer and mechanic, and, as it were, hedge up his way to health.

1878. How can he, for example, whose employment dooms him to ten, twelve, or fifteen hours of labor every day but Sunday, in an atmosphere heated to 80°, and very impure, and in a situation, too, where he can make very little use of his muscles, expect to have his calorific powers either active or vigorous?

1879. The wonder is not that in such circumstances the lungs, and skin, and other organs become powerless as regards

the work of generating heat; but rather that the individual does not perish long before he gets half way to his natural vital limit.

1880. Nor are we to wonder, when we see the smith, shoemaker, tailor, glass-blower, cotton-singer, and others go home from their heated, impure shops, to their own cooler but purer rooms, and then, lest they should be chilly, raise the temperature ten or twenty degrees, and almost extinguish the languid flame within their own bosoms, and the bosoms of their families.

1881. A country blacksmith, whom I well knew, after toiling ten or twelve hours in his shop, highly heated, would, at evening, pile wood on his family fire till the room glowed like a furnace. He and his family are still living, but the majority of them have little power to generate heat. They are thin-skinned, nervous, delicate, and even diseased.

1882. We err greatly in regard to night clothing (427–431). In our haste to get warm quickly, we pile on one-third too much clothing. Before we experience its depressing effects we are fast asleep, and perhaps do not awake till morning. We may, indeed, be conscious that something is wrong, but we are not enough awake to refer our sufferings to the proper cause. This error is the source of more sensibility to cold than most of us are aware.

1883. In travelling, once, in cold weather, I was so fortunate as to find—instead of a *warm bath*, made of *feathers*—a good, clean mattress to sleep on. Rejoicing in my good fortune, I quite forgot to pay any attention to the bed-clothing. On awaking at midnight, I found myself sweltering under a load which was equal to the necessities of two persons. Half the clothing was immediately thrown off, and the remainder was found amply sufficient, not only for that night, but for a week of equally cold weather afterward.

1884. Heat, externally applied, is a stimulus whose effects need to be watched as carefully as those of internal stimuli. There is a general fondness for this form of indulgence, both externally and internally. But the gratification sought is often purely nervous and morbid. While already comfortable, we seldom seek heat or warmth from principle or necessity, but from sheer laziness,—unwillingness to take the proper and healthful course for procuring it.

1885. Hence the almost universal inclination to increase our heat, both internally and externally, beyond what is needful; while every unnecessary degree of heat as certainly increases

our debility and our general sensibility to cold, as the use of alcohol or tobacco. And, as civilization and refinement go on, and human employments become more and more minutely divided, this tendency becomes more and more inevitable.

1886. We have heard of the serpent, how, by his charm-power, he makes his prey fly round and round him, while every circling movement diminishes power to resist the syren influence. So with warmth, especially external warmth. It seduces us to approach, when such approach is not needful; and the increased warmth makes us desire it still more; till, at length, we lose the power of resistance entirely, or perhaps sink into slow disease and lingering death.

1887. How mankind are to be set right in this matter it is not easy to conjecture; at least, till the reign of Selfishness shall be succeeded by that of Benevolence. In some parts of Europe each family employed in the factory is furnished with a cottage and a little land, and is required to cultivate the soil several hours of each day. This, in one important particular, is an approach to what is greatly desired by every intelligent friend of hygiene and of Christianity.

Questions. — Do we generally use too much clothing, both by night and day? Do some use twice too much? What is said of infants, and those who worship fashion? What daily and hourly increases our delicacy and sensitiveness? What diseases are with us engendering? What anecdote is related of a literary gentleman? Was not this an extreme case? What general inference may be made from it? Why is it that, the more clothing we wear, the more sensible to cold we become? Why are the weak more susceptible in this particular than the strong? What illustration is here borrowed from the business world? What does Solomon say? How is his remark applicable here?

Is it sufficient for us to know the truth in order to do it? What is one difficulty in the way of making changes in our habits generally? How does the state of society become a source of difficulty in this particular? Are we, then, to wonder, when we find our farmers and mechanics and manufacturers suffering from colds, fevers, and consumption? What anecdote is related of a blacksmith? What were some of the probable effects of his error? What fact is given from the author's own experience? What may we all learn from it?

Is external heat a stimulus? Is extra heat, whether applied externally or internally, an extra stimulus? Does it come under the law of extra stimuli in general, as to its effects? What is that law? Has heat or warmth a charm-power, like the serpent? Does it, in the end, bite like the serpent? What alone will probably set us right in this matter? What is beginning to be done in Europe? Is it worthy of general imitation?

SECTION XI. — MISTAKES ABOUT HARDENING OURSELVES.

1888. It has been said of the savages about Nootka Sound, that they plunge their newly-born children, at all seasons, into cold water, with a view to harden them; but that, though a few of them are made stronger by it, the far greater part, not being tough enough to resist the depressing tendencies of the practice, are destroyed.

1889. But this error is not confined to the northwestern coast of America, nor to savages. Some parents, both of the old world and new, are about as unwise in this particular as the more ignorant of the savages. Thousands of children are every year victims of their folly.

1890. The truth is, as Bacon well intimated, a little knowledge is a dangerous thing. Many have the good sense to know that we are gradually debilitating ourselves and our families by our erroneous practices; and, in their half knowledge, they rush to the opposite extreme. To avoid Scylla, they encounter Charybdis.

1891. Many imbibe the idea of hardening themselves by going cold. Thus, at the approach of winter, when the hands begin to look blue and the fingers to be benumbed, they refuse to put on mittens; "because," say they, "if we do, we shall want two pairs by January."

1892. Others refuse to put on their flannels when the blue, dark, and homely days of "bleak November" arrive, and for similar reasons. They wish to harden themselves. They know, from sad experience, they are growing tender; and, instead of encasing up so early, they are determined, this year, to wait a little while, and harden themselves.

1893. Some of those who fall into this error are not beyond the reach, it is hoped, of recall. They will yet listen to the voice of instruction. But there are a few self-styled and self-exalted persons, — new lights, it would seem, — whom you can no more reach than the poles. It is not with the hope of benefiting such that I write. My remarks are for those who know enough to know and feel their own ignorance.

1894. No error can be greater or more unfortunate than the belief that, if we wear one pair of mittens or socks in November, when we really need them to keep us warm, we shall need two pairs to keep us equally warm in December or January. Going habitually cold, I have often said, never hardens us, but always makes us tender. In fact, we can far better dispense with mittens or wrapper in January, provided we keep rea-

sonably warm till we become, as it were, well acclimated, than in November.

1895. So true is this remark, that certain medical gentlemen of celebrity have, as an experiment, taken off their flannel under-clothes in January or February, and gone without them the remainder of the winter; and, according to their report, they have never suffered the least inconvenience from it.

1896. If, at any time, proper air, exercise, food, drink, mental employment, etc., do not keep us from being chilly, we should add clothing, — taking care to use the least possible quantity which will subserve our purpose. I need not repeat that, though momentary chills and heats do not necessarily harm us, no one is benefited by the long application of either cold or heat, *though* a few facts may serve to confirm the general doctrine.

1897. A certain distinguished physician of Boston began his medical career in the interior of the State, where the population was sparse, and where he had occasion for riding a long distance. One cold night, after visiting a patient, he became lost in the woods, and did not find his way out till morning. He was nearly frozen; and, from that day to this, — now twenty years, — he has been obliged, in order to be comfortable, to wear about twice as much clothing as before.

1898. Long before the days of railroads, I had occasion to travel one night from Boston toward Hartford. It was the last of November, and extremely cold. I was the only passenger; the coach was nearly a wreck, and I reached Worcester almost frozen. Here I purchased a buffalo skin, and went on the rest of the journey quite comfortably. However, I was permanently injured. For a year or two my susceptibility to cold was unusual; but I finally recovered my usual hardihood.

1899. My counsel, in such cases, for the last twenty-five years, has been the following: If you would harden yourself against the cold, keep cool during summer; if you would harden yourself against heat, keep warm in the winter. It is not a time to talk so zealously about hardening ourselves in the very teeth of late autumn and early winter, nor when the great heats are staring us full in the face.

1900. When the cholera came, in 1832, I was asked very anxiously by many of the people of Boston, where I then resided, what ought to be done to prevent the disease. My reply was: "You should have asked me this question two years ago; or even at the beginning of life. At this moment, while you

are debilitated by apprehension, sudden changes are by no means desirable."

1901. The same remark, in its essential features, is applicable to the case before us. We should begin life and continue it in obedience to all the known laws of God, — the physical, no less than the intellectual and the moral. We should then suffer very little, if any, during the process of acclimation, even in this severe and almost barbarous climate.

1902. When I say that we must keep cool during the hot season, if we would be warm during the cold weather, I am often met by the inquiry, But how can this be done? Some clothing we must wear to cover us; and most of us are obliged to encounter the great heat, more or less. It is but a small proportion of our population that is able to stay within doors.

1903. Yet there is a wide difference, in the first place, between wearing the same clothing the year round (1858), and wearing very thin clothing — as thin as possible — in the summer. Then, in the second place, it is not true, though generally supposed to be so, that they who are out of doors in the summer suffer most from the great heat; at least, it is not wholly true. The reverse is nearer the truth.

1904. That it is hotter in the sun than it is in the house, at least generally, I do not deny; but they who are much out of doors get used to it. There they breathe a purer air, which is a most essential aid. And then, above all, they perspire more freely; and every one knows that a constant evaporation from the surface of the body does a great deal toward keeping one cool.

1905. Hence, it might almost be laid down as a universal rule, that females and the sedentary of our own sex — students, writers, mechanics, merchants, etc. — suffer much more from heat in summer, as well as from cold in winter, than they who, like farmers, laborers, and stage-drivers, are nearly all the while exposed. The latter are by the former often pitied, but their pity might be spared.

1906. Although it is impossible not to feel the heat more or less during summer, yet, if we will but dress properly, and obey correctly all the physical and moral laws, and live chiefly — both sexes of us — out of doors, we shall not only enjoy ourselves better than we now do, but be much better prepared to endure the cold of the following winter.

1907. It is also asked, What will you do with infants? for they cannot take care of and judge for themselves. Of course,

we must judge for them. At birth, they feel the heat more intensely than we; and so they do the cold. This is because they have a feeble circulation at first, and of course a feeble vitality. They require great care, till they can be in the open air like ourselves.

1908. It is a most sad mistake of ignorance that leads a few parents, in this day of reform, to suppose that if little children never use much clothing, they will never need it; and, consequently, to dress them very thinly in the winter, no less than in the summer. This will not harden. When they can run abroad and face a good northwest wind, they may be clad more thinly.

SECTION XII. — CLEANLINESS OF CLOTHING.

1909. One thing, in human life, is paradoxical. The vast majority of travellers are far more solicitous about their food and drink, as they pass along, than their rooms and beds. And yet they spend nearly ten times as many hours in sleep as they do in mere eating. Is it that they think it of little comparative consequence what they take into their lungs twenty times a minute, or six hundred times an hour? Or is it that they do not think at all on the subject?

1910. In the first place, unless you take the precaution to see to the matter yourself, you will often be turned off with a most miserable bed, — one that, if everything about it were cleanly, would be hardly fit for the domestic animals! It will be rather an apology for a bed than the reality.

1911. But, secondly, though it may have been a good bed at first, it has not been thoroughly shaken up or aired, perhaps, for a whole week. Then you sleep, it may be, across more or fewer hills and valleys, in miniature; or else, deeply engulfed

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QUESTIONS. — What mistake is made by the Nootka Indians? Do none but the savages fall into mistakes about hardening? What is said of the dangers of a little knowledge? Can we harden ourselves by going cold? What frequent mistake is made in autumn? Would it be safer to go with scanty clothing in January than in November? Relate the anecdotes which are given in illustration of the subject. What is the author's general counsel on this subject of hardening? What is said of preventing cholera? Is the remark applicable to this subject? Should we dress as thinly as possible in the summer? Which suffer most from the heat, those who work in the sun or those who work within doors? Do females generally suffer as much from extreme cold and heat as males? Is it desirable that we should live more and even work more out of doors? What mistake is often made about young infants? When should we begin to harden them by attention to clothing?

in one central cavity, from which some half a dozen or a dozen have already been glad to escape.

1912. Or, thirdly, perhaps it was made up, as soon as the last occupant had left it, without anything more than a momentary airing, and with the clothing as unfit for use as if no washing had been done in the house in a whole month. I have seen sheets, intended for use, as foul almost as the furniture and other fixtures.

1913. The mystery — the paradox (1909) — is this: how it is that people who claim to be decent at home, and who have the credit of being so, appear to care little or nothing about the condition of their beds and rooms for sleeping, — on which so much of health, and even of comfort, depend, — while half their conversation and thoughts seem taken up with the inquiry, what they are to eat and drink.

1914. Our wearing apparel and our bed-clothing must have attention, or we deserve not to be entrusted with the body which they cover. Who does not know how rapidly they become loaded with foul air and emanations; and how well they retain both? Most certainly, he who does not, has never removed his garments, after wearing them a day or so unchanged; or entered a bedroom in the morning, from which the occupants have just escaped, even though they were patterns of excellence for personal attention and care; or, finally, is destitute of the sense of smell.

1915. I know it is toilsome to give a due regard to this matter. It will — it must — take up a considerable share of human life. But has not Jeremy Taylor said that "Cleanliness is next to godliness?" We must pay taxes, would we enjoy a free gift, — the use of a patrimony at the hands of the great Owner of these earthly estates; nor are the taxes heavy. God is not a hard master.

1916. It is indeed a pity that so much labor should devolve on woman. But, while the strict laws of hygiene require that she shall wash more than she now does, if we would not require her to cook half as much, nor to spend half as much time as she now does on sundry other things which might be mentioned, she would be better and happier, and so would the world at large, with three-fourths of the labor she now expends on what is called house-keeping; even if the toil of washing were doubled.

1917. Then, there is hope of relief, even here. First, from her associate. To man it belongs — and always did — to do

this kind of work; and I have known a few who did it, either from principle or necessity. Secondly, we may, as I think, look out for some speedy invention, which, without injury to the texture of the fabrics we use, will clean them effectually, at one-half, or even one-fourth, the present amount of labor.

1918. There have already been pretended discoveries, in this line; but they do not as yet amount to much. I see no reason why woman should not set her powers of invention at work in this direction. Has she no capabilities of invention, even of that which is to benefit herself? Or has she never yet been properly educated?

SECTION XIII. — CHANGING OUR CLOTHING FREQUENTLY.

1919. One of most healthy men I ever knew, made it a point to change his clothing so as to meet every considerable change of weather. It made little difference, with him, about the time of the day, or of the year; if his present comfort, real or imaginary, demanded a change, and if at liberty to do so, he would always be sure to make it.

1920. I have known him, for example, to rise in the morning, feeling languid and cold. Perhaps he had slept badly, or went to bed late. In this condition, he dressed himself warmly. But, on going out of doors, he would find the weather mild and spring-like, and on going into the house would put on lighter clothing. Two hours afterward, a chilly east wind would come up, and he would put on a thick coat. And then, perhaps, at two o'clock in the afternoon, his thinnest dress would be in requisition.

1921. Now, every person is not so situated as to be able to spare the time for all these changes. Nevertheless, every one can come *as near it as he can.* It is, in its general features, the only method of hardening one's self in a proper manner; or, in other words, of becoming properly acclimated. He who expects to enjoy the best of health must learn to adapt himself,

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QUESTIONS. — Is there, in the world, at least one paradox? What is it? Is man, at the best, an uncleanly animal? What obvious and every-day evidences have we of this? Must we pay taxes if we would have property? Is it natural in this view to sympathize with woman, — already a slave to household labor? Does she not enslave herself voluntarily, — at least, in a small degree? Might she not cook much less? Might not our sex do the washing? Might not something be invented to save labor in this department? Why should not woman invent something herself? Is there not reason to hope that she, or her associate, will yet bring tc pass something for her relief?

in no stinted degree, to the ever-varying changes of an ever-varying, not to say treacherous, climate.

1922. In some parts of the United States, particularly the eastern coasts of New England, the actual changes during many months of the year are fully as great as are indicated in the remarks and statements of a preceding section. I have witnessed all, and more than all, which is there implied. I have witnessed changes almost as frequent and great in Northern Ohio, and even in Virginia.

1923. Thus, in Virginia, I have heard frogs peeping in the morning of a clear forenoon of February, while the afternoon was overcast with thick and dark clouds, and the weather was as cold as December. Now, the clothing of the forenoon of such a day would not be at all adapted to the afternoon; and one's own genuine feelings would tell him so. So that I have generally regarded it as a safe rule to be governed, in no small degree, by our own feelings.

1924. I do not mean by this, however, that our feelings are the ultimate standard of action, from which there can be no appeal. I mean, rather, that the feelings are never to be wholly neglected or violated. It is with these somewhat as it is with the consciousness of right and wrong in moral matters. We must never cease to make our appeals to conscience. Still, the *ultimate* appeal should be to a higher standard,—for the light of revelation may correct and elevate even our conscience; just as the light of hygiene and physiology may convict our consciences of what is right in regard to temperature.

1925. There are always to be found cases where our feelings cannot govern, at least, without counsel. Thus, suppose a laborer rises on a charming May morning, and dresses himself accordingly; but is, ere long, overtaken by unexpected cold. He is, however, actively engaged; and, though aware of the change, he does not feel it, but works on. Presently, however, he has occasion to remit his labor for a time. He does not feel the cold at all, because his circulation and respiration and calorific powers are excited, and all the tendencies of his physical nature are onward. Shall he obey, implicitly, his feelings, and continue in the same dress, or shall he forestall evil by making provision against it?

1926. Another illustration of the point in consideration, is this. We are apt to be more or less feverish toward evening. So strong in this febrile tendency, in some individuals, that with very moderate exercise they will be quite warm enough,

at this hour, and will be disinclined to those changes which reason and hygiene would direct. Is feeling — mere feeling — in such a case, to be made the standard of appeal; or is there a higher law to which the perverted feeling should itself be amenable?

1927. That there are difficulties in the way of doing what we know to be right, I have admitted (1877). In the varied conditions of human life, and especially with the present minute division of human labor, few can carry about with them a whole wardrobe. Still, it is true that most men, even the field laborer or the teacher, might have with them an overcoat, or the females a shawl.

1928. And, during the great heats of summer, the ordinary or outside garment might be removed for a time. In a medium condition of temperature it might be replaced. In a case of greater necessity, — a sudden reduction of temperature, or an east wind, — the overcoat, the cloak, or the shawl might be used.

1929. A frequent change of clothing has other advantages, besides being one of the appointed means of regulating our temperature. It contributes, in one word, to cleanliness, and helps the skin to keep up its work, and all parts of the body to perform their offices. Cleanly and well aired garments also regulate the temperature better — much better — than soiled ones.

1930. Changes of our day clothing for a night dress are also desirable. Half a century ago, many had never heard of an entire change of clothing for the night. At present, such a dress or suit is no uncommon thing, in enlightened society; and should not be uncommon anywhere. Let our day dress, when removed, be hung up, piece by piece, and let our night garment, in like manner, be hung up, and well ventilated during the day.

1931. There is even much philosophy — not to say a little physiology — in having separate dresses for various other purposes. Thus, we may have morning dresses, Sunday dresses, etc. Only I would, from moral considerations, be careful not to exalt one of these dresses to patrician rank, while another is compelled to sink to the low level of plebeianism. Republicanism, so fashionable — at least in name — everywhere else, must not be interdicted in the brotherhood we are now considering.

1932. It may be said that the carrying of these views into

practical life would involve too much expense. It is more than many can do, in their poverty, it will be said, to procure a single suit often enough to keep up with the requirements of the fashions. Yet these same people submit to the expense, in time and money, of being sick; and of paying long physicians' bills! Nor are they too poor to buy silk and broadcloths. Now, which is the cheaper course in the end, that which secures the rarer but costly suit, with worse health to boot, or that which secures less costly suits, in greater variety, with better health?

1933. A second and more specious objection is, that it seems like a waste of precious time. Is it, then, no waste of time to be compelled to hours and days of lassitude, and nervousness, and irritability, and headache, and sore throat? Is an aggregate of one or two years of lost time, from ill health, to each average individual, less formidable in the eye of the "Christian economist" than a part of the same aggregate, spent, not at the toilet, but in keeping clean and healthful?

1934. There is one more objection. A variety of dresses, it is said, will increase the labor of washing. But I doubt whether this objection is valid. Clothing does not usually become so impervious, as it were, to water, when there are a variety of dresses, each of which is only worn occasionally, as when a smaller number, or a single one, is worn continually. But I have discussed this point already (1916).

1935. A word may be necessary concerning the feet. Not a few of our females suffer, most fearfully, by a certain change of dress which is as objectionable as these I have been advocating are commendable. After having spent the day—perhaps the week—in their own warm, dry, and highly heated rooms, with good substantial shoes and warm socks on, they go out to a party, or on a sleigh ride, in shoes and stockings so flimsy as to be of little service as a protection.

1936. In the beginning of the year 1852, when the mercury was down to 18° below zero, some forty or fifty young gentlemen and ladies went from Elyria to Cleveland, in Ohio, for a sleigh ride. They meant to go safely; but, after all, many of the females suffered severely. They returned the next day,—a part of them, however, with colds. From the effects of these colds several of them have not yet recovered.

1937. Our transatlantic friends, especially some of those who are of the higher ranks, are said to be more careful in this matter than their sisters and daughters of this country.

They wear thick, stout, and comparatively coarse shoes, when they go out; and good, firm, woollen socks. They do not appear to inquire so anxiously as we, how their articles of dress will look, but rather what is right.

1938. And they find their account in it. For, though consumption is nearly as frequent and as fatal in Great Britain as it is with us, and is not wholly unknown on the continent, it does not make such havoc with the higher classes of society as it does in the United States. Let us not be ashamed to imitate what Hygeine bids us observe, and what our own good sense should dictate; but follow the indications of both.

SECTION XIV. — DAMP CLOTHING.

1939. We hear the continual injunction: Beware of damp clothing. But why this caution? In a warm and sultry day in July, why should not damp clothing be as healthy as it is agreeable? And if our under-clothing is perfectly dry, why should a wet overcoat be at all injurious? Or, if all else be dry but gloves and stockings, why should dampness in these be of doubtful or injurious tendency?

1940. That evaporation produces cold, whenever and wherever it takes place, is well known. It does so by reducing free caloric to a latent condition, and by doing it very suddenly. Now, the ordinary evaporation of this fluid of perspiration, during summer, and indeed at almost all seasons, has much influence in keeping the skin cool. But, when damp air comes in contact with the skin, it applies to it so closely as to take away the caloric still more rapidly, which induces a sensation of chilliness.

1941. It makes very little difference whether the dampness

QUESTIONS. — What is said of changing the clothing, many times a day, to meet the varying circumstances of climate and weather? Can every one do this? Is our own climate an exceedingly difficult one to live in? Is Virginia any better? Must we not attend to our feelings as well as we can? Is there a higher law than feeling? What is it? How is it to be known? What are a few of the cases where feeling alone cannot tell us what to do? What can nearly everybody do, if they will?

What is said of the importance of a special night dress? What particular directions are given respecting its use? What is thought of separate dresses for other purposes? What objections are made to these views? What is said of going out in thin shoes? Relate the anecdote of the sleigh-ride near Cleveland. Are our British friends, in this respect, wiser than we? Is it our duty to learn from them, and to go and do likewise?

is on our inner or our outer clothing. If there is evaporation, it removes the free caloric in the neighborhood of our skins, if not on the surface; and this, so far as the caloric is concerned, leaves a kind of vacuum, which, you know, nature abhors. It is the sudden abstraction of heat from the surface, under such circumstances as these, that does the mischief.

1942. We must not sit in damp clothing, as we are very justly told. The reason is, that, while the caloric is being abstracted by evaporation, we are thus adding nothing to make up for our loss. Whereas, if, instead of sitting still, we use brisk or even moderate and persevering exercise, heat is generated and evolved; and the danger is either wholly or partly removed. This danger is greater or less, according to the hour of the day, and the particular condition of the system.

1943. At the middle of the forenoon, the loss of caloric near the surface of the body will produce less of chilliness than if it were at evening. Then the loss will be greater, and the effects more injurious, if the body is debilitated; whether it be by over-exercise or disease. The young or middle-aged will resist the depressing tendencies of the dampness better than the infant or the octogenarian.

1944. Damp feet and hands should be avoided, both because they are more remote than any other parts from the centre of circulation, and because there is a particular but well-known sympathy between the ankles and wrists and the cerebral and nervous systems. Nevertheless, many a strong and healthy individual, in the prime of life, may go with damp feet for a time, in the early part of the day, and yet not suffer immediately.

1945. Locke, the philosopher, would put "an end to the controversy," by accustoming the young to shoes with holes in them (1729). But this timely suggestion has not received that attention which the author of an "Essay on the Human Understanding" might have expected. It is claimed, I know, that the children of the poor, particularly in the country, who go nearly half the time with wet or cold feet, are the healthiest. But has any one been so discriminating in this matter as to be able to tell whether they are healthier on account of their habits in this respect, or in spite of them?

1946. Damp bed-clothing, particularly damp sheets, seem to be the most injurious of all. My own manner of life has led me into contact, more than most men, with this source of evil, and I have oftener been a sufferer from this cause than from

any of the other forms in which dampness is so generally applied. Why is this?

1947. There is at least one strong and obvious reason. It has been seen (1792) that we are cooler, at the same external temperature, while we sleep than while we are awake. Consequently the abstraction of caloric during the evaporation of the moisture, in the bed-clothing, would be likely, in the same proportion, to reduce the temperature of the surface so low as to invite disease, when it ought to repel it. Hence, no doubt, many of our colds, as well as a share of our consumptions.

SECTION XV. —WRAPPING UP THE FACE AND NECK.

1948. What custom is more prevalent among us than that of wrapping up the neck, and even the face, when we go out in very cold weather? And yet it is not easy to say how this custom originated; nor to speak of it in terms of sufficient severity. For if, among the erroneous customs of modern times, any can be found more diametrically opposed to the plain laws of Physiology and Hygeine, I am not yet made acquainted with them.

1949. These remarks more particularly apply to the custom of tying something about the nose and face. We thus embarrass, not to say obstruct, the movements of the organs of two or three of the more important of the senses. With a large amount of flannel or fur about the neck and face, so as barely to leave the eyes uncovered, who can hear or smell?

1950. There may, indeed, be found a few children, of larger or smaller growth, to whom, as regards their digestive powers, it might be advantageous to have their instruments of taste fettered for a considerable portion of each twenty-four hours. But it should be remembered that I am not just now inveighing against the custom of eating between our meals.

1951. The strongest objection to covering the nose and face

QUESTIONS. — What physiological reasons can be given for the common direction to avoid damp clothing? Does it make much difference whether the dampness is external or internal? Why is it specially wrong to sit in damp clothing? What circumstances may diminish or increase the danger? What is said of dampness, applied to the hands and feet? What has Mr. Locke said? Has his advice been much followed? What is said of children in the country who have been habituated to wet and cold feet? Are we to avoid damp sheets with particular solicitude? For what reason?

when we go out, is, that it defeats the very purpose it is designed to secure. In thus bundling our persons, as a defence against the cold, by bandages of any sort which obstruct our breathing, we only render ourselves the colder in the end. The effects, to the superficial observer, are deceptive.

1952. That there are individuals, with diseased lungs, to whom the *respirator*, or perhaps even the common comfortable or muffler, is at times more needful than pure air, and to whom a little warmth of the cold air, before it is allowed to enter the lungs, may be more important than purity of this fluid, is doubtless true. But I am writing for those who are supposed to be healthy, and under the impression that prevention, as far as it can be applied, is better than cure.

1953. We have clearly seen (1366) that, the lower the temperature of the air, provided it does not give us actual pain or make us shiver, the better is it for the lungs, because we thus bring more oxygen to their almost innumerable cavities and cells to operate upon the chyle and blood. We have also seen that the denser the air is, by reason of cold, and the more freely it passes into and from the lungs, the warmer we are. Why, then, should we take all the pains we can, when we go out, to render ourselves uncomfortable?

1954. There can be little doubt that they who muffle the face the least are the most comfortable, as regards temperature, and, other things being equal, and taking one year with another, the most free from colds. They who are so very cautious about inhaling a breath of air below zero, are the very individuals to suffer from colds, throat complaints, ear-ache, weak or inflamed eyes, rheumatisms, lung complaints, and especially pulmonary consumption. In spite of all their cautions, they will now and then be exposed; and, when they are so, they are pretty sure to suffer.

1955. After long speaking, during a winter evening, especially when the weather is very cold, and we are about to go out into the open air, it may be well enough to turn up the collar of our outer garment. Wrapping the neck loosely is somewhat different from wrapping the nose and mouth; though even this, unless we are going to be out in a wagon or sleigh, is seldom demanded. Walking or running is preferable.

1956. The custom of wearing the beard long, has, within a few years, been gaining ground among us; and has had at least one good effect. In the belief that it is a protection against

colds, bronchitis, and pulmonary affections, the muffler has often been omitted; and, on the whole, it would seem that fewer colds and sore throats have existed. Such, at least, is the testimony of those who suppose they have been benefited.

1957. It is, however, quite doubtful, to say the least of it, whether the favorable change is attributable to the beard so much as to our faith in it, and to the disuse of comfortables and other mufflers. It is certainly better to go with the neck bare, as is done in one-half or two-thirds of the world, than to clothe the neck and face and chest too warmly. Were the occasional muffler or comfortable useful, the habitual one would not be.

1958. Having been exposed for two or three months of a cold autumn and winter, some ten or twelve years ago, to the dense atmosphere of the interior of Maine, without muffler or comfortable, I became suddenly prostrated, as if exhausted by excess of oxygen. As soon as I was able, I proceeded to Sandwich on Cape Cod, where I was persuaded to use a comfortable. Though the air was moister and milder, yet it was very changeable.

1959. A comfortable was accordingly procured, and put on, and worn. But, alas for the uncertainty of all human things! the wind, in a couple of hours, blew away my protection, — so at least I supposed, for I have never seen it since. It was the first and last article of the kind I have ever used; and, in my more advanced years, I shall not be likely hereafter to resort to it.

1960. My custom is, to wear as little clothing as I can, in cold weather, and yet not be permanently chilly. When I go out, fully sure of being able to walk or exercise in some way all the while I am exposed, I want no additional clothing in the severest weather; but, to meet all possibly recurring dangers, I usually take an overcoat.

QUESTIONS. — Is the custom of wrapping up the face and mouth, when we go out, objectionable? Why so? Which is the strongest objection of all? May not certain diseased persons be exceptions to the general rule? Is it not, almost always better to breathe the pure and cold air? Do they who wrap up so carefully have more or fewer colds and other diseases on account of it? What may be needful, after long speaking? What is said of wearing the beard long? Relate the anecdote of the author's experience. What are his present habits? What does he say in particular about redeeming the time?

CHAPTER IX.—THE BRAIN AND NERVES.

SECTION I.—GENERAL ACCOUNT OF THE NERVOUS SYSTEM.

1961. THE Nervous System, in man, is naturally divisible into five parts. 1. The BRAIN. 2. The branches or NERVES of the Brain. 3. The SPINAL CORD, or marrow. 4. The branches or NERVES of the Spinal Cord. 5. The great SYMPATHETIC nerve. But these, too, most of them, have their subdivisions.

1962. The BRAIN is divided by a membrane into two halves or hemispheres; which exactly correspond with each other, and are connected at the base. Then it is also divided into the *cerebrum*, or larger brain, lying above and filling almost the whole cranium; and the *cerebellum*, or little brain, lying behind and below. At the bottom of the cerebrum is a mass of substance called the *medulla oblongata*.

1963. The SPINAL CORD is a projection or extension of the brain along a hollow in the backbone. Its substance is very much like that of the brain itself; and, like the latter, too, it is covered over with a strong and tough membrane. The NERVES are properly branches of the brain and spinal cord. Nine pairs of these proceed from the brain within the cranium, and thirty from the spine.

1964. The GREAT SYMPATHETIC NERVE has connected with it a great number of *ganglions* or *knots;* or, as some have called them, *little brains*. It lies along near the spine in the back part of the abdomen. Sometimes it has been regarded as an independent portion of the nervous system; yet it is not wholly disconnected from the other parts or portions.

1965. The nerves that proceed from the spine are of two kinds. One carries out the vital or nervous energy, as it is called, which the brain manufactures, to the locomotive powers, everywhere; the other kind communicates intelligence to the brain. The former are called nerves of motion; the latter, nerves of sensation.

1966. The brain is inclosed in the skull; the spinal cord, as we have seen, in the spine; and the sympathetic nerve and its

ganglions, in the trunk and neck. The nerves, both of the brain and the spine, are extensively and minutely distributed to all parts of the body. They are white. They divide and subdivide, like the branches of a tree, till they become so small as to be seen only by the microscope, and are lost in the substance of the body.

SECTION II. — USE OF THE BRAIN AND NERVES.

1967. The brain is, in some way not wholly understood, the organ or instrument of the mind. In view of its wonderful structure and properties, some have regarded it as almost mind itself; but we have quite too many proofs on hand to admit of a doubt that, though the mind acts through the medium of the brain, it has of itself an independent, and, to some extent, a separate existence.

1968. But the brain is the seat or centre, as it were, of the mind. I do not say, positively, that there is not mind or intellect wherever there are nerves; but we do not seem to have any proof of it. In any case, there is mind or intellect at this great centre, — the brain. Or, if we regard the nervous system, generally, as an intelligent province, here is its capital.

1969. In general, too, the brain has been considered as the seat of the passions and moral feelings; though some have regarded these last as more particularly and directly connected with, or dependent upon, the great sympathetic. Consciousness, by most, is also supposed to have its centre in the brain and nervous system.

1970. The brain, though a soft mass, is yet in three lobes or portions, on each side. They are called the anterior, middle, and posterior lobes. Cuvier and many of the physiologists regard the anterior lobe as the seat of the intellectual faculties, — thinking, memory, will, etc. The animal propensities are generally assigned to the cerebellum, or little brain, or to that of the great sympathetic.

1971. Then, once more, the brain is believed to be the chief source of what we call vitality or vital energy, or sometimes nervous energy. This nervous energy is a commodity

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QUESTIONS. — Of how many grand divisions or parts does the nervous system in general consist? Are most of these subdivided? What are the subdivisions of the brain called? What subdivision of the nerves? What division is sometimes made of the great sympathetic nerve? Where is the brain situated? How many branches has it? How many has the spinal cord? How are the latter distributed?

in very large demand in the system. Even if the ganglions connected with the sympathetic nerve should be found to have something to do in this work, it would still devolve on the brain to take the lead.

1972. There is, I grant, a great variety of opinion about the uses or offices of the brain; but it has been my aim, in the foregoing paragraphs, to mention only those things concerning which nearly all are agreed, leaving the doubtful points to other writers, and to more extensive students and readers.

SECTION III. — RELATIONS OF THE BRAIN.

1973. The brain is, in the first place, an overseer or supervisor of the whole system. Nothing can go on without its consent, as it were, or hardly without its aid. Or, to use a nautical phrase, it is the great helmsman of the vessel. It is, as Dr. Jarvis has well said, the "presiding genius over all the powers and actions of life."

1974. And why should it not be so? It has a hold upon all its parts. So minutely does it ramify or divide everywhere, by means of its own nine pairs of special nerves, and the spinal cord and its thirty pairs of more general ones, aided by the great sympathetic system, that it has a channel of communication, through which, quick as lightning, it can reach and control the smallest and remotest atom or fibre of the whole.

1975. Dr. Jarvis has made another comparison still more striking than the former. The brain is, as it were, a string of bells belonging to the rooms in a hotel; and the nerves are the wires that connect with them. When the occupant of a room, say No. 50, wants anything, he pulls his wire; and the servant, who watches the bell, knows to which room it belongs, and attends to the wants of the occupant. He knows, in the case above, that it belongs to No. 50, and to no other.

1976. I have said that the brain, by means of its nerves, —

QUESTIONS. — Of what part of man is the brain the organ? Is mind the result, or child, so to speak, of matter, or has it a separate, independent existence? Of what is the brain the seat? Is mind to be found anywhere else except in the brain? What do some think of the passions and moral feelings? What of consciousness? What is meant by the lobes of the brain? How many are there? With which of these have the intellectual faculties generally been supposed to be connected? To which of the great divisions of the nervous system have the propensities usually been referred? Is the brain the great manufacturer of what we call vital or nervous energy? Is this a commodity in large demand in the journey of human life?

the wires,—has a communication with all parts of the human body. Could all the rest of the system but the brain and nerves be destroyed, and these remain in perfection, they would be an almost solid mass of human size and shape, except the very features. You cannot touch a part of the system as large as a pin's head, unless it should be the most solid bones, ligaments, or cartilages, without hitting one or more of the branches of the brain or the spinal marrow.

1977. Is it strange, then, that the brain should be a kind of presiding genius? Is it strange, if it should be seen that it has intimate relations with every part of this wondrous frame? Such relations it has, most unquestionably; as has again and again been demonstrated. I will advert briefly to some of them; though future sections will explain the matter more fully.

1978. There is a relation, most intimate, between the brain and the stomach. If the latter could be separated from the former without deranging the other parts, still, the separation would be a most fatal one to everything like digestion. We might eat food ever so nutritive, yet we could never be nourished by it. No healthy chyme, or chyle, or blood, could be manufactured.

1979. There is a most intimate relation between the brain and the lungs. The air received into these important organs may be ever so pure and ever so abundant, and yet, without that energy which it belongs to the "presiding genius" to impart, it could be little better for the system than so much smoke or choke-damp. The lungs are as dependent on the cerebral centre for a due quantum of nervous energy as the stomach.

1980. The heart could not beat, nor the blood circulate five minutes, if it were isolated from all cerebral influence. Strong as the heart, seems to be,—so strong as to impel the blood with a force that has sometimes been estimated as high as many hundred pounds,—it would grow weak and become palsied, without a constant stream, so to call it, of nervous energy sent down to it.

1981. Nor would the muscular or bony system fare better. The great doctrine, already in substance often quoted, that, if one member of the human system suffer, all the members suffer with it, and if one member rejoices, all the members rejoice with it, is applicable here in its fullest and strongest terms. And so of all the organism and functions of the body. The

brain has a relation, more or less intimate, with every living particle.

SECT. IV. — THE BRAIN AND NERVOUS SYSTEM MUST HAVE EXERCISE.

1982. "The brain," says Dr. Andrew Combe, "being an organized part, is subject, so far as regards its exercise, to precisely the same laws as the other organs of the body. If it be doomed to inactivity, its functions languish, and its health decays. If it be duly exercised, after regular intervals of repose, its functions acquire readiness and strength. And lastly, if it be overtasked, either in the force or duration of its activity, its functions become impaired, and irritability and disease take the place of health and vigor."

1983. But what Dr. Combe says of the brain, in general, meaning, as I suppose he does, the whole nervous system, is equally true of every part of that system. The cerebellum, or little brain, needs exercise, as well as the cerebrum, or larger, upper portion. The spinal marrow, too, comes under the same law, and so do the nerves; not only those of motion, but those of sensation.

1984. It will not answer the purpose to throw all the exercise on any one part or portion of this extended and influential system, to the neglect of all or any of the others. The cerebrum cannot, with entire safety, as regards the health, perform the work which Nature has assigned to the cerebellum, or the great sympathetic nerve. All the parts have their own work assigned them, and they should not be excused from its performance.

1985. If it be true — of which as I suppose there can be little doubt — that the cerebrum, or upper brain, is the seat of the intellectual faculties, then it can never be in accordance with the laws of health in this great nervous system to sit still, and use the cerebral portion exclusively, and neglect to make any use of the spinal marrow. Yet how many there are, who,

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QUESTIONS. — What is the first or general office of the brain? What does Dr. Jarvis call it? Does its supervision extend to every fibre of the system? What very striking comparison has been sometimes made to show what offices the brain performs? Are the nerves divided and subdivided, almost to infinitude? Can you insert the point of the finest needle into any part of the body, without hitting one or more of them? Is it strange that the brain should have numerous relations? What is said of the connection between the presiding genius of the system and the stomach? What between it and the lungs? What between it and the heart? Is there a relation between it and the locomotive system?

either at their employments or their studies, — or perchance in their indolence, — leave the spinal cord almost without action of any kind, day after day, if not year after year.

1986. And then, as we have seen, there are two kinds of offices assigned to the nerves. Now, if one of these offices is duly performed and the other is neglected, must not the whole system suffer? Yet how frequent is this abuse. How many neglect to use the nerves of communication almost altogether, while the nerves of sensation or reception are as continually put in requisition.

1987. Again, too, either the cerebellum or the great sympathetic nerve is supposed — and I think justly — to be the seat of the affections, passions, and propensities. Now, if a person gives himself up, in an undue degree, to the appetites and passions, and scarcely calls into activity those parts of the great nervous system which are the seat of intellect, properly so called, what is to be expected but the dwarfing of that intellect, and the inordinate growth, by cultivation, of the lower propensities?

1988. The nerves of motion, finally, may be too much used, as well as too little. In this case, the whole mind would be dwarfed, even the cerebellum. It often happens, however, that, along with a good deal of muscular exercise, to call into activity the nerves of motion, there is also much feeding of the appetites and passions, — so that the muscular activity does not produce what would otherwise be its legitimate results.

1989. The great doctrine designed to be impressed in this section is, that the general rule, that action is Heaven's first law, is applicable to the brain and nervous system, as well as to all other parts and organs; that all its divisions and subdivisions must have a due proportion of exercise, or not only themselves must suffer in their individual offices, but the whole must suffer as a system.

SECTION V. — PREMATURE DEVELOPMENT.

1990. No error, connected with the subject of the present chapter, is more frequent, or pregnant with worse consequences,

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QUESTIONS. — Is the great nervous system subject to the same law, with regard to exercise, as the rest of the human organism? In order to have the whole system duly exercised, must all its parts or portions be exercised? Are all parts made, so to speak, to be working men? What illustrations of the principle are given?

than that of the premature excitement and development of the nervous system; particularly the brain and the nerves of sensation.

1991. Some twenty-five years ago, certain movements in the world of education brought infant schools into notice. The idea was then rather new in the United States. They speedily became a species of hobby. They were thought, by many a good man, to be the favored latter-day instrumentality. They would, it was believed, regenerate the world.

1992. In this state of the public mind, just awakened as it was from sleep, and directed to a new subject, it was not strange that the press should teem with accounts of precocious children, — precocious both as regards intellect and piety. It was not strange that the public eye should be better filled with its Nathan W. Dickermans, John Mooney Meads, and Charles L. Winslows, — victims, rather than examples, of early wisdom and excellence, — than with the plain, well-balanced child, who gave no evidence of anything but good health, and common sense, and strict conscientiousness.

1993. Nor is it strange that the fruits of this fair but forbidden tree should have awe-struck a whole nation; nor that the generation which came up, under such influences, should, twenty years afterward, be ready to surrender its whole direction and all its rights to those who, though they might never have been in infant schools themselves, were yet supposed to be intellectual prodigies.

1994. But that day of precocity — of hot-house mental and spiritual culture — of worshipping prematurity — is at length passing by; so, at least, we may reasonably hope. The world is coming to learn that, not only does all this precocity injure the brain and nervous system, but the whole man. A prodigy in literature, at twenty years of age, whether delivering his valedictory in a college hall, or already holding forth in the pulpit or at the bar, is seen to be a calamity and not a blessing.

1995. And yet, though passing by, as we may hope, the influences of the mania for precocity-worship are not yet quite past. There are still too many who make their children pass through the fire to please this Moloch. Multitudes are still hastened, by every possible excitement, in school and in family, to what is believed by many can "come a day too late" — the world's applause, especially its gold and golden pleasures.

1996. A few years since, a minister of the gospel, not yet twenty-three years of age, might have been seen and heard, in

the heart of New England, whose history would aptly illustrate our principles. He had graduated, at eighteen, with the highest honors of Yale college; he had studied theology till twenty; became duly licensed, settled in the ministry, and married at twenty-one; was committing well-written sermons to memory, and delivering them with the highest approbation, at twenty-two; and now, before twenty-three, was a confirmed dyspeptic, sinking to rise no more!

1997. But this is a miniature history, which, in all its essentials, though with ever-varying particulars, will apply to thousands now at different points and stations of the same precocious road. It will, in particular, apply to the conscientious, and, not unfrequently, to the philanthropic. Some of our very worthiest men in the United States are more or less of this description.

1998. They begin life with that scrofulous and nervous temperament, which, while it unfits them for strong muscular efforts, at the same time disposes them to read and perhaps to think; though in general they read too hastily to admit of much thinking, except in a very superficial manner.

1999. The parents, not aware that these very circumstances create a necessity, most imperious, for exercising the muscles, were it only for the sake of invigorating the already too active brain and nervous system, not only encourage their natural tendencies, but actually stimulate them by various forms of reward. They are at least put to learning, as the phrase is; and kept at it. At an early age they are fitted for college.

2000. At college they are prompted by emulation, and usually by conscientiousness. Their health, at first feeble, soon becomes still more so. Perhaps they contract the habit of smoking tobacco, to say nothing of other habits which draw largely upon the brain. They are through college at eighteen, and with flying colors; but their diseased tendencies have increased.

2001. But they must do something in the world, they think; and, since manual labor is generally deemed less reputable and even less useful than some other callings, they frequently fall into the ranks of the ministry, and perish under an attempt to fulfil the combined duties of preacher, pastor, and head of a family, before they are as old as our Saviour was when he began his ministry.

2002. There is ample time for educating a scrofulous boy, who is not born with a greater load of disease than usually

falls to the human lot, in such a manner as to give him a good physical constitution, no less than a good intellectual and moral one. In the best days of our race, when the young had the greatest degree of hardihood of constitution, the age of twenty-nine or thirty was quite early enough for entering on the responsibilities of life.

2003. At present, we are hurried on to a species of physical maturity that renders us less fit for the work of life at that age than formerly; and yet, we enter upon our work sooner and sooner in each successive generation, and with greater and greater responsibilities.

2004. An entire revolution in the public mind on this subject is demanded; or our race must soon fall into a condition which, though it may be a little short of absolute extinction, will be in some respects worse. A world peopled with ten times or a hundred times its present population, and yet a world of imbeciles, — who would not be ready to prefer the utter extinction of the race? Who would not prefer the new heaven and new earth, wherein dwelleth righteousness?

SECTION VI. — EXCESSIVE USE OF THE BRAIN.

2005. Excessive application of the mind, at any age, — even though it should not be begun in precocity, — is in the end deeply injurious, not only to the mental apparatus and faculties themselves, but, through its relations already mentioned (1973–1981), to every important organ of the system; and not unfrequently impairs the health for life.

2006. One of the most striking cases of suffering from excessive use of the mental apparatus, is that of Sir Humphrey Davy, when he was employed in making some of his great chemical discoveries. He frequently rose in the morning to pursue his studies before any other person in his establishment had risen, and was always and invariably a very early riser; and yet he "*commonly continued in his study till three or four*

QUESTIONS. — Is premature development of the brain and nervous system a great and growing evil? What gave a strong impulse to this, twenty years ago? Has the worship of mental prodigies entirely ceased? To what unhappy influences are multitudes, even now, subjected? What are strong evidences of this fact? Relate the anecdote I have given of a precocious minister. What mistaken course of education prevails? Might our scrofulous boys be so educated as to be useful? Is not thirty years of age quite young enough to enter upon the responsibilities of life? Is a great reform in this matter most imperatively demanded?

o'clock next morning." It is true that he spent a considerable time at dinner, where he was not always as temperate as he should have been; still, the great tax he imposed was on his brain.

2007. The result was such as might have been expected. He broke down under a severe fever, which, with the consequent debility, confined him to the house about three months. Davy, himself, ascribed his illness to contagion; but his physicians — two very eminent men — said there was no ground for this opinion, but that it "was evidently the effect of fatigue and an over-excited brain."

2008. Sir Walter Scott is another instance of the same kind. "In the prime of life, his literary labors were immense; and, as his constitution was naturally good, he bore the cerebral pressure for a time very well." But, because "sentence against an evil work is not executed speedily," and his circumstances compelled him to continue his severe labors into the very confines of age, he persisted till he became weak and irritable, and perished by the very brain which had so long been his friend and supporter.

2009. "The distinguished Dr. Boerhaave," says Combe, in his work on health and mental education, "after a long period of intense thinking, which sometimes encroached upon the hours of sleep, suffered for six weeks from excitement of the brain, bordering on madness, and characterized by that irritability and indifference to ordinary interests which so often appear as the harbingers of insanity."

2010. Sir Isaac Newton's case differs a little from either of the former, inasmuch as he was more temperate than Davy and Scott, especially when he was prosecuting his severer studies. Yet it is very well ascertained that even "his mind was for a time disordered by excessive application, and there is reason to believe that he never altogether recovered from the shock."

2011. Such facts as these might be multiplied, almost indefinitely; but I will only add the case of Weber, the musical composer. "He continued deeply engaged in his labors," says the historian, "long after his health was undermined; and, even when the hand of death pressed upon him, his avocations bore so heavily that he could not help exclaiming, 'Would that I were a tailor, for then I should have a Sunday's holiday!'"

2012. It is frequently thought that when great men, or any others, perish in somewhat advanced life, it is owing to the fact

that they *were* thus advanced, and could not endure what they might have endured in earlier life.

2013. Something of this may be true; but it is also to be remembered that there is such a thing as accumulated tendencies. It is as if the consequences of transgression against the organism were allowed to heap up for a time, till, like suppressed lava, they burst forth, scattering desolation everywhere around.

2014. Let not anything I have said be construed into a license to labor excessively, in advanced life, or in an enfeebled or fatigued condition. The brain should never be much worked in these circumstances. It should seldom be used continuously when we are at what physiologists call the bottom of our condition. The same amount of effort in these circumstances will do much more in the way of destroying us, than at any other time. This working at the bottom of our condition is, however, in fashionable life, a great and growing evil.*

SECTION VII. — INFLUENCE OF PERIODICITY ON THE BRAIN.

2015. The brain will submit itself, on occasions, to what is sometimes called the law of periodicity. Thus, it is said of one of our great poets, that his mental machinery would operate best about the time of the vernal equinox. But, to speak of shorter periods, many — perhaps most — can work best in the morning, while not a few can do nothing, or almost nothing, till everybody else has retired to rest.

2016. There was a time, in my own early history, when ten o'clock at night brought with it the strong desire for mental application, and some of my best efforts were made between ten and two! But I saw my error, and reversed my habit of

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QUESTIONS. — Is excessive mental application, at any age, deeply injurious? Are its evil influences confined to the brain and nervous system? Does it sometimes produce effects as lasting as life? What striking cases of this kind are presented in detail? Will you mention, particularly, the case of Sir Humphrey Davy? Has mere age as much influence in unfitting the brain for continuous effort, as has sometimes been supposed? What is said of the law of accumulation? What of working the brain when we are at the bottom of our condition?

* It is scarcely too much to say, that we serve ourselves and Satan at the top of our condition, and God and mankind at the bottom. For we rise to eat, drink, and make calls, or buy, and sell, and get gain; and it is only when we are gorged, — sated, — fatigued with self-worship and Satan-worship, that we enter with the refuse of our energies upon the service of God and humanity.

turning night into day. Others, however, have not been fortunate in making a retreat, ere they have suffered.

2017. Dr. Channing, late of Boston, used to say, that to be in any respect under the law of habit was to be a slave. But I should rejoice in such a slavery to habit that certain well-selected hours of the day would bring with them not only an increased aptitude for mental labor, but also increased power.

2018. And yet such a habit is not very difficult to establish. The law of association may be enlisted in our aid. We have but to take our place at the work we have assigned ourselves from day to day, at the same hour, and we shall at last find ourselves entering upon it without the least difficulty, and pursuing it with increased alacrity, pleasure, and success.

2019. All diseases of the brain, it is said, have a tendency to observe regular periods: why should it not be so with healthy habits? We observe the power of habit, too, in the case of the musician, or the dancer. The fingers and feet, by long habit, come to move with less fatigue, and, as it were, without effort. Why should not frequent repetition produce the same effect in regard to our mental labor? Most undeniably it is so.

2020. In truth, the tendency to periodical and associated activity sometimes becomes so great, as Dr. Combe has well assured us, that when our study hour arrives we can almost unconsciously go on with our labors; and this, too, without much fatigue, and with increase of facility and certainty in a similar proportion.

2021. It is related of Silvio Pellico, that when first imprisoned he was allowed a copy of Dante and the Bible. He used to commit a canto of the former to memory every day, till, as he assures us, the exercise became at last so mechanical that "it ceased to afford any interruption to the melancholy train of thought!" This anecdote sufficiently illustrates our subject.

SECTION VIII. — ONE THING AT A TIME.

2024. Not only will the brain work better, but in a more healthy manner, by forming the habit of doing one thing at a time. Indeed, it seems to be a general law of the animal

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QUESTIONS. — Will the brain, on occasions, both in health and disease, submit to the law of periodicity? What anecdote is related of the author? What has Dr. Channing said of the influence of habit? How shall a habit of this kind be formed? What has Dr. Combe said of the power of periodical and associated activity? Relate the anecdote of Silvio Pellico. What does this anecdote teach us?

economy,—to which, however, I grant there are some exceptions,—that two classes of functions cannot be called into vigorous action at a time, without injury to our well-being.

2025. The celebrated President Dwight, of Yale College, was accustomed to attend to two or three different trains of thought at the same time. Thus, he would dictate to two amanuenses, on different subjects; and occasionally hear a third person read history, or biography, or even science, with such faithfulness as afforded the most undoubted evidence of his ability to perform all he professed.

2026. It is quite another thing to do this, and to do it uninjured. Dr. Dwight did not live out all his days, in a physiological sense. How much this and kindred errors had to do with such a result, is not easy to say at this distance; nor would it have been easy, had we been his contemporaries. Various, and sometimes numerous, influences combine in these cases.

2027. It must be observed, here, says the excellent author from whose work on Health and Mental Education I have quoted before, that the bad effects of immediate exertion "may show themselves only at the end of months or years, when the influence has, as it were, accumulated by repetition."

2028. "Although, therefore, the system possesses a certain power of resistance, and many persons seem to escape, even for years, it cannot be doubted that opposition to the law of nature will eventually prove injurious." It is even better, in the end, and more conformable to nature, to do but one thing at a time, whenever and wherever we have it in our power to exercise the right of choice.

SECTION IX.—MUSCULAR EXERCISE: ITS INFLUENCE ON THE BRAIN.

2029. "When thought shall need no brain, and nearly four hundred organs of motion shall cease to constitute the principal portion of the human body, then may the student dispense with muscular exertion." Such is the language of a Report on Manual Labor connected with Study, made nearly a quarter of a century ago; and, most unhappily, as well adapted to the condition of society now as it was then.

QUESTIONS.—Why is it best to do only one thing at a time? Do great and good men sometimes violate this rule? Are we quite sure they do it with impunity? Does not punishment sometimes come a long time after the transgression? Can this idea be too often repeated?

2030. I do not know how soon a union between manual labor and mental exercise will be effected, but of one thing I am well assured, which is, that such a union must one day be secured as the only method of keeping together what God originally joined, and has never divorced—the "sound mind" and the "sound body."

2031. It may be difficult, I grant, to pursue study, perseveringly, on the condition that three or four hours of hard, or at least active, exercise shall be performed every day in the open air; but never will the professions, as they are called,—more especially the clerical profession,—fulfil their mission, till this blissful union is consummated. Most devoutly, therefore, should every good man pray and labor and labor and pray that God will hasten it, in his time.

2032. Such a union would double the efficiency of the clergy in ten years, and triple it in twenty. It would more than quadruple their value in the next generation. It would also do much for all, of both sexes, who attend school; since all our schools should include the condition of three or four hours active employment of the muscular system, either at healthful labor or amusement.

2033. One-fourth—perhaps one-third—of our students in the United States are at this moment scrofulous. The proportion of theological students who are thus affected is greater than even one-third. Now, there is—there can be—nothing so well adapted to meet this great and growing evil as well-directed manual labor, performed chiefly, if not wholly, in the open air.

2034. That three or four hours of active exercise will not only keep all our young men and women in health, while they are driven through a protracted course of study, in the neglect of the other laws of health, some of which are equally important and imperative with those which pertain to the due exercise of the muscular system, is not pretended. But that the due exercise of the muscles can never be safely overlooked as long as we have brains, is a truth so plain and palpable, that I am anxious it should be everywhere known, and everywhere rigidly enforced.

QUESTIONS.—What was said of the necessity of muscular exercise to the health of the brain, a quarter of a century ago? Is it less needful now than it then was? Are there not some difficulties about it? Can they not be easily overcome? What would be the effect of the union of manual labor with study, on the clergy, and on religion? What the gen-

SECTION X. — THE BRAIN AND THE LUNGS.

2035. No human brain can work well under the influence of bad air. Every one who has noticed the phenomena attendant upon the introduction of bad gases into the lungs, particularly the choke-damp or carbonic acid, must have observed that a sense of oppression on the brain, if not of actual headache, is almost always present.

2036. Who has not observed the almost immediate effects on the brain of a person who has inhaled a quantity of the "exhilarating" or nitrous-oxyd gas? The effects are even more immediate and more marked than those of alcoholic liquors. Delirium, more or less, takes place, says Dr. Gorham, in his work on Chemistry; and on this point it is impossible to entertain a doubt.

2037. Another proof, on this point, may be found in the effect of pure oxygen on the brain. Its effects on the human brain are not indeed so immediately obvious as those of the nitrous oxide; but small animals confined in a definite portion of it are said to show signs of apparent intoxication, and to die before the gas is exhausted. Here is an influence of the lungs on the brain, most unquestionable and decisive.

2038. But we have at hand, were it needful, testimony still more indisputable. Withdraw the stimulus of arterial blood from the brain, and at once it ceases to act; and we lose all sensibility and all consciousness.

2039. Or, what is more common, let the blood be but partly oxygenated, as when other gases, in too great proportion, are present in the lungs, to the exclusion, as far as they go, of a due proportion of oxygen and nitrogen, and we shall soon perceive our dependence for life and health upon a mutual good understanding, so to call it, between these two organs.

2040. Nothing is more common than an undue proportion of carbonic acid gas. This, in the same proportion, excludes the needful stimulus of oxygen. We may not know, at first, what it is that so oppresses the brain and powers of life; but the oppression certainly exists.

2041. There is scarcely any limit to the dulness which is imposed upon mankind, in civic life, by the presence of this same carbonic acid gas. We have dull sermons, dull hearers,

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eral effect? How would it affect the general tendency to scrofula? Is this great change the *all in all* to be performed; or is it merely one important thing?

dull books, and dull readers; dull laborers, and dull professional men; dull teachers, and dull pupils.

2042. My own manner of life has led me to think most of the effects of carbonic acid gas on children and youth at school. On their arrival at the school-room, it often happens that the frequent opening of the doors and other measures, accidental or intentional, have been the instrumentalities of purifying the air; and the scholar, for a short time, breathes free.

2043. But how long is it before a "drowsy dulness" begins its influence? Perhaps he does not yet yawn; but there is a degree of uneasiness, manifested by an inconvenient restlessness, inconvenient at least to the teacher himself. This, in general, waxes worse and worse to the hour of recess; or, if the recess is not managed as it should be, to the hour of intermission, or close.

2044. I must quote once more from Dr. Combe, since his remarks are so pertinent. If the vitality of the blood, says he, be "impaired, by breathing an atmosphere so much vitiated as to be insufficient to produce the proper degree of oxygenation, the blood then affords an imperfect stimulus to the brain; and, as a necessary consequence, languor and inactivity of the mental functions ensue; and a tendency to headache, syncope, or hysteria makes its appearance.

2045. "This is seen, every day, in the listlessness and apathy prevalent in crowded and ill-ventilated schools; and in the headaches and liability to fainting, which are so sure to attack persons of a delicate habit in the contaminated atmosphere of crowded theatres, churches, and assemblies. It is seen less strikingly, but more permanently, in the irritable and sensitive condition of the inmates of cotton manufactories and public hospitals."

SECTION XI. — THE BRAIN AND THE STOMACH.

2046. The influence of the stomach on the brain is as well known to medical men as that of the lungs. The quantity, no less than the quality, of both our food and our drink, has an immense power over our mental operations. He must have

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QUESTIONS. — What are three striking proofs of the injurious effects of bad air on the brain? Which is the most common, and therefore the most injurious, in the aggregate? What gas is it which causes an insufferable dulness and cerebral oppression to steal upon us? What are the effects of carbonic acid gas on our schools? What does Dr. Combe say about its effects on the brain?

been but a careless observer, who cannot from his own experience attest to the truth of this general statement.

2047. Dr. Johnson, a distinguished British writer, in his work on Indigestion, tells us that many an important and well-planned military expedition has utterly failed in execution, because the commander-in-chief, at the time when a clear head was particularly demanded, had a bit of indigested pickle in his stomach.

2048. A man, in England, drank a large quantity of spirits for a wager, but was overwhelmed by its effects, and perished. On examination, after death, a large portion of the gin he drank was found deposited in the ventricles of the brain. This fact alone would seem to prove the influence of exciting drinks on this conservative organ.

2049. We need not cross the Atlantic, either in imagination or otherwise, to know the connection between the stomach and the brain. Anthony Benezet, a famous teacher of Philadelphia, of the last century, when his brain was almost overcome by the fatigues of the school-room, was accustomed to procure relief by a strong cup of tea. The restoration was almost instantaneous.

2050. But we have experience in our own persons and families. He who has never felt a temporary exhilaration from any drink containing alcohol, may have felt it from tea or coffee, or even from hot water or hot food. A large quantity of heated food or drink, in the simplest forms, if thrown suddenly into the stomach, may produce some degree of exhilaration, by its effect on the brain, though the exhilaration is doubtless increased when excitants or condiments are added.

2051. On this topic we have some excellent remarks from Dr. Jarvis. He is contending, most manfully, against alcohol in any of its forms, as a common beverage, when he incidentally lets fall the following statement, which is as truthful as it is applicable, and might be extended to the use of everything that exhilarates, whether solid or fluid.

2052. "After the brain and nervous system have been frequently excited, and their control of the muscular actions interrupted with stimulating spirits, they do not recover the complete command of their muscles when the fits of intoxication pass away. Therefore, old drunkards, even when sober, walk with a faltering step, and work with an unsteady hand." The helmsman is crippled, and hence the ship is without a guide, and is hourly exposed to peril.

2053. A thousand daily errors, in civic life, have their origin

in mistaken notions connected with the obvious fact that indulgence in eating and drinking gives immediate strength. The strength thus derived must ever be but temporary. Natural strength, as derived from good and wholesome food, is not to be had immediately; the process of digestion and conversion into blood, and flesh, and bones, requires considerable time. Sudden power is derived from nervous influence; and this influence is obtained by a sudden draught upon the brain.

2054. A person feels stronger after eating what he calls a good dinner, almost immediately. So he does after drinking almost any kind of drink, except water; and even hot water—swallowed *very* hot — may produce the same effect. He thinks all this is right,—is as it should be. It is what he calls his experience. You may oppose it by your opinion, but it is to no purpose; nor is it to a purpose much better that you meet him with arguments derived from physiology. He knows, because he has experienced; and "experience is the best schoolmaster."

2055. How great will be the gain, in a thousand particulars, when it comes to be known, by the world generally, that this supposed superiority of exciting drinks and high-seasoned food is all deception! That the experience on which it is thought to be based is false experience; opposed to science and fact. Nor will the cause of truth make much more progress, in any direction, till this matter, small as it may seem to be, is set right.

2056. Stimulus to the brain there must indeed be, when we eat,—not when we drink,—or the work of digestion could not go on. There must be not only the sympathy of this predominating organ, but the aid. Were there no nervous excitement produced by our food,—none at all,—there could be no call on the cerebral centre for what is usually denominated nervous energy.

2057. But water, our drink, if *pure* water, is not digested, and the absorbents of the inner coat of the stomach, which take it up and carry it into the circulatory system, can do their work without any very special aid from special nervous energy. Hence it is that the brain should not be stimulated when we drink.

2058. I have insisted on enough of stimulus to the brain to call forth the requisite amount of nervous energy, in order that there may be good, and wholesome, and energetic digestion; because, although it is true that the universal tendency of the

age is in the line of too much stimulation, yet there is such a thing as too little. In a certain state of debility of the mental apparatus, or of the stomach, or both, there may not be enough of nervous energy imparted to the stomach to enable us to digest our food properly.

2059. It is said that, among the Milanese peasantry, whose diet is defective as regards nutritive properties, a species of insanity is very prevalent, which, for want of a better source, is, by those who are best competent to judge, attributed to this very cause. And it is certainly true, that starvation produces insanity, as one of its common and legitimate effects, in any country, and under almost any circumstances.

2060. One thought more, and one only, on this topic. It is this. All men of experience and study, on this subject, will find that, if they wish to have clear heads, — such heads as that of Sir Isaac Newton was, while he lived on bread and sack, — they must observe much more regularity and simplicity about their diet than is common in these days of a double refined, not to say thrice abominable, system of cookery.

SECTION XII. — HEREDITARY INFLUENCES ON THE BRAIN.

2061. So great is the need, to those who would enjoy health of the brain and nervous system, of being made acquainted with the laws of hereditary descent, that I subjoin a few paragraphs on that subject, which are derived essentially, though not in words, from the writings of Dr. Combe, whom I have already so often mentioned.

2062. If, from the earliest period of human existence, the brain possesses a freedom from all hereditary taints and imperfections, and we have acquired no unusual susceptibility from injurious management during infancy, it will endure a great deal in subsequent life, before the health will be likely to give way.

2063. But if, on the other hand, it inherit striking defects,

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QUESTIONS. — Do the quantity and quality of our food have much to do with our mental operations? What has Dr. Johnson said? What British experiment is alluded to? What is said of Anthony Benezet? What of our experience nearer home? State the main idea of the quotation from Dr. Jarvis. What great dietetic mistake is noticed? But must the brain have no stimulus through the medium of the stomach? May not the stomach suffer from too little stimulus? What example of this sort is mentioned? What is the diet of all wise men who wish to have clear heads?

or if early mismanagement has given it a diseased tendency, it will succumb, and disease of a serious or perhaps fatal kind will follow, in circumstances which would, otherwise, have left no such impression.

2064. Hence, then, the great importance of guarding, with unwearied care, against all those influences which tend to fasten upon successive generations of mankind, insanity, consumption, and other fearful or incurable maladies. Even where the parental character has nothing more about it than some of those things that are usually called eccentricities, there is no guaranty of a sound brain in the generation that is next to succeed.

2065. Where the eccentricity is on one side only, the results, of course, are not so marked as where they are on both. But such peculiarities are highly undesirable in either. These remarks, brief though they are, will prepare us duly to appreciate the force of what is to be said, as a sequel of the same subject, in our next section.

SECTION XIII. — LIABILITY OF THE BRAIN TO DISEASES.

2066. We have seen, in a former section of the present chapter, that the brain and nerves, no less than the muscles and the other internal organs, demand exercise; and suffer if the demand is not complied with. This suffering is experienced in various shapes and ways.

2067. Perhaps the higher classes suffer most, in this respect; for, though the intellectual faculties of the lower classes are not duly developed, yet, to what brain and nerve they possess they usually give more employment than the opposite extreme of society. Many of the latter have nothing to do; and hence are not only miserable, but they actually become the victims of disease.

2068. You have read Dr. Johnson's story of the eastern prince who was miserable because he had nothing to desire; nor was it till he was awakened to the existence of evils among his subjects, of which before he was ignorant, but which it was needful to the public happiness to remove, that the burden was

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QUESTIONS. — Is it of great importance to all, who would have healthy brains, that they should well understand the law of hereditary descent? Must all constitutional defects, then, be most assiduously and carefully watched against? Are eccentricities of character unfavorable, even when they affect only one parent? But, if so, are they not still more unfavorable when they affect both?

lifted from his shoulders. "Now," said he, "I am happy because I have something to desire."

2069. A large proportion of human disease and suffering has its origin in the very source here alluded to. Mankind, for the most part, have no high, commanding object before them. They have nothing of a worthy character to live for. And not a few have nothing at all before them. They doze away life, as it were, with no aims of any kind. Who will show us any good? is their only inquiry.

2070. Such, alas! is the condition of many of our females in fashionable life. They live like butterflies,—merely for the sake of living. They do not live for their parents and friends, for these, according to their standard of human wants, are provided for. They do not live for families of their own, for they have none.

2071. They do not live for their neighbor, for they have never been trained to the great idea that they are his keeper. Above all, they do not live for their neighbor of a thousand or ten thousand miles distant, or of the tenth or twentieth generation yet to come; for they do not even acknowledge his claims.

2072. Certain people, too, advanced in life, their families settled far away from them, and under no supposed need of parental aid; their own pecuniary wants provided for, beyond any reasonable expectation, and almost beyond possibility, of failure; what have they to live for? And why should not their mental apparatus suffer for want of due employment?

2073. When such persons as those I have mentioned, and many more that could be mentioned, fall into a state of stupidity, and turn out to be half idiots, is it to be wondered at? Is it strange if their minds become contracted till they lose the balance of thought, and become hypochondriacal, or even cataleptic; or, in a few instances, when a strong predisposition exists, absolutely insane?

2074. Another class there is, however, of those who have leisure, who brood over their woes, whatever they may be, till their mental energies become impaired, and they fall into hysteria or hypochondria; and thence pass, by a natural if not an easy gradation, into insanity.

2075. That the liability of such individuals to melancholy, hysteria, hypochondria, and insanity, really depends on an irritable or diseased state of the brain,—the penalty of their own transgressions,—and is induced often by want of due exercise, is fully evinced by the well-known fact, that, whenever they

can be put upon the right track, they not only recover their health, but recover rapidly.

2076. In a previous section, I have noticed the liability there is of inducing disease of the brain by over-exertion of that organ, and neglect of proper exercise; and have given, by way of illustration, several eminent examples; so that, on this point, I have nothing to add. It is sufficient for my present purpose if I have shown the liability of the brain, as well as other organs, to disease, and alluded to the importance and the means of so educating that, and the whole nervous system, as to prevent any such disaster.

SECTION XIV. — EDUCATION OF THE BRAIN AND NERVOUS SYSTEM.

2077. In the right education of a child's brain and nervous system, — or, in other words, of its mind, or intellect, — it becomes necessary to cultivate the various faculties in their proper order. It would be useless to require a child to remember what he has never known, or even what he has never attended to. There must be attention and comparison, in the first place. But, to have something on which to place our attention, perception must have been called into exercise prior to everything else.

2078. But delicacy of perception is so indispensable to acuteness of intellect, that too much pains cannot be taken to have children perceive things in their right attitude and right relations. Now, in order to perceive them clearly as they truly are, and not in a manner which is unnatural or artificial, there must be a habit of attention.

2079. This habit of attention is one of the most important parts of practical physical culture. So important did Maria Edgeworth regard it, that, in her work on "Practical Education," — perhaps the greatest of her works, — she has devoted to it no less than forty pages, and they are pages of much interest.

2080. In these pages, she lays it down as a rule, never to be

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QUESTIONS. — Do the higher classes suffer more than the lower from mental disease? Why is this so? Why was the prince, of whom Dr. Johnson speaks, so very miserable? What restored him to happiness? What is the usual consequence of having no high, commanding aim before the mind? Are not females often sufferers, especially in high life, from this source? How is it with the aged? To what diseases are such people most liable? Does this liability point to the true cause of the disease? What other evidence have we of this fact?

forgotten, to teach but one thing at a time. First, because we cannot attend to more; secondly, because, as she says, a child will be better pleased with himself, and with his tutor, if he acquire one distinct idea from a lesson, than if he retained a confused notion of twenty different things. And I have a friend, sixty years of age, who insists that one idea is enough at a time, even in a sermon.

2081. But we must not only teach attention by positive effort, we must also do it negatively. We must avoid such customs and habits as tend to weaken the *habit* of attention. Thus, if it should appear that the habit of having a watch in one's pocket leaves him without the necessity of so attending to the order and character of passing events as to be able to judge, with tolerable accuracy, concerning the hour without one, then is it a natural and necessary inference that the watch is miseducating him.

2082. This inattention to passing events, when we *will* to be inattentive, — at least, for a time, — or, as phrenologists would say, this neglect to control and concentrate our thoughts, is, however, in its place, to be cultivated. It is rather mental *absence* that we should oppose, as tending to dwarf our powers of attention, than mental *abstraction* or *concentrativeness*.

2083. Some, I know, confound the two; but they need not. Absence of mind is a kind of vacuity, a listlessness, or an unmeaning dreaminess, — common at school, and sometimes at lectures or at church; "but mental abstraction is an active and self-absorbing process," as Moore says, "in which a powerful and cultivated mind well sustains the soul in that intellectual exaltation which constitutes the true habit of genius."

2084. When Sir Isaac Newton was asked, How he discovered the system of the universe? he replied, "By thinking about it." "This thinking to an end," says the author just quoted, "is the glory of mind." It is the power of fixing the intellect on an object, and bringing all facts within our knowledge, and all we can find by diligent search that can by possibility relate to that object, to elucidate it.

2085. In fact, as has repeatedly been said by writers on mental education, unless the mind be employed habitually, in obedience to a higher will than that which belongs to itself, no education worthy of the name can be possible. And hence the bulk of mankind, even those who enter and pass through our schools, are never educated. Their minds are not trained to

concentration on an object. Perhaps they never had a lesson on this subject in their whole lives.

2086. Horace Mann, in selecting from a crowd of strangers one to be an arbiter, said, "I will take that man; he appears to know what he is thinking about." The mass of mankind not only do not know what they are thinking about, but do not care. And, what is still worse, they feel no misgivings or compunctions because of their thoughtlessness.

2087. What we call the human mind, in its ordinary uneducated state,—and too often after it has been through the schools,—is little more than a machine, that, being once wound up, goes by the force of weights or pullies till it is run down again. The only difference, practically, in the two cases is, that the course of the pure machine is always the same. It runs down each day with a similar clatter; whereas, the human machine clatters differently each day, according to the different impressions made on it by other minds as mechanical as itself.

2088. In plain, matter-of-fact language, we rise in the morning when we happen to, or when impelled by outward force of one kind or another; we think as we happen to, usually as we have thought before, under the same outward circumstances; and, except when our own sphere of helter-skelter thought is infringed on by others, we continue to think as we happen to during the day, till we sleep a little more soundly,—for our thoughts by day, thus undirected, are little better than our dreams.

2089. It seems indeed strange that the human being, whose glory consists in thinking to an end, should never, as a general rule, for one hour of the twenty-four, know what he is thinking about, or even know whether he thinks at all. Strange that he should be, for a whole lifetime, a mere ship at sea, without compass or helm, driven whithersoever the wind or the storm chance to drive him!

2090. The Pythagoreans had a rule, which, were it obeyed by all mankind,—and had it been so for six thousand years past,—would have greatly altered the condition of the human family. Had every human being, who was not a drivelling idiot, from the days of Adam to the present hour, run thrice over every night the thoughts, words, and actions of the preceding day, it is not easy, in our present dilapidated state of brain and nervous system, to conjecture what the degree of advancement at the present time might have been.

2091. It was my custom, in one instance, to require my

school each morning at the opening of the session, to devote five minutes in recalling, by reflection and memory, the studies, and exercises, and discipline of the preceding day. This was a faint approximation to what Pythagoras had in view, and to what is indicated in the whole life of Him who was much greater than Pythagoras.

2092. Men have been known who had the power of recalling to memory, at pleasure, every act, however trifling, of their whole business lives. I have myself been acquainted with one such individual. Though a man of extensive business, he never made a written record of anything in his whole life, and probably never forgot anything. For the satisfaction of others he ought undoubtedly to have kept written accounts; but our present business is with the fact.

2093. This man had no faculty or faculties different from other men; he simply attended to his own thoughts and deeds, and remembered them. He not only knew what he was thinking about, but he knew what he *had thought* about. And what man has done, man may do, is a rule with as few exceptions as most other general rules.

2094. But while perception, attention, comparison, and reflection are to be cultivated, we must not forget memory. In truth, we cannot. The very education I have indicated would insure its cultivation, and its rapid and stately growth. Special lessons, however, might still be useful. A good memory, even of words, — though better of ideas, — is not to be despised.

2095. Is it asked what all this has to do with the health? And will such a question — after all I have said — still rise in the mind? Must not every grand department of the whole human being be properly and healthfully educated, in order to the health of the whole? And must not what is true of the whole, collectively, be true of each of its parts or subdivisions? Must it not, above all, be true of the brain and nervous system?

2096. It is not enough that we should realize the full blessedness of that day when, by thinking to an end, we shall act gloriously. Man, in his wonderful capacity, should not do less than this. But we should, as rational and moral and social beings, do more. We should think to a glorious end. Satan may think to an end, — undoubtedly does so, — but education, on physiological and Christian principles, would teach us to think to a far different purpose.

2097. It was quaintly said by Dr. Caius, who flourished in 1552, — more than three hundred years ago, — "Man, being born not for his own use and commodity alone, but also for the common benefit of many, he which in this world is worthy to live, ought always to have his whole mind and intent given to profit others." And Moore, whom I have already quoted, goes further, and insists that in no other way, such is the nature of things, can we enjoy health.

2098. It is only when man lives to and for others, that he truly lives to himself. It is only then that he can be perfectly healthy. Such is the contracting, collapsing power of selfishness, that it not only deranges the soul, but the body. A purely selfish world could not long survive. There must be a little salt in it, or it would run to speedy decomposition. Without this preserving influence, it would have gone to decay thousands of years ago.

2099. More will be said on this subject when we come to consider the true education of the senses. Meanwhile, let us fully understand that, to train up a child in the way he should go, is to train the body no less than the spirit; and with a care and solicitude, too, which none know but they who have caught a glimpse of the dignity and worth of the spirit.

QUESTIONS. — In mental cultivation, what faculties should be first developed and directed? What is said of attention? How did Miss Edgeworth estimate this faculty? Is the habit of abstraction to be encouraged? What is the difference between absence of mind and abstraction? What anecdote is related of Sir Isaac Newton? What one of Pres. Mann? Are the mass of mankind in the habit of thinking to an end? What comparisons are made to show their folly? What is related of the Pythagoreans? What custom in school was once observed? What remarkable instance of great memory is mentioned? What is the bearing of all this, on the subject of health? What is quoted from Dr. Caius? Is he correct?

CHAPTER X. — THE FIVE SENSES.

SECTION I. — SEEING.

2100. HEALTHY eyes, in these days, are very uncommon. The eyes are often weak by inheritance; they are still oftener made weak by early mis-education; they are mismanaged at every age; they are destroyed by medicine, or by its effects; and not a few injure their eyesight in attempting to strengthen it by external applications, and by the premature or improper use of glasses.

2101. Scrofulous children frequently have weak eyes. I suppose there are in the United States, at this moment, not less than one million and a half of scrofulous persons under twenty years of age, of whom at least one million have weak eyes. One misfortune connected with this is, that a large proportion of these very persons are inclined to abuse their already abused eyes, by reading too much.

2102. But scrofula, though often inherited, is not the only inherited complaint which brings with it weak eyes. I might mention several others which have an influence. The worst visitation of parental iniquity upon the young in this particular form, — though I would fain hope an infrequent one, — is in connection with sensuality. Many a drunkard transmits a tendency to weak eyes; but the transmission is still worse, in the case of impurity. But consumption itself often entails weakness of the eyesight.

2103. Then the evil is aggravated by mis-education; sometimes very early. The nursery is almost always too warm. Infants, it is true, have very feeble powers of calorification; but then they should gain the needful external heat much more by contact with the body of the mother, and by additional clothing, than by raising the surrounding temperature. They need to breathe a denser air, even if their skins will not endure it. And then every degree of unnecessary heat is particularly injurious to the eye.

2104. Much has been said about the unfavorable influence of light on the eyes; and I have not a doubt that most which

has been said is true. The eye was never made to bear a sudden glare of light, nor for any considerable time a very bright light. But, if the adult eye could endure this, that of the infant cannot. And yet, how often is the candle or lamp allowed to shine directly into these young and tender instruments of vision!

2105. Do we consider how delicate the eye is? Though the deep internal parts may be punctured or cut almost without the slightest pain, yet the membrane which covers the fore part of this organ, and is exposed to air, heat, and light, is exceedingly sensitive. Who does not know how much a very small particle of dust will sometimes irritate it?

2106. Now it is very true that the Author of nature has curiously provided the means of allaying such irritation, in no trifling degree, with the tears. These are manufactured by the lachrymal gland, and sent forth, in case of irritation, in large quantity, to wash the membrane. Indeed, in a state of health, the eye is always kept slightly moist with them.

2107. Still, the eye is peculiarly sensitive, and sometimes becomes hot and dry and inflamed. In an infant, this might result from mere exposure, for some time, to a strong light. Neither the rays of light, nor radiating heat, should ever strike upon the fore part of the eye. It is said that the eagle can look at the sun; but the human being can never do it with safety.

2108. We arrive at this conclusion, in the first place, by study. Here is the delicate eye, with a strong curtain before it, — the eyelid. During most of our waking hours, this curtain prevents the sun's rays from reaching the eye. Most of the day, the sun is quite above us; and then, at night, by a very little care, if we take the hint from nature, we may either throw a curtain around our lamps or candles, or suspend the latter quite above our heads.

2109. But this argument is, in the second place, sustained by facts. Cruel tyrants, like Dionysius, or cruel nations, as the Carthaginians, used to cut off the eyelids of men as a punishment; and every reader of ancient history knows what dreadful effects followed, and might have been expected. And how often has the strong sunlight, in Egypt and elsewhere, produced ophthalmia? But in our own families there are seldom wanting cases, every year, of inflammation of the eye, induced, in part, in this very way.

2110. But heat, applied directly to the eyes, is, in my own view, quite as bad as light; as in the case of sitting too long or

too much around a blazing and hot fire. The custom of forming a semicircle around the fire, with both the light and heat doing their best to destroy the eyes, wherever it has prevailed, and however agreeable it may have been, from custom, has been followed, in the next generation at farthest, with its appropriate punishment.

2111. But, as I have before observed, these abuses too often begin while the child is in the nursery. The heat is apt to be too great by ten or twenty degrees, and he is obliged to submit to it. Then it not unfrequently happens that, unless great care is used, his eyes are exposed more or less to a glare of light.

2112. Most nurses have learned better than to let children acquire the habit of squinting, by looking at the light sideways; but they still think it a pretty notion — many of them — to let them lie and look at a light, when it can be placed directly before them.

2113. Then there is another evil. From the thickest darkness, not only infants but adults are very often ushered into the brightest light of our most highly-illuminated apartments; and this, without the slightest precaution whatever. Now, if there are a few eyes so strongly put together as to be able to endure this, I am sure they are rare. Nine in every ten of mankind — infants especially — must in this way be more or less injured.

2114. The custom of exposing the eye thus suddenly to light and heat, or to light alone, has done a vast deal of mischief, even to grown persons. I knew a student, of twenty-two years of age, whose habit was to rise long before daylight, and study by a lamp; and I have known him suffer severely from this sudden lighting up. I always avoid exposure of this sort, at rising, with the most scrupulous care and conscientiousness.

2115. The skilful surgeon who operates for cataract, as it is called, does not at once let in the light upon the eye; for it might destroy this delicate organ forever. He only admits it gradually, — little by little, — as the tender and delicate organ may be able to bear it. May we not derive an important hint from this very circumstance?

2116. The sudden change from light to darkness does not greatly injure the eye, — perhaps not at all. It is the mere abstraction of an accustomed stimulus. We need the solar rays as a stimulus; and, perhaps, in the absence of the sun, light is still useful, with proper arrangements; but we must be

very careful about the manner in which it strikes upon the optic nerve, as well as about its too sudden introduction.

2117. And it is in this point of view that we are led to see the folly of darkening the rooms which we occupy, as is too much the custom in our day and time. Our sitting-rooms, our parlors, our studies, and our churches, are often kept so dark, that, in the first place, we deprive the eye of a healthy stimulus, and debilitate it; and then cripple it still more, by a sudden introduction to the light of the open day, and perhaps to light in excess.

2118. The eye will bear abuses — like every other part of this wondrous frame — much better in the morning than at evening. So that, though I cannot but recommend great care and caution about exposing it to a sudden glare of light soon after rising, and especially at getting out of bed, still, there is much more of caution needed at evening, when, like the rest of the system, it is fatigued and debilitated, than in the morning.

2119. But we should be careful, always. Too much pains can hardly be taken, at any time. Dr. Reynolds, of Boston, is wont to relate the story of a lawyer of his acquaintance, who brought upon his eyes a very serious disease, by performing his studies in a gloomy and rather dark room, and then passing suddenly into a very light one, to take his meals.

2120. Whether sleeping-rooms should be artificially darkened is a question which admits of some discussion. My own opinion is that they should not be. The gradual influx of the morning light to our rooms is probably salutary; and, to admit that we sleep more soundly by darkening our rooms artificially, would be a sort of critique, as it appears to me, on the wisdom of Him who set smaller lights to rule the night, no less than larger ones to rule the day.

2121. The eyes are much abused by the use of bad print, much too small. The great question seems to be, who shall be able to crowd the greatest amount of matter, in some sort of type, into the smallest space. A friend of the author, whenever a light seemed too faint, was accustomed to say that *oil was cheaper than eyes.* In like manner, paper and ink should be regarded by printers and publishers — and above all by readers, since, what the market demands, printer and publisher will be likely to supply — as much cheaper than eyes and spectacles and disease.

2122. A faint light, whether that of the fire, the lamp, or the

candle, is very injurious. Have light in sufficient amount to sit easy on the eye, or lay aside your reading. Above all, avoid the faint light of the evening, especially the evening twilight. Extremes are to be avoided; but the extreme of too little light, long applied, is worse than excess would be for a few moments only.

2123. More eyes have been injured by Saturday night sermons, says Dr. Reynolds, than by the week's study that preceded them. Still, if you are determined to read or write during the evening, — whether Saturday evening or any other, — such a selection should be made as does not require much mental effort. Perhaps familiar letter-writing is among the best of occupations for this season.

2124. But it may be well to present a brief code of general rules for the education and management of the eye, an organ of such essential and never-ceasing importance to us; and which, if once lost, is lost irrecoverably. Let me, therefore, take the place, at once, of parent, teacher, and physician.

2125. Rise early, but, in general, avoid the glare of lights or fires; especially avoid the *sudden* glare. In summer, the young will hardly be required to rise before the sun gives all the needful light. Recollect the story of Franklin, — that he once wrote an essay, the object of which was, to prove to the people of Paris that *the sun gives light as soon as he rises.*

2126. Be much in the open air, and in broad sunlight. Remember that, unless for a very short time early in the morning, the eye is properly curtained. There is but one exception to the truth and necessity of the injunction to be much out of doors. When the ground is covered with snow, the reflection of the sun's rays may be injurious. This is said to be particularly the case in Russia. Otherwise, study and labor as much in the open air as possible.

2127. Be careful to have your artificial lights, whenever they must be used, as much above you as they can be, or else at your left hand. Never have them on your right; and, above all, between you and the book or paper to which your eyes are directed. Sit, also, while you read or write, as far as you can from very white, bright, and polished surfaces, whether walls, floors, or furniture.

2128. Keep the eye cool. I have already insisted on this, but not strongly enough. This will be best accomplished where the temperature is low, and the air pure. Hence one important reason for ventilation, and a still stronger reason for

studying and performing everything else as much as possible in the open air. Be around the fire and in hot rooms as little as possible.

2129. The eye should be clean, as well as cool. And there is one method, extensively approved by all who have made the trial, which will, at once, do much to accomplish both of these objects. When the eye is hot, or begins to be, immerse your face, as long as you can hold your breath, in a basin of pure and clean water; and learn, at the same time, to have your eyes open during the process. Do this, if needful, ten or a dozen times a day.

2130. The eyes of some will not at first endure, while opened in the water, a low temperature. But you may begin the custom by raising the temperature of the water almost to blood heat, and afterward gradually diminishing or lowering it. Without opening the eyes in the water, the custom is a good one; but with it, you will find it much better.

2131. This last is the only eye-water, or eye medicine, which is safe; and is the only one necessary. All things else are more or less injurious in the end; though some of them may *hasten* a cure which nature would accomplish in a much better, not to say safer, way. Immense is the mischief done in the world to the human eye, by eye-washes, collyriums, and ointments. With some families, diluted elixir vitriol is a favorite!

2132. That I am not singular in this advice, will appear from another quotation from Dr. Reynolds. "The student," says he, "whose eyes are affected, should never use a stronger collyrium than good warm water, without the counsel of some skilful, well-informed physician." He enforces this advice by an anecdote of a celebrated eye-water which made the fortune of a family in Paris, by the wonderful cures it wrought, but which proved to be the water of the river Seine!

2133. Avoid irritation. The Germans have a proverb, "Never touch your eyes, except with your elbows." The advice is excellent. There should be no rubbing the eye, unless we touch it gently once a day in washing it. But we must also avoid the irritation of dust of all kinds, as much as we can; and of smoke, especially of tobacco smoke.

2134. You need much exercise. Whether it is that abundance of muscular exercise in general strengthens the eyesight directly, or that it does so by furnishing the eye not only with air and light, but at the same time, in many instances, with

"living green" to rest and feast upon, is not quite certain. Probably both have their influence.

2135. It would be strange, indeed, if naked pavements, walls, and sidewalks, or even the interior of our houses, shops, factories, and school-rooms, were as favorable to the cultivation and health of the eyes, as nature's own arrangement, in her own dress. And, reasoning apart, who has not felt his eyes relieved by resting for some time on cultivated gardens and fields, and even on trees and forests?

2136. He who would have good eyes must also take care of his stomach. "The day laborer," says a foreign writer, "may eat what he will, provided it is wholesome, and his eyes will not suffer. But let the studious person, who is called upon to devote not only his eyes but his brain to severe labor, live upon highly nutritious food, and such as is difficult of digestion, and we shall soon see how his vision will be impaired, through the vehement and persevering determination of blood to the head, which such a course will inevitably occasion."

2137. It is not alcoholic drinks alone, no, nor alcoholic and fermented drinks united, that, by their tendency to the head and stimulation to the blood generally, injure the eyesight. It is all exciting or exhilarating drinks. Why do tea or coffee soothe the nerves of the jaded brain, and rouse us into talkativeness or wit? Is it not because they produce a rush of blood thither? And can the eye, so closely connected with the brain, be unaffected? And can it bear the stimulus without injury?

2138. But highly nutritious food, as we have just seen (2136), may injure the eyes. Now, more than this is true. Many of the dishes found on our modern tables, without being highly nutritious, — which is quite bad enough, — are also over-stimulating, or at least heating, to the blood. Dishes of food may be high-seasoned without being naturally very nutritious. I know not but bran, or even sawdust, might be high-seasoned and keenly relished, if not recognized; but would they be very nutritious?

2139. It is no mean proof that food is too heating when it imparts a perceptible glow to the whole system, especially to the eyes and face, and quickens the circulation and respiration. But, be it ever remembered, *that* food is generally best for the human system, and for the eye among the rest, which produces the least perceptible immediate change, except to satisfy the demands of our appetites.

2140. The best condition of the eye — other things and cir-

cumstances being equal — will be found in those who use no drink but water, and no food but what is at once perfectly plain and simple. He who subsists on a moderate quantity of farinaceous substance, with about an equal quantity of good and ripe fruit, will, all other things being right, have a good and healthy eye.

2141. And allow me to say, in passing, that, if there be a part of the human machinery which can be particularly regarded as an index to the health of the system, it is the eye. Physicians are known to examine attentively the condition of pulse and the color of lip and tongue when they visit their patients; but they can tell nearly as much by the eye as by all the rest.

2142. Ordinary but observing men, moreover, with little knowledge of medicine or disease, can even tell much by the eye. "No organ," says Mr. Woodbridge, in the Annals of Education, "gives a more striking indication of the general state of health, and there is no other whose strength depends so much on the general vigor of the system." And hence, he adds, "the same rules which are necessary to be observed, in order to keep the body in health, should be regarded by those who would secure clear and distinct vision."

2143. He who would have the pleasure of good eyesight all his life long, and who would have, too, a long life, must give special heed to an injunction once made by Paul to Timothy, "Keep thyself pure." Nothing more certainly impairs the strength and energies of the organ of vision — not even tobacco and rum — than does every form of licentiousness.

2144. In short, every cause, mental, moral, or physical, which, by producing a determination to the brain and nerves of sense, and overloading the tender blood-vessels of the eye, — and licentiousness, in thought, word, and deed, is among these causes, — is, of necessity, injurious to that highly delicate organ; and should be, by the wise, forever abandoned.

2145. Now, if these things are so, — if impurity of thought, word, and deed, is but half as common in the world as there is reason for believing it to be, — it is no wonder we find among us so many weak eyes, and such a premature display of spectacles of all sorts. The wonder is, that the evil consequences of this master vice are not a thousand times greater than we find them to be.

2146. I have alluded to spectacles. Weak eyes often fall to our lot, in these days, by inheritance. So does near-sighted-

ness. Still, it is not always advisable to use spectacles, because the eyes are weak. Nor is it always best to use spectacles at all, except in the case of near-sightedness. In general, would we have patience, after the eyeballs begin to flatten, only a few years would be needed to place the eye in such a condition that spectacles might be dispensed with.

2147. But the grand point, after all, in relation to improving the eye, is to act in relation to it as we should in relation to any other organ which we wished to invigorate,—USE it. Of course, its use, or exercise, must be varied. We must not read always; and yet we must *read*. We must not confine ourselves to the coarsest print; but we must avoid the extreme in the other direction with still greater care. We must not read largely by artificial lights; and yet, we shall not act wisely in refusing to use artificial lights wholly. We should not read much when the body or mind is fatigued; nor need we go quite to the opposite extreme. There is a golden mean in this, as well as in all other matters.

SECTION II.—HEARING.

2148. Passing up Washington street, in Boston, the other day, I met a blind man on the sidewalk, whom I had not seen for many years. He was led by a dog, to whose neck a string was attached, which the blind man held in his hands, while the dog moved along, at a few feet distance, before him.

2149. Just as I saw him, his dog was opposite the entrance of an arch that enters upon the street at that point, and a

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QUESTIONS.—Are not weak eyes very frequent, in these days? Are they not sometimes inherited? What are some of the causes of such transmission? Is the evil greatly increased by mis-education? In what particular? Has the eye a natural curtain to exclude it from the direct action of light? How do we know this is nature's intention in forming the eyelid? Is the direct action of heat on the eyes bad, as well as that of light? What is said of sudden exposures to light and heat, especially in the nursery? What is said of darkening our rooms by curtains, blinds, etc.? What does Dr. Reynolds say? What is said of bad print? What of Saturday night studies? Is it advisable to use artificial lights in the morning, very early? Should we be much in the open air? Should the eye be kept cool,—and how? Should it be bathed, as well as kept cool? What method of bathing and cooling is recommended? What is the only safe eye-water? What is the testimony of Dr. Reynolds on this point? What do the Germans say? Does general exercise benefit the eye? How? Should the stomach be attended to? What drinks injure the eyes? What food? Is the eye an index of the state of the health? What is said of impurity? What of spectacles? What is the grand point after all?

man with a cart and horse was coming out of the arch. The blind man jerked the dog back with considerable force, and made him stand by his side till the man and his cart were passed by.

2150. "How did that blind man know the cartman was coming out of the arch?" I said to a little boy, who, like myself and several others, stood gazing at him. "O, he heard him," was the reply. And such was the fact, no doubt, though it was quite a puzzle how he could understand the matter so quickly and withal so correctly.

2151. But we know how it is, when we reflect. Not being able to see, the blind cultivate the senses of hearing and touch to an extent which surprises us. It may not be easy to say *how* they can tell many things with as much accuracy as they can, but we know the facts. A person who can see would never, perhaps, be able to arrive at that perfection of this sense.

2152. And yet in some few instances they do. The North American savage will detect the sound of his enemy's footsteps, or of those of his prey in hunting, at distances which surprise us. It is not that his ear, any more than that of the blind man, is constructed differently from our own. The difference consists solely in education. The savage has been trained to hear keenly; the blind man has trained himself.

2153. In order to maintain health in the ear, it is necessary to be attentive to the law of cleanliness. The cerumen, or earwax, may sometimes accumulate in such quantities, and, its finer parts being absorbed, may become so solid, as to interfere very much with correct hearing.

2154. Some have been afraid to inject even warm water or warm milk into their ears, lest it should go so deep into the head as to cause pain or irritation. In one instance, perhaps, in a hundred, the membrane of the tympanum or drum of the ear may have an opening in it; but, even when it has, mild liquids are not apt to do much injury.

2155. Taking cold, in some persons, causes deafness. Perhaps this is on account of a thickening of the lining membrane of a tube, called the Eustachian tube, which passes from the back part of the throat to the ear. For, though all the uses of this tube are not well known, yet we do know that its obstruction affects, in a greater or less degree, the hearing.

2156. It is necessary to mention that trouble in the ear has sometimes been caused by picking it, especially with the head of a pin. Tumors, ulcerations, and many affections of this

organ are the result of unnecessary meddling. The German proverb — which forbids touching the eye, except with the elbow — might be extended, with almost equal propriety, to the ear.

2157. In a few instances, fluids of various kinds have been poured into the ear to dislodge small substances, or remove insects. Such a course is hazardous. Above all is it hazardous to pour in spirits, camphor, turpentine, etc. Soapsuds, made weak, is the most acrid thing that can be borne; and, in general, warm water, or milk and water, are more safe than that.

2158. Some among us have an ear for music, as it is called. Most certainly there is a native difference among people in this particular; but no one has yet been able to trace it to a difference of structure. Besides, much has been done to change a person in this particular, but the structure has not been altered by it.

2159. It greatly cultivates the ear to be a good listener. Many hear what others say by halves. The strictest attention should be paid to this matter in early education. It is ill manners, saying nothing about the tendency to imperfect or unhealthy hearing, to receive a part of what is said, and proceed to speak and act as if we had heard the whole. The world of needed improvement is certainly very extensive.

SECTION III. — SMELLING.

2160. No doubt there is a native difference among men in regard to acuteness of smell, as well as in regard to anything else. Some inherit this sense in much greater perfection than others. But the diversity becomes greater in after life. In a few the smell becomes exceedingly acute as they advance in life; while in many more it becomes perverted or blunted; and in a small number it is wholly obliterated.

2161. I have seen two men, who, at about middle age, had entirely lost the sense of smell. It was not easy to ascertain the cause in either of these cases. Both the individuals had

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QUESTIONS. — What anecdote is related of a blind man? Do we know how it is that the blind can hear so well? Can any other individuals learn to hear as keenly? What instances are given to prove this possible? What is said of the law of cleanliness? What fears has ignorance sometimes entertained? Is there ever an opening through the cardrum to the head? Does taking cold sometimes produce deafness? What is said of picking the ear, especially with pins? May fluids be safely injected into the ear? Have all persons an ear for music? What is said of being a good listener?

early and largely expended their nervous energies by a too severe attention to literary pursuits; but others have done the same without suffering in the same way.

2162. The sense of smell is perverted and benumbed by high living, both as regards eating and drinking. So it is by the frequent or liberal use of medicines. The use of snuff, by drying this membrane, greatly impairs this sense. So also by certain diseases, especially such as affect the nasal cavities, or the nerves of sensation generally. I have occasionally known the sense of smell almost obliterated by the habit of taking cold in the nasal cavities.

2163. The habit of picking the nose—saying nothing of its coarseness and unseemliness—has sometimes, by constantly irritating a part of the nerves of smell, and by other means not well understood, so benumbed this sense as to render it of very little use to the possessor. The nose, like the eyes and ears, should in general be let alone.

2164. But, of all things which tend to destroy the integrity of this important sense, I know of nothing more influential than the unnatural odors to which, under the conventionalisms of civic life, we are daily and hourly exposed, particularly in our modern cookery.

2165. For what, think you, would be the effect on the sense of vision, if, instead of having an object distinctly before the eye, everything was jumbled together? What if, when the attempt was made to look at a rose, instead of beholding a rose simply as such, it had at once the tints of the rose, the peony, the pink, the marigold, and half-a-dozen other flowers, all mingled together; and so of every other living object? Would the eye be cultivated—could it be—in such circumstances?

2166. But so it is, by what I conceive to be a just comparison, with the odors of our food and drink, as custom—erring conventionalism—requires it to be prepared now-a-days. We have constantly before us, three, or four, or five times a day, strange mixtures, that have no genuine smell, because they smell of everything.

2167. And then, as the most natural result in the world, the sense of smell becomes, in a good measure, callous to impression, and the law of cleanliness comes to be forgotten, not only in our contiguities, but in our own persons. I have seen those who actually became insensible to their own offensiveness.

2168. Will this be thought an exaggeration? I have before my eyes, while I write, a letter from an intelligent and

reliable man, at the camp before Sebastopol; who, in describing scenes of filth which can hardly be described at all, takes occasion to mention the consolations which were attempted to be afforded by a friend in the favorable comparison made of the present season with last winter, and to add, as by way of conclusion, "Use, of course, reconciles one to anything." In other words, as he might have said, use stupifies and stultifies the senses, and that of smelling among the rest.

2169. There can be no reasonable doubt that, were not the sense of smell almost obliterated in many, and strangely impaired in all, our world, fallen as it is, would be to us a source of happiness, especially in the season of flowers, to an extent of which the most favored and least fallen have at present no conception.

2170. This sense, like all the others, comes to us, by the Divine appointment, greatly short of that perfection which it might have possessed, had our long line of ancestry maintained their integrity. It brings us large measures of enjoyment as it is; but, in its normal state, it might have done much more for us,—almost infinitely more. We might secure, by proper and judicious cultivation, such measures of enjoyment as at present we have no conception of. All the senses are given us on condition of our improving them as so much capital in trade; nor have we any right to hide or bury our talents, be they one, two, or ten.

SECTION IV. — TASTE.

2171. It has been said, by some of our ultra physiologists, that, were it not for perversion and the evils of perversion, especially in our early years, it would not be difficult for us to decide on the adaptation of food to the health of the human body, by the mere supervision of the senses. Thus, an article which was unpleasant to the taste, would be found, in the issue, to be as unhealthy as it is unpleasant.

QUESTIONS. — Is there not a native difference in mankind in regard to acuteness of smell? Do not education and circumstances increase the diversity? Is this sense sometimes lost, even in middle life? How is it affected by high living? What is said of irritating the organ of smell? Are the tendencies of modern cookery favorable or unfavorable to the sense of smell? How can this be made to appear? What is said of the nerves of the organ of smell becoming callous? What anecdote is related by way of illustration? Are we not great losers of enjoyment in this very way? Are our senses like so many talents given us to improve?

2172. Such an opinion may be correct; but, if so, we are so sadly fallen as to render it next to impossible for us to ascertain the truth in the case. As the world now is, many things which are agreeable to the taste are among the most deadly poisons; and not a few things the most wholesome, and by no means in their nature intrinsically the most insipid, are to us the most disagreeable.

2173. The great and glaring evil alluded to in the preceding section has fallen with still greater severity on the sense of taste than on that of smell. Seldom, if ever, does anything come to our tables with its normal or genuine taste. All is mixed, distorted, confused. The genuine taste of a thing is not only lost, but, if it were present, it would be unacceptable and often disgusting.

2174. Our taste sustains a heavy loss in the first place by not being put in requisition. Thus, he who swallows — bolts, rather — a large piece of food, tastes it many times less than he who should so masticate it and retain it as to bring many times the amount of surface in contact with the gustatory nerves which are so largely spread over all the inside of the mouth, especially in the neighborhood of the tongue and palate.

2175. Then, too, he is forming a habit of not having his taste called into activity. He who swallows his food without much mastication, and substitutes for saliva a good deal of artificial fluid, — tea, coffee, milk, etc., — is learning to dispense with the sensation of taste almost entirely. Thousands, in this way alone, commit an amount of error that would of itself well nigh deprive them of the sensation of taste long before three score and ten.

2176. But it is not in this way alone that they err. I have said we have almost nothing brought to the gustatory region in its normal state. An artificial taste is formed; everything is distorted from its original character, and, by means of over-cooking, mixing, and condiments, reduced to one monotonous level, till few of the original gifts of God — even his richest gifts — would be relished in their natural state by any but children, and hardly by them.

2177. The French, we have seen, have six hundred and eighty-five dishes into which the egg enters to form a component part (764); and that Governor Hill of New Hampshire, many years ago, in his "Family Visitor," incidentally asserted that in New England, if not elsewhere, butter had already become, by habit, a necessary ingredient in almost every dish!

2178. The sense of taste, however, is probably vitiated much more by condiments, preserves, and sweetmeats, than by butter and eggs, and milk and cheese, — though the last-named are by no means innocuous. And pies and pastry — and last, but not least, confectionery — must come in for a considerable share in this work of destruction.

2179. Among the condiments in use, while none of them are, in regard to taste, by any means harmless, — especially pepper, mustard, and a long list of acrid substances, which are deemed indispensable to give a relish, — I know of none so successful in its deadly work as saleratus. Let this article continue to be used for two or three generations as it has been for ten years past, and a sawdust pudding will be relished as keenlyas the richest plum pudding, for there will be no relish for any.

2180. Tea and coffee, especially the latter, being taken hot, have done a great deal — and are still doing a great deal — to benumb if not to paralyze, the nerves of taste. How many, if they can have a suitable quantity of coffee, want little if anything else for their meal; but why? For several reasons; but chiefly, however, for want of a relish for anything else. The coffee destroys the power of relishing.

2181. Tobacco is not without its influence in this war against the gustatory nerves. Indeed, in our own sex, it is probably doing as much to those who use it — already the vast majority — as saleratus. To the smoker and chewer, most food, unless it be highly seasoned, is insipid; and even then it never tastes to them as it did in their early years.

2182. Some, it is admitted, have no expectation of enjoyment from food, in later life. They suppose it belongs to age to have the senses blunted. Now this is almost wholly a mistake. He who preserves the integrity of his senses, by obedience to the laws of God, will not only live out his appointed time without a dim eye, but without the destruction of the rest of his senses.

2183. Why is it that no one — hardly any one, at least — enjoys his food and drink with as keen a relish as he did when in youth he sat at the parental table? It is not age, necessarily. No; it is that his sense of taste is vitiated, — nay, half spoiled, — both by early education and subsequent mismanagement. Such a thing, I repeat, as a normal taste is hardly known.

2184. I must say a word more of tobacco smoke. We have seen that it is not only the actual smoker that has his system poisoned with tobacco; it is everybody that inhales the smoke,

— even our women and children. But this constant war upon everybody is gradually, though surely, undermining our enjoyments of every kind, — our pleasure from the gustatory system, among the rest.

2185. Most of us came into life the "poor inheritors of smart," in this particular. As surely as the sins of parents are visited upon children to the third and fourth generation, just so surely are we experiencing a large abatement of gustatory enjoyment on account of ancestral errors, particularly the free, general use of fermented and distilled liquors, and tobacco.

2186. A normal taste is probably as rare as a normal appetite, and is closely connected. They live or die together. But, as I have more than intimated elsewhere (979), a normal appetite is nearly if not wholly unknown. It is the general custom to eat before a good appetite arrives. In other words, we eat before we are hungry; and hence are never hungry. Few living persons ever know the pleasure or the health of a good or normal appetite, or even of integrity in the sensation of taste.

SECTION V. — TOUCH.

2187. The sense of touch may be said to reside in all parts of the human skin; though it is more concentrated, and as we may say more acute, in some places than in others. Thus, by means of a kind of fatty cushion in which the extremities of the nerves are imbedded in countless numbers, this sense is exceedingly acute in the lips and in the balls of the thumb and fingers.

2188. It is by means of this sense, closely connected as it is with the skin, that we hold communication with the external world. When we are in danger of being lacerated or otherwise injured by blows, sharp weapons, fire, frost, etc., the nerves of this organ, as so many faithful sentinels, perceiving by con-

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QUESTIONS. — What physiological error is alluded to? Has taste suffered at the same time with smell? What is the first heavy loss which this sense sustains, — and how? Is an artificial taste almost universal? What is said of some of the habits of France and of New England? Are condiments doing more mischief than animal products? Which is doing most harm of all? What is said of tea and coffee, especially taken hot? Must our taste decline with age? Do others suffer from tobacco smoke besides the smokers themselves? Is an imperfect taste often transmitted to us? Is it dependent upon or closely connected with a want of appetite?

tact the danger, send up to "head-quarters" their report, and are forthwith relieved (1976).

2189. The doctrine has prevailed, that one principal office of the sense of touch was to sit as judge over the decisions of the rest of the senses. It is certainly true that it sometimes performs this office; but it is also true that the other senses occasionally have to sit as arbiters or judges on the decisions of this. There are cases, however, in which we should grossly err, but for the timely aid of this living envelope.

2190. Take the case of the savage or the child, when first shown a most excellent picture or painting. He supposes it to be a reality. Can we say that his eyes deceive him? Rather let us say that he is wanting in experience. By means, however, of the sense of touch, he soon discovers his mistake, and governs himself accordingly.

2191. One of the uses of touch is to enable us to judge of the temperature of bodies. And yet, in the performance of this office, mistakes are sometimes made. I have known many a sick man fancy everything to be ice-cold, when it was well known that his senses deceived him. But this is disease. The contrary has also been observed. The poet Tappan, when dying of cholera, said that everything, which had but the slightest contact with his skin, burned him.

2192. Our sensations, moreover, especially with regard to heat and cold, are comparative. During the voyages made by Capt. Parry and others, to discover a northwest passage, it was found that, after living for several days in a temperature fifteen or twenty degrees below zero, the air felt quite comfortable to the skin when the mercury again rose to zero.

2193. The perfection of the skin, and hence the perfection of the sense of touch, is greatly affected and modified by the condition of the cuticle, or scarf skin. Where this is very thin, as upon the lips and fore part of the limbs, sensation is very acute; but where it is very thick and hard, as upon the heels of those who go barefooted, it becomes very obtuse.

2194. Habit, too, has much to do with the perfection of this sense. Some men have trained themselves to the performance of wondrous feats. Thus, M. Chabert, who called himself the fire king, is said to have been able to wash his hands in melted lead, with the most perfect impunity.

2195. Thus too the blind, by long habit, acquire in some instances such an acuteness of tact that they not only judge of the common qualities of bodies by this means, but even learn to

distinguish colors. The same thing, to some extent, has been observed in the deaf and dumb. It would seem as if Nature often made efforts to compensate, in acuteness or skill in one part or organ, for loss or deficiency in another.

2196. Touch is greatly improved by education, as we have often seen in the case of the deaf and dumb; and as will be seen, more fully, in the closing section of this chapter. Among the processes of education as applied to the human skin, the subject of bathing is one which particularly demands and will repay our attention.

2197. An equable and free perspiration has much to do in the way of enabling the skin to perform, with great and increasing energy and skill, its varied functions, — the office of touch among the rest. So also has a free and healthful secretion of unctuous matter from the sebaceous glands which abound in it.

2198. But, although a due supply of nature's oil on the surface of our bodies is believed to be highly favorable to the performance of all the healthy functions of the cutaneous system, the application of artificial preparations for the same purpose is objectionable. I know it has found favor, even among whole nations; but it has always done more harm than good.

2199. There are certain abuses of the sense of touch, which may, perhaps, require a passing notice. One of these is the act of tittilation, or tickling. We are not all equally sensitive to this act of tickling, though most persons but ill endure its application to the soles of the feet, and to several other parts of the body. But there are those who are in danger of convulsions from this cause, and who can hardly endure a creeping motion of the fingers, accompanied by a threat of titillation.

2200. They who use artificial teeth sometimes feel the same inconvenience when substances become lodged between them, that they would if the teeth were real. So the man with a wooden leg feels the cold in his toes during a cold winter's day, when those toes have been buried years before. But this is explicable by the law of association of ideas. The suffering is real; though the mind, by some means, refers it to a part which once existed, but which has an existence no longer.

QUESTIONS. — Is touch diffused over the whole surface of the body? Is it not much more delicate in some parts than in others? What is said of the skin as a medium of communication with the outer world? Do we sometimes correct the other senses by this? Does not this sense also sometimes deceive us? Does touch aid us in judging of the temperature of bodies? How does the state of the cuticle affect this sense? Has habit

SECTION VI. — ON THE EDUCATION OF THE SENSES, IN GENERAL.

2201. "The merest savage," says Dr. Combe, "following the footsteps of nature, would pity the philosopher who would seriously assure him that, to cultivate acuteness of hearing or of vision, it was sufficient to be told how to listen or look. The savage goes more directly and surely to work. If he wants physical strength, agility and swiftness of foot, he sets himself to develop the muscular system of his child by ample muscular exercise, by constant repetition of the movements and acts he requires him to perform, and by causing him to run, to leap, or to swim; and he rests in the well-founded hope of accomplishing his purpose.

2202. "Following the same rule, when he seeks acuteness of hearing, he does not merely tell his child how to listen, but he lays him with his ear to the ground, and teaches him, by practice, how to distinguish the qualities of sounds. If he wishes him to excel in hunting, in fishing, in lying in ambush, or in scenting the approach of an enemy, he expects to be successful only in proportion as he finds occasion to employ him in the practice of these pursuits."

2203. Let us be at least as wise as the savage. Let us cultivate every organ which we wish to have active, strong, healthy, and perfect, by exercising it on its own objects, never forgetting the grand principle in all education, physical, intellectual, or moral, that everything is made perfect by use or practice.

2204. This is particularly the way to be pursued in the development and cultivation of the senses. I have not a doubt that, if the proper course were to be pursued by every parent, through a succession of generations, a degree of perfection might be acquired in seeing, hearing, smelling, tasting, and touch, of which, at present, we have no conception.

2205. Do we wish to perfect the eye? This is not to be done by hastening its activities in advance of its strength, but by properly directing it, as fast as the plastic hand of nature developes it. The only safe way of hastening its advancement is by increasing the general health and vigor of the body. As well and as safely might we attempt to increase the size of the apples on a tree by directing our efforts to the apples

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any influence over it? What is said of its perfection in the blind? Does the free and healthful performance of the functions of the skin contribute to its acuteness? Are there abuses of this sense?

themselves, as to cultivate the eye in advance of its natural vigor and maturity.

2206. The secret of properly cultivating this organ consists, then, in rightly directing its powers as they come forward into healthful action, sustained by general bodily vigor. It consists in following Nature, rather than in attempting to lead or urge her forward out of her way.

2207. Suppose a child to be looking at a flower. While his attention is directed to it, let him be encouraged to examine it carefully. "I'll know what I *do* know," said a resolute young man, whose love of improvement had been roused to activity. "I'll see what I *do* see," should our young pupil say who wishes properly to educate his eye.

2208. So of everything else of which it is proper he should take cognizance; let him be careful to see what he *does* see. Many parents encourage their children in the contrary habit, which is as pernicious to the organ of vision itself as it is to the general habits of the mind. It is, moreover, as unreasonable as it is pernicious.

2209. Thus, suppose they are looking at a picture-book. Now, children are quite enough inclined to hurry over the pages of their books, and run rapidly from picture to picture without seeing what they see. Why should parents, then, hasten them on, saying, "Here, my son, here; is not this pretty? Here is another picture; O, look here," etc.

2210. The same error is committed when, in passing through a museum, or a picture gallery, or a flower garden, the eye is hurried from object to object, without giving the owner time to look continuously at anything whatever. It would be as great an improvement to the eye as it would be to the mental powers and faculties, to detain the child a little, rather than urge him forward.

2211. The sense of hearing is confused, stinted, dwarfed, and half-spoiled for all practical purposes, in the same way. I do not mean that an average degree of perfection in this sense is not attained by most persons; but there is also an average degree of imperfection in this as well as all the other senses. But the imperfection is not perceived where all are so nearly alike. To perceive a necessity of self-elevation, we must have an elevated standard for comparison.

2212. The parent who would have his child possess acuteness of vision or hearing, must endeavor to have him hear, as well as see, attentively. He must *see* and *hear* what he *does*

see and hear. It may not be improper to quote from high authority, in application to the present case, an injunction which is as needful in physical matters as in moral,—"He that hath ears to hear, let him hear."

2213. There can be no doubt that a careful attention to the differences of objects, or sensations, so as to be able to separate them, whether they are the objects of one sense or another, greatly tends to the perfection of that organ. Thus, a gardener who dwells amid a profusion of every kind of flowers, and who never took any pains to compare or discriminate odors, is very little more able to do so than the mere ignoramus or savage, whose attention was never called to the subject.

2214. He who would be skilful in detecting different shades of odor, and who would cultivate his sense of smell to the highest possible pitch of perfection, must compare flower with flower. He must not be in such a hurry, moreover, in passing from one flower to another, as not to get a correct idea of any.

2215. To have acute, strong, and skillful sight, we must not only use the eye a great deal, but apply it always, attentively and leisurely, to a great variety of objects. In our reading, for example, a variety of type may, and should, from time to time be used, though not in too rapid succession; as also a great variety of light. In either case, however, we need not go to extremes; above all, as I said before, suddenly.

2216. In order to secure perfect hearing, we must accustom the ear to many different sounds, and to be able to distinguish them one from another. Some persons hardly know the sound of one bell from another; while others, in a great city, will distinguish each from every other, in a moment. Some can hardly distinguish human voices; while others will know the voice of every acquaintance instantly.

2217. The same remarks are applicable to smell, taste, and touch. Of taste, I have already said something (2174), but a good deal is needed. It is wonderful, with regard to the last, that, amid such strange violations of all law or good sense, any integrity should be preserved.

2218. There are various exercises, for both the family and the school, which might be of service in the correct education of the senses. I do not propose here to write an elementary treatise on this department of practical instruction; for it belongs to a separate volume, and not to the closing section of a work on

health. All I intend now, is, to lead those who, by correct physical education, would attain to perfect health of the senses as well as of the functions, to a little more thought on this subject.

2219. It is a capital exercise for the senses to collect together, in a promiscuous heap, the leaves of trees, and require the pupil to assort them. In doing this, the sight, the smell, the taste, and perhaps also the touch, might all be required; and this, too, in the best possible manner, and without any necessary confusion. Grasses, also, and flowers, thrown together promiscuously, might be assorted in the same way.

2220. It is worthy of remark, moreover, that though a knowledge of botany, chemistry, geology, etc., might be of service in these exercises, it is by no means indispensable. On the contrary, besides the advantages thus afforded in the cultivation of the senses, they are a most important preliminary to the study of those very interesting and useful sciences.

2221. Another exercise which greatly aids in the cultivation and healthful perfection of the senses, is that of measuring distances and weights without the usual facilities which are afforded by art. There are those who will measure heights and distances, and ascertain the weight of bodies, with almost as much facility, by the eye, as in any other manner. There is a cattle dealer in Illinois, who can weigh by the eye, almost to a pound. The other senses, however, sometimes aid the eye.

2222. Suppose the weight of a statue, or of a piece of hollow ware, is required. There it stands before the eyes. But you wish to touch, and handle, and lift it. Or, if too heavy, you wish to strike it, to ascertain the degree of solidity by the sound. Now, this is a capital lesson in the education of the senses.

2223. But I would sometimes cultivate or educate one sense at a time. Let the pupil be blindfolded, for example. In this condition, strike your hand, or a stick, on different bodies, and ask him to tell you what bodies you have struck. Does not every one see the adaptation of this exercise to the purpose required?

2224. Again, you wish to give him lessons on the taste or sapidity of bodies or substances. Being blindfolded, you present to him the pulp of various fruits; or you offer him different kinds of food, and ask him to tell you what they are. Or, to cultivate the sense of smell, you require him to try his powers of detection without tasting them.

2225. In this method, we follow the order of nature. I have no objection to art when it can afford aid to nature as her handmaid. What I object to, is, the prevailing custom of turning nature out of doors, or of substituting art in her stead. This is attended with no possible gain, but with certain and very great loss.

2226. It will be said, perhaps, that in cultivating one sense we may dwarf another; just as the blind, though they have such delicacy of touch, are nevertheless without sight entirely; or, as a person who is exceedingly accurate in his vision may at the same time be deaf and dumb.

2227. But it must be remembered, that the blind is not blind *because* his touch is so acute, nor the more so on this account; and that the deaf and dumb are not in this condition because they see so accurately; nor are they the worse for it. The reverse were much more true.

2228. In truth, there is no evidence that acuteness in one of the senses interferes at all with acuteness in any of the others. On the contrary, we have much reason for believing, that, instead of perfecting one sense at the expense of another, the proper and healthful cultivation of any one sense reacts favorably on every other. This conclusion, though it may not be easily demonstrable, is nevertheless sustained by many facts.

2229. There is another important thought. It is more than probable that the proper and healthful and harmonious development and cultivation of the senses, or even of any one of them, is favorable to the natural and healthful and harmonious development of all the organs and functions of the body, if not of all the faculties of the mind, and even of the passions and affections.

2230. Have we, then, — the wisest and most sanguine among us, — ever conceived of the high state of physical, intellectual, and moral perfection to which our race, as a race no less than as individuals, may aspire, when we shall come, universally, from generation to generation, to know and obey all the laws of the great Creator? Is it not probable that eye hath not seen, nor ear heard, nor heart conceived, of even the terrestrial glories which are in reserve for such a course of unswerving obedience?

QUESTIONS. — Does the savage follow nature, in the little education which he attempts, far better than we? May we not learn from him in this particular? How shall we perfect the eye? What is said of know-

ing well what we attempt to know? What error do many parents fall into? What examples are given of this error? Do all the senses suffer in this way? How must this error be avoided? What is said of a careful attention to the differences of objects? What particular directions are given about the education of the eye? What about the education of the hearing? What is said of collecting and examining the leaves of trees? What of measuring distances, etc., with the eye? Should the senses be sometimes cultivated singly, as well as in the gross? In following nature, should art be wholly excluded? In cultivating one sense, do we necessarily dwarf the others? Is there not reason for believing that, on the contrary, the cultivation of one sense improves all the rest? Does the healthful cultivation of the senses react beneficially on the rest of the system? Does it not even affect the mind and heart? Does not this consideration open up a glorious prospect with regard to the improvement of the human race?