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A MEDICAL WORK FOR LAY READERS



'Go, little book, from this my solitude:
I cast thee on the waters,—go thy ways;
And if, as I believe, thy vein be good,
The world will find thee after many days.'

SOUTHEY.

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THE MAINTENANCE OF HEALTH

A MEDICAL WORK FOR LAY READERS

BY

J. MILNER FOTHERGILL, M.D. EDIN.

MEMBER OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON
JUNIOR PHYSICIAN TO THE WEST LONDON HOSPITAL
AUTHOR OF 'DIGITALIS'
(HASTINGS PRIZE ESSAY OF THE BRITISH MEDICAL ASSOCIATION, 1870)
ETC.

'Health is the greatest of all possessions; and 'tis a maxim with me that a hale cobbler is a better man than a sick king'

'To live long it is necessary to live slowly'

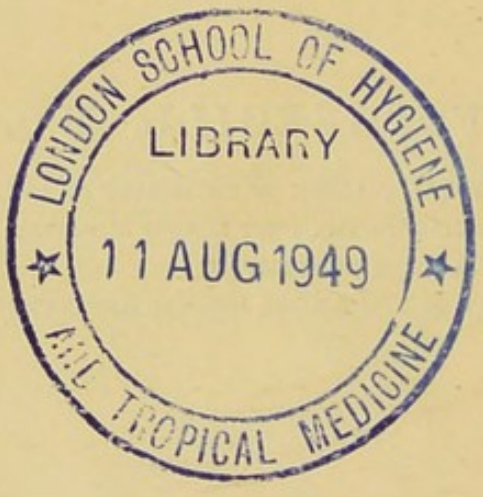
COLLEGE OF PHYSICIANS

LONDON
SMITH, ELDER, & CO., 15 WATERLOO PLACE
1874

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TO

DAVID FERRIER, M.A., M.D.

PROFESSOR OF FORENSIC MEDICINE IN KING'S COLLEGE

IN RECOGNITION OF HIS PERSONAL QUALITIES NO LESS
THAN HIS SCIENTIFIC ATTAINMENTS

This Work

IS AFFECTIONATELY DEDICATED

BY

THE AUTHOR

PREFACE.



This little work is written with the intention of its being useful to the general public, or rather to such of them as are interested in the matter of health, and consists of a selection from the knowledge the writer has acquired in the study of his profession.

It is not a Family Practice of Medicine, but aims at the inculcation of those principles which ought to guide us in our search after health.

While essentially a popular work, the different subjects are handled with strict, indeed all attainable accuracy, and according to the most recent physiological teaching. As a consequence thereof, this little book may be found not altogether unworthy of the attention of those just entering the medical profession—or even of those older members of it whose lives have been spent in attention to the wants of others rather than in adding to their own stores of information.

Many of the chapters are original and novel, as for instance Chapter IX., on 'Overwork, and Physiological Bankruptcy.' Others have no such claims, as Chapter XI., on 'Hygiene,' which is based on the standard work of Professor Parkes and the excellent handbook of Dr. George Wilson.

A brief recapitulation, in the shape of so many formulæ or propositions, is appended to each Chapter, with the hope that such a plan will enable the reader to carry away the contents more thoroughly.

22 Lower Seymour Street, Portman Square, W:
July 21, 1874.

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THE

MAINTENANCE OF HEALTH.

CHAPTER I.

INTRODUCTION—HEALTH! WHAT IS IT? AND HOW IS IT MAINTAINED?

HEALTH consists of a balance betwixt the various parts of the organism, in power as well as in function. Health is no more the endowment of the man whose brain, active and restless, tyrannises, in reiterated demands, over the body, its patient, enduring bondslave, than it is the possession of another person whose inefficient digestion leaves the system ill-fed and famished, the prey of depression or neuralgia. Neither can the idea of robust health, the full-fed, bright-eyed, glowing-skinned, redundant health of writers and painters, be associated with the dweller in cities, the pale-faced spare handicraftsman of Southwark. You may as vainly look in the yard of a manufactory, for a group of oaks or elms, whose ring-recorded years go back to the days when Puritan rule had not yet modified the rude mirth of England in the olden time, with merry groups of rustic urchins busily engaged in romp and play under the spreading shade, regardless of the hum of machinery and the measured stroke of the engine—

you may as well, I say, indulge in this utterly impossible and wild outbreak of the imagination, as look for those outward appearances which characterise the peasants of Cumberland and Northumberland amidst the pallid denizens of Spitalfields. And yet, because such is the case, it does not follow that the man of Spitalfields is not in health, in what is health to him. There are types of health, as there are the flesh of fishes and the flesh of beasts.

The one shows health under the most favourable circumstances, the rude health of primitive man, of man dwelling where the air is pure and uncontaminated; the other indicates the effects of aggregation, the consequences of centralisation and commerce, the results of the necessity for labour. Still, man is no more secure from disease under the first-mentioned circumstances than he is its victim under the latter. A neglected cold may prostrate the mountaineer, and gradually developing into tubercle, consumption may lay upon him its unrelenting grasp; or typhoid fever, the nemesis of outraged sanitary laws, may stretch him powerless, and threaten his existence; while even in the most crowded localities the lean and anxious-looking dweller in cities may survive to the years of man's allotted existence, comparatively free from infirmity or intercurrent disease. Much will depend upon the personal habits of each, of their accommodation to surroundings, of their obedience to the organic laws which rule over our existence. Neglect of these laws will blast the health or imperil the existence of the first-mentioned, while attention to them, and the availing himself of such sanitary arrangements as are within his power, will prolong the existence of the other in a state of comparative health.

What are the conditions necessary to the maintenance of health—not of ideal health, but the best health possible to the individual—will be detailed and manifested as the scheme of this work evolves itself in its various chapters: so far as it is possible in such a work to combine general rules with the exigencies of the individual. The first step, however, is the consideration of what man is, regarded physiologically. Looked at chemically he is a combination of oxygen, nitrogen, hydrogen, and carbon, with some inorganic matter, chiefly lime, soda, potash, sulphur, and iron. By various combinations are the different constituents, solid and fluid, arranged out of these primitive materials. His muscles, the red flesh of animals, consist of the four first-named, with traces of potash. The nerves do not differ chemically very widely, but the leading difference is in the presence of phosphorus, in the form of highly complex phosphoric compounds. As phosphate of lime phosphorus, however, is found in the greatest proportion in bone, which becomes a mere gelatinous mass, flexible but firm, when the lime has been chemically dissolved out. Blood contains quantities of iron, which is indispensable to the chemical interchanges carried on by it.

The other structures, as the skin, viscera, blood-vessels, &c., are built up in a similar manner; while the fat, the stored-up fuel of the body, consists of hydrogen and carbon. But after all, water constitutes the great bulk of the individual, forming no less than 70 per cent. of the gross weight of the organism. For its repair, and to a greater extent for its growth, material is required chemically identical with itself, flesh, fat, saccharine and farinaceous matter, milk *par excellence*, and water. These are eliminated again, in the form of carbonic

acid, the combination of the carbon with oxygen; and water, the union of hydrogen and oxygen; the nitrogen passing off in the solid constituents of urine and of sweat, accompanied by the eliminated lime, soda, &c.; the products of the combustion of hydrogen and carbon, passing off chiefly by the lungs and skin.

Man, as an animal, is chemically an oxidising agent, reducing again to primitive forms the principles built up by the vegetable world, and taken in by him either directly as vegetables, or indirectly in the shape of the material of other animals. Without vegetable life, animals could not exist, and never could have existed; side by side they grow and flourish, indispensable to each other's existence; the tree breaking up the exhaled carbonic acid of the animal, the carbon being stored up in its increasing mass, while the oxygen is returned again, free and uncombined, to the atmosphere for the respiratory needs of the animal world. Round and round go the elementary bodies in ceaseless change of form, nevertheless never more than they were at first, and will be at the last; the atomic material of this planetary sphere being ever absolutely the same in amount. The material of the bodies of Saul and his sons when burnt by the men of Israel after their ignominious exposure at Bethshan, in consequence of their defeat on Mount Gilboa, are circulating amongst us still; it served others before them, and has formed part of thousands since. It is quite within the bounds of chemical possibility that some of the atoms contained in the fated apple of Eve may have lain in the material of the apple which revealed to Newton the law of gravitation; and that atoms of the knife, long mouldered into dust, with which Abraham threatened the life of Isaac, may be circulating in the blood of the Bedouin,

aiding in bringing the free oxygen of the desert air to the tissues of the Arab rover. 'To what base uses we may return, Horatio! Why may not imagination trace the noble dust of Alexander, till he find it stopping a bunghole?' Hamlet, Act v. sc. 1.

To meet these constant chemical changes, material is taken in, in the form of food and drink, which is being constantly assimilated, and so nutrition and repair are conducted. The rapidity with which these changes are carried on is much greater than is usually supposed. Paley, in his 'Natural Theology,' states that seven years are requisite for the perfect renewal of the body; and this statement, owing partly to the mysticism associated with the number 7, partly to its constant reiteration from the pulpit, is generally accepted and believed. The time really is rather months than years; but it is absurd to fix a time which must necessarily vary in different individuals, being much less in the infant than in the aged, in the active than the indolent; widely different too in various tissues, from the epithelium lining of the glands of the stomach, renewed several times in each act of digestion, to the enamel of the tooth, which is probably never renewed during a lifetime.

In addition to the growth and maintenance of integrity in the different tissues of the body, it is by chemical combustion that the body-heat is maintained. No matter where found, whether on the blazing sand of the Sahara or on polar ice at midwinter, the temperature of man is much the same, not varying two degrees Fahrenheit. Of course the aid of clothes, especially in preventing the radiation off of the body-heat in cold climates, must not be undervalued. But food plays the essential part in the maintenance of this

balance, and the Esquimaux will consume in twenty-four hours a gallon of whale oil, to say nothing of other food, chiefly fatty, to maintain his temperature, while a handful of dates and some succulent fruit will serve the Arab over an equal period of time. The body temperature of man is about 99° Fahrenheit (37° Centigrade), and a variation of a few degrees from this forms fever if higher, collapse if lower. The combustion goes on in the internal parts, chiefly in the muscles; and by means of the blood circulating everywhere, the heat created in one part goes to maintain the temperature of another. The immense blood supply of the face permits of its being uncovered without risk when all other parts of the body are and must be warmly clad. A variation of 8° on either side of 100° is almost invariably fatal; a greater variation may occur ere actual death, but that is the limit compatible with life, and lesser variations are fraught with peril.

The circulation of the blood is a very interesting subject. This fluid contains not only the material for the nutrition of the body, for which purpose it is in close relation to the intestinal canal, but also the waste material, for the elimination of which it is in communication with the various emunctories of the body, as the skin, kidneys, and lungs. Not only so, but it bears with it millions of blood corpuscles, minute microscopic bodies by means of which oxygen is taken up and carbonic acid given off, *i.e.*, the gaseous interchanges are effected by these means and through the instrumentality of the lungs. In the lowest animals there are no blood-vessels, the fluids merely permeating the tissues, aided by simple spaces; but a little higher up these spaces have become pulsating sacs connected by tubes. In the higher animals there is a central heart, and from it

springs an elastic tube, the aorta; this subdivides into myriads of minute vessels by means of numerous intermediate elastic arteries, just as the trunk of a tree becomes ultimately, by means of the branches, divided into thousands of twigs; and along this arterial system the blood flows. The vessels which return the blood to the heart are the veins, and between the minutest arteries and the smallest veins are the capillaries, so called from capillus, the Latin name for a hair. These extremely fine vessels permit, in some cases, of the blood-corpuscles only passing in single file; and yet they can contract and again become dilated. By this means the elastic arterial system is kept evenly filled, and the blood pumped in by the heart restrained from at once passing out again into the veins. By these minute capillaries go on the processes of nutrition, the absorption of waste, and the combustion which produces heat. When the internal capillaries are dilated there is an excessive production of heat, and an increase of waste material in the urine, as in fever; when the cutaneous vessels are dilated, the body temperature is rapidly cooled down by the warm blood being brought in contact with the cooler air, and this is aided powerfully by the perspiration, the evaporation of its watery constituents being a powerful cooling agent, as seen specially in warm climates. When the surrounding medium is of low temperature the skin is dry and cold, *i.e.* its vessels are contracted, and thus a small stream of blood only circulates through the skin, and so the heat is not drawn away from the internal parts; were it not for this action in the vessels of the skin, man would be found only along a narrow strip of the temperate zone; in colder regions he would rapidly freeze

to death, in warmer climes he would quickly succumb to a body-heat too high to be compatible with life.

The veins gradually enlarge as they gather together, like rivulets uniting until a river is formed, and ultimately converge into one large stream from the upper half of the body, and another larger stream from the lower half; these two meet at the heart, opening into the right heart, from whence the blood passes into the lungs. In the lungs the gaseous interchanges go on, the little blood corpuscles, dark with carbonic acid, becoming bright with oxygen, while the scarlet arterial blood rushes into the left heart to be rhythmically pumped out into the arteries. To enable the blood to come freely in contact with the air, a minute subdivision of blood-vessels takes place in the lungs, and a network of tiny capillaries surrounds the vesicles, or pouches, in which the minute air-tubes terminate. A fine thin wall alone separates the blood and the respired air, and by this means the chemical interchanges are carried on.

The heart is simply a hollow muscle which contracts rhythmically, and in doing so contracts upon its contents and expels them. Valves prevent the return of the blood, just as the valve of a pump prevents the return of the water, and thus the oxygenised blood is distributed over the whole body. This respired oxygen fulfils several purposes: by it the waste material is made soluble, and so capable of being removed; by its union with the material of the body not only is the body-heat maintained, but all force is evolved.

There is also a subdivision of blood-vessels in the kidney. The artery going to the kidney, itself only a small organ, is large, and rapidly subdivides into capillaries; these form balls by coiling up with the minute

tubes in which the urine is secreted. Here pass off water and the products of tissue waste, the cinders of the body combustion; and the blood so depurated rejoins the general circulation by the renal veins. Urine contains a number of substances in solution, and from the amount of these, especially the urea, can be calculated the amount of body combustion. It is as if one calculated the amount of fuel used by a furnace by collecting the incombustible ashes. Knowing how much coal was represented by so much ash, you weigh the ashes, and at once know the amount of coal consumed.

From the blood the tissues of the body are fed; from the blood comes the material for growth and repair; and to the blood goes the material furnished by food. Speaking of food collectively, for it will be considered more particularly in an ensuing chapter, it goes through the following processes in its progress in the organism: When offered to the mouth it is taken in by the lips, it is rolled over by the tongue, it is ground or masticated by the teeth, and moistened by the saliva, after which it is fit to be received into the stomach. Dyspepsia is the penalty for imperfect mastication, either from haste or from the want of teeth, and is the stomach's protest against food but imperfectly prepared for it. After this preparation it is swallowed and rolled about in the stomach until thoroughly mixed with gastric juice and reduced to pulp, the ring at the intestinal orifice of the stomach only permitting the digested portions to pass: at last, however, the ring relaxes, and the contents of the stomach pass into the intestines, and the stomach is empty and ready against the next meal. Erroneous popular impressions exist as to the persistence of indigestible or unsuitable material in the stomach, and medical men are often told that a patient wants to get

something 'off his stomach.' In reality the stomach having received unmasticated or indigestible food, passes it on in time—usually several hours—into the bowels, whence it is removed by what we call purgation. Occasionally only is something seized by a fold of the stomach and retained for some time, months even, and then rejected by vomiting. I remember an elderly farmer suffering from cancer of the stomach who was reported to have vomited a mouse. On examination it turned out to be a piece of orange, the outside black from the charcoal biscuits the poor man had been induced to swallow for 'indigestion;' but when opened up the peculiar cells of the orange pulp were there, perfect and of natural colour. It was in the country in winter, and the orange was, and indeed must have been, swallowed the preceding season.

After passing the ring called the pylorus the food moves along the bowels or intestines, receiving the secretions of the liver and pancreas (sweetbread), bile and the pancreatic juice, after which it is called chyme, a pulpy fluid containing meat &c. in a semi-fluid condition, and fat emulsionised; the starch of our food having been converted into sugar.

Along the intestines absorption goes on both into the veins and into the lymphatics, a series of canals in connection with the glands; the blood carrying to the liver the material for combustion and for bile, the lymphatics passing into a congeries of glands from whence an elaborated fluid called chyle passes along a duct from the abdomen into the thorax, ultimately opening into the veins at the root of the neck and furnishing nutritive fluid to the blood. The unassimilable part of the food passes off by the bowels. In doing so it becomes of firmer consistency and acquires a disagreeable and

offensive odour from the secretion of the glands of the lower bowel. This is much more marked in the meat-eater, the stools of a young infant being usually almost odourless. The same is seen in the fæces of the meat-eating animals as compared to the herbivora; compare the cat and sheep for instance.

Man is also a locomotive animal, and possesses a bony skeleton, jointed and moved by his muscles. These joints or breaks in the bone are of course indispensable to movement. The connecting materials are the ligaments, tough bands admitting of movement. The muscles which pass from one bone to another contract, and so occasion movement; for instance, in walking the foot is flat upon the ground, and when the muscles of the calf contract the heel is drawn upwards and the weight of the body rests upon the toes only; by the aid of the other muscles of the leg this movement is converted into a step forward. Under other circumstances the body can be raised and allowed to fall again, as when a person without moving away stands alternately upon all his foot or only upon his toes, producing a rhythmical up-and-down movement. Muscles do not always pass from one bone to another, as the muscles of expression in the face, the muscle which wags the ear of a dog &c. The tongue is also a muscle, and an active one.

Muscles can convert their force into certain external effects, for instance the potter uses his muscular force to modify the lump of clay into a hollow pot by turning a wheel; the archer by means of a bow gives to an arrow the force of his contracted muscle which enables it to defy for so long a period the force of gravity. Thus a bow of fifty pounds pull will send an arrow much further than a bow of twenty-five pounds will send the

same arrow. The 'pull' means the amount of muscular effort required to draw the bow, and this counteracts the effect of gravity upon the arrow: the more the force the further it will fly, all things being equal.

But the muscular machinery does not go of itself; it remains like a gun loaded and the hammer raised; an external force applied to the trigger is required to let it off. This force for the muscles is a nerve current. The nervous system of man is a wonderful matter, and nothing so excites our admiration or fixes us spellbound in wonder as the working of the nervous system. Its material is largely water, and in infancy the brain substance is merely a pulp. But what a marvellous pulp! By it is the body set in motion; thought has its residence in it, as also has memory; it not only devises the plans of buildings, the schemes of commerce, the day-dreams of the visionary and the theories of philosophers, but evolves the force which is requisite to put them into execution when practicable. The great central mass is the brain, placed at the top of the organism, and enclosed in the bony skull; from it proceeds the spinal marrow along a canal hewn out of the vertebræ, as the bones of the spine are denominated, which sends off the nerves of the trunk and extremities. From the brain directly proceed the nerves of special sense—the nerves of smell, sight, taste, and hearing, nerves which do not communicate the sense of feeling common to other sentient nerves. When the nerve of sight is severed a bright flash of light, not a shoot of pain, marks the act. Pain is the aggravation of a sensation, often not unpleasant in a minor degree, and feeling alone belongs to the trunk and limbs; this pain attracts the attention of the brain, which then directs to it the light-carrying organ, the eye, for further explanation as

to the cause of the sensation. By the brain are all sensations received and registered, and when communication with the brain is cut off, as in paralysis, sensations are no longer felt, neither is motion practicable, the brain can no longer put in motion the muscles by inducing their contraction; they no longer obey the dictates of the will.

By experiment upon animals and observation of the effects of disease upon man, it has been found that the brain is not a mere homogeneous mass as regards function, but that different portions of it fulfil different functions. Thus disease in different parts will give correspondingly varying symptoms; paralysis is the consequence of disease in one part, involuntary movements the result of it in another. One portion institutes movement, another gives it direction and co-ordinates the several movements into harmony, or regulates them in connection with the eye. More recently Prof. Ferrier has demonstrated that centres for certain movements have a fixed locality, and has mapped out the brain; so that by the symptoms of a movement here and a paralysis there, the exact locality of disease of the brain may and can be determined. His experiments also confirm the view that the brain, the centre of sensation, possesses no sensibility to pain itself, and that severe operations upon it are not accompanied by any signs of suffering.

The brain is a very active organ, and possesses an unusually large blood supply, upon which its activity depends; indeed its activity is in direct proportion to its blood supply. When the arteries going to the brain are compressed, as by the garrotter, unconsciousness follows. A diminution of the amount of blood circulating in the brain is indispensable to sleep; conse-

quently the maniac, whose brain is flooded with blood, cannot sleep often for many days together. Agents which prevent sleep or put it away achieve that end by filling the brain with blood; such is the action of tea, coffee, and some medicinal remedies. Use of the brain directs more blood to it, and so men develop themselves by study, becoming actually cleverer than hitherto. By want of use and exercise the power of the brain becomes gradually enfeebled, and it loses its grasp, till a condition almost approaching idiocy results; as is frequently seen in persons who from inherited means have never been compelled to use their intellect. On the other hand, great and excessive demands upon it frequently lead to disease of a most serious character; and the oncome of great age is usually accompanied by gradual impairment of the mental faculties called dotage; this psychical change going on hand-in-hand with physical changes in the brain substance or in its blood-vessels.

But there is also another nervous system than that of the brain, spinal cord, and their proper nerves. It would be extremely awkward if our digestion were to depend upon voluntary effort: if man had to direct his digestion at the risk of its stopping when his attention was withdrawn, humanity would present a curious spectacle for some time after the customary meal hours, and man's activity would be marvellously crippled. If the heart's action were dependent on attention and will, the first sleep would also be the last one for all animated creatures high enough up the scale of creation to possess a heart. Suppose the liver were to stop because it was forgotten, and the nerve orders for it to go on suspended by any engrossing matter, as speculation or love-making, humanity would be thrown out of its groove, and the progress of the race be arrested

beyond the powers of even antibilious pills to restore it. This second nervous system has its centres in the abdomen chiefly, but also in the chest and neck, and innumerable nerve filaments connect it with the cerebro-spinal system. Along these pass nerve currents which are stored up in the centres or ganglia of the organic nervous system, and from these centres they again pass off in a slow but continuous manner to maintain the action of the heart, stomach, liver, or intestines. The nerve force passed into this reservoir is regularly distributed without the action of the will to the different organs of organic life, that is, to the actions which belong to life, and not to motion or the other active manifestations of vitality. Thus a blow upon the head will knock a man senseless, but he still lives and survives; a blow of like violence upon the pit of the stomach is followed by instant death, because the great centre of the organic nerves lies there, and the vital actions are suspended by the blow, so that the system never lives to recover, but abolition of function and of life at once follows.

Many other actions also belong to this organic nervous system. It controls the calibre of the blood-vessels, for which end filaments run along each of them. The body temperature is maintained by the production and dispersion of heat thus regulated, a continuous oscillation going on betwixt the internal vessels and those of the skin. It is connected with the emotions; and so the heart beats perceptibly with excitement, and the maiden's cheek blushes before words that should never be spoken or thoughts that should never arise. The momentary dilatation of the vessels of the skin constitutes the blush, in the German, 'shame-redness,' which is not confined to the face, though of course it is only seen there, the body being hid by the clothes. Alteration

of nutrition in parts follows dilatation of the blood-vessels, as in congestion of the lungs; and paralysis of the nerves of the blood-vessels, called the 'vaso-motor' nerves, is an essential part of inflammation.

A fair balance between the organic nervous system and the cerebro-spinal system endows persons with control over themselves; where the cerebro-spinal or reasoning system predominates the individual is cool and self-possessed, where it is overruled by the organic system we get the impulsive, emotional being. The one feels, the other reasons. In man the cerebro-spinal system rules: woman is under the dominion of the organic, otherwise called the sympathetic system. Hence the well recognised difference between the mental processes of the opposite sexes. Cultivation of the habit of self-control greatly increases the power of the individual to exert it; the giving way to emotion rapidly unfits persons for the duties of life, and leaves them a pain to others, a misery to themselves. A cold, dispassionate, calculating woman is, however, as naturally repugnant to one as is a man who is so emotional as to be devoid of self-control.

We are all subject to intermissions of consciousness called *sleep*. During this period conscious activity is suspended, and only the actions of organic life are continued. The heart beats, respiration goes on, and digestion progresses; but all voluntary movements are arrested, and the life of the strongest man is at the mercy of his feeblest enemy. Sleep is the after-consequence of toil, and the precursor of energy. The body, exhausted by effort, sinks into sleep, and after an interval of hours awakes refreshed and reinvigorated. What is sleep, and how comes it about? All that we know is that sleep is diminished functional activity of

the brain, and that during this time the blood supply to the brain is diminished and the circulation through it reduced. During this time the brain rests and its nutrition is effected. When awake, a free blood supply evokes manifestations of brain activity, and we have active life manifested in muscular movement, and in thought or mental action. In sleep this is suspended as a consequence of brain inactivity. Brain rest or sleep is absolutely indispensable, and want of sleep is one of the foremost factors in brain-exhaustion. Short hours of sleep are eminently destructive, especially when combined with long or severe labour. If the labour is bodily, the individual is tired out and obviously incapable of or unfit for further exertion. But if the labour is brain-work, the exhaustion is either not so readily perceived or the indications are neglected, and acute cerebral disease for a time necessitates rest; or, more frequently, a chronic impairment of brain-power is inaugurated. Many men exhaust their brain-power when young, and are comparatively worthless afterwards for all but simple routine duties; much as a horse which has 'done too much work when he was young' is a weak, valueless animal compared to one whose early work has been less exhausting. The brain must have its rest just as much as any other part.

Early rising was one of the cardinal virtues of the past, and at the easy pace of our forefathers during a long day was an excellent and proper practice. But they combined with it an early hour for bed. Early to bed and early to rise were the royal road to all that was desirable. But at the pace we now live when awake, longer hours of rest are very necessary. A horse cannot gallop as many hours as it can walk, and a daily tale is the sum-total of what man or beast can do with

impunity or compatibly with health. Quicker work entails fewer hours and longer rest. The tendency now is to combine a day of toil with a second of amusement, and to compress them along with the allowance for sleep into one twenty-four hours. It cannot be done without one of two things—early exhaustion, or an alteration in the earth's movements and a day of more hours.

Disturbed sleep is the precursor of grave and serious conditions; at other times the consequence of existing lesions. Dreams are uncontrolled actions of the imagination, and crowd on the border-land of sound sleep and waking.

Health consists in a balance betwixt periods of activity and periods of rest, as much as upon a balance of power and function in the various organs.

We have already glanced at the eliminating or excretory action of the lungs, skin, kidneys, or bowels. These are all excretions as well as secretions, *i.e.*, their secretion is cast out of the body. A secretion is not necessarily, however, an excretion; for instance, the secretion of the salivary glands is poured on the food in the mouth and reabsorbed in the intestines; in like manner bile is secreted by the liver, and also to a great extent absorbed by the intestines. Health depends largely upon these secretions and excretions being properly conducted, and arrest of each of them is a matter to be at once attended to. Nothing is more conducive to comfort, as well as to health, than a regular and sufficient action of the bowels. Dis-*ease* is truly discomfort here.

Mucous membranes are the moist coverings which line the alimentary tract, the air-tubes, and the genito-urinary organs. They all communicate by orifices with

the external covering; and looked at from one point of view may be regarded as involutions and modifications of the external covering, the skin. Serous membranes are closed bags, which envelope the contents of the skull, chest, and abdomen; in health they are sufficiently moist for their surfaces to glide easily on each other; thus the lungs play over the chest walls at every respiration without friction; and the contents of the abdomen adapt themselves readily to the various changes of posture. But let these become inflamed and pain on movement becomes intense, and the effects of rest in giving relief become very apparent.

Pain is not an unqualified evil; often indeed it is the protector of the voiceless tissues, and, were it not for it and its monitions, much irreparable injury would be inflicted without any consciousness thereof. Without it injured parts would not be permitted the rest necessary to repair; and without indigestion to protect it the digestive system would frequently be systematically abused. In like manner there are other sensations not unpleasant at first, which quickly become unbearable and necessitate attention to the wants they indicate; these are hunger and thirst. We none of us object to a sharp-set appetite; that is by no means unpleasant, especially when there is food at hand, but if this is not the case it soon becomes a craving passion, a strong impelling power. The cravings of hunger have done much for this world; 'look where we may, we see it as the motive power which sets the vast array of human machinery in action.' It has supplied the human labour which was requisite to the carrying out of design. In the erection of the pyramids labour under the blazing sun of Egypt was enforced by the dread of hunger; so much food was apportioned out for a certain amount of

labour to be performed; if the food was consumed ere the work was accomplished, starvation was the consequence. This was a sharper goad than the overseer's whip. Hunger is also the incentive which directs our attention to the system's need for food, and if it be sharp enough the most loathsome substances are greedily devoured. By it has man, and civilised man too, been driven to feed upon the putrid corpse of his comrade. Hunger is one of the great forces in action in the preservation of the life of the individual; and the fear of it is one of the strongest incentives to action.

But the pangs of hunger are tolerable in comparison with the tortures of raging thirst. In fact, so terrible are the latter, that they form one of the cruellest tortures which man can inflict on man: so cruel a torture indeed that it has rarely been used, except in cases of bitter personal animosity, by others than brutal Eastern tyrants, or bigots under the influence of religious fanaticism. A constant supply of water is indispensable to our existence, and a constant bathing of the tissues with fluids goes on in every organised form, either vegetable or animal. The deprivation of water is fatal to both alike. The call of thirst may well be urgent!

Equally necessary is a supply of pure air. The denial of this is a speedy mode of destroying life as compared to either of the former. These require days for their action, especially hunger, but a few minutes is sufficient in the case of air; that is, in warm-blooded animals. We all know how drowsy we become in crowded and ill-ventilated rooms, and how great is the change on emerging into the pure, or at any rate purer, air outside. Air when rebreathed loses its vital properties, its oxygen becomes consumed or modified, while it is also laden with carbonic acid gas, the product of respiration.

A terrible instance of the consequences of ignorance of this fact occurred in an Irish steamer bound for Liverpool in 1848. A storm came on and the steerage passengers were crowded into a small cabin; the hatches were closed and covered with a tarpaulin to keep the water out. It also, however, prevented the ingress of air; and when at last these unfortunates attracted the attention of the crew, no less than seventy-two were dead, and the survivors had suffered almost as terribly as those who endured the horrors of 'the black-hole of Calcutta.' Suffocation is a fate we all regard with dread, though but few meet it. Thousands, however, suffer from the consequences of bad air and ill-ventilated rooms. Here, too, a feeling of positive discomfort leads us to take the necessary steps for the maintenance of health. Without pain, hunger, thirst, cold, suffocation, and allied sensations, which we are commonly taught to regard as unmitigated evils, the existence of man would cease: not only so, but the earth would become a sterile waste, for animals would, for want of these incentives, quickly die out, and then the extinction of the vegetable world would follow.

Another powerful incentive exists in those sensations of animated creatures termed the sexual appetite; an incentive necessary for the reproduction of the species. This is a matter which cannot be omitted from any prudish considerations. It is one of the strongest passions implanted in us by the Creator, and we must not profess to be oblivious to its existence. It is a most difficult subject to discuss, and its further consideration will engage our attention in a forthcoming chapter. At present it is mentioned in its place as one of the impelling forces which affect us through our sensations. It is a force which, when directed by the ennobling action

of love, of chaste affection, evokes our best energies, and in connection with the natural love for our offspring, a direct outcome of it, has stimulated man to many of his noblest efforts. It is, however, a force which has also led to his deepest abasement: and in its evil aspects has made man the subtlest beast of the field. Ever since man was a religious creature has religion in every one of its forms engaged itself with this appetite, regulating and restraining it; yet lust and its consequences are still the canker-worm of our social life.

Man is indeed a complex creature, curiously built up of many materials, with wants, necessities, and aspirations, with a power of choice or free will much more limited than is commonly imagined. Not his physique only, but his mental characteristics bear the brand of inheritance, and in mind and body we are not only what we make ourselves, but we are also the sum-total of our ancestors for a thousand years; and the collateral circumstances which affected them, exert an unseen and hidden influence over us, their descendants. The grim truth of the second commandment is revealed to us every day, and the consequences of sin in every form bear not on us only but also on our progeny.

This physiological introduction is a mere sketch, and is necessarily imperfect; so brief indeed that some of its statements may seem not always strictly correct, from the absence of qualifications in general statements omitted from want of space: but all general statements contain necessarily an element of incorrectness, and mine may be no exception to the rule, though they will be found to be as correct as is compatible with brevity. Broad and general impressions only are required in a popular work, and if the perusal of the chapter incites any reader to pursue further either the physiology of

man or comparative physiology, he will find no difficulty in procuring works on the subject. One caution he must observe in connection with a science advancing so rapidly, and that is, his book must not only be good but recent: old editions of standard works even should be avoided.

An account of man as he exists in health must be the foundation for an erection which will include the common deviations from the norm, the external causes that induce such deviation, the influences that affect us, the exigencies of the individual at times, and the proper line to be pursued under different circumstances and in varying positions. Bald dogmatic statements are suited only to childish minds, a condition not incompatible with a stalwart adult frame, and should ever be abandoned for the inculcation of a principle, wherever practicable. Hard and fast rules of thumb are always cutting both ways, and an intelligent comprehension is ever to be preferred. The one however does away with the necessity for individual thought, the other demands it. Any reader who objects to such exertion may as well at once lay aside this little book; it is unsuited to his wants, and it is mere waste of time to read further. All shall be made as simple as is possible and within the writer's power, but if his or her thinking has to be done by deputy and the statements made here be made to do duty instead of individual thought, the further perusal had better be at once abandoned.

What is attempted here is to give such information about 'the casket of the soul' as will enable the lay reader to have some idea of his own frame and its physiology, and by describing what health is, and how variations from it are brought about, to give him some

general impressions as to what to do in order to be well, and to keep well, under various and dissimilar circumstances. A superb physique does not necessarily imply that the owner is in perfect health; in fact it may be purchased at the expense of his vitality, his organic powers may have been overtaxed in order to procure his 'condition,' as was the case in the well-known instance of Heenan, the American pugilist. His muscular condition was perfection, but his strength was exhausted, his 'acting force' was out of all proportion to his 'vital force;' he succumbed ere his muscular power had ever been taxed, and he was never well after as long as he lived. The muscular powers of man may be likened to an army, with the brain and nerves representing the commanding officer and his staff, while the viscera represent the commissariat. No matter what is the condition of the army, if the commissariat fails it is crippled; an utter breakdown of it means destruction. With an efficient commissariat a small army may achieve wonders, without it the most magnificent host ever arrayed would quickly melt away. Health in man not only means a fair condition of the acting powers, but also a similar condition in the vital forces represented by the organs whose action is not dependent upon the will—viz., the viscera, under the control of the organic nerves. Health, perfect health, has no consciousness of any of our organs, but endows us with a consciousness of energy, of fitness, muscular or mental, of acting force, of capacity in fact; this is ideal health, the lot of some only. For the majority of human beings, especially in populous centres, something far short of this ideal must suffice, viz., how to make the best of oneself according to surroundings and circumstances must be aimed at. A great portion of the work done

in this world, especially in manufacture, is performed by human beings who never felt this ideal health, of necessity never could feel it, and never will feel it.

For perfect health, or the nearest practicable approach to it, not only is a sound body requisite but a similar mental condition is indispensable. 'There is no health in us' was not meant to apply to our physical condition, but to our spiritual condition. It is not sufficient that the body merely be kept in temperance, soberness, and chastity, the mind must also be controlled and governed. Consuming passion and carking care affect the body, and mental anxiety stamps its impress upon the outward man. Inevitable burdens are borne with a sense of resignation which renders them tolerable, but when self-inflicted no such mitigating force is in action, and contrition and remorse bring but slight and uncertain relief. Cleanliness of mind is as important as cleanliness of the body, and chastity of thought is as important as continence. The habits of thought are as subject to our choice as the fashion of our garments. Self-respect is incompatible with rags, and health is equally incompatible with moral beggary. The mind may be debauched while the frame is in its integrity, but ere long the effects will be apparent enough. The breaches of the moral laws are neither so apparent in themselves, nor in their consequences, as similar infringements of the physical laws; but this should not lead to the inference that the consequences do not follow, or can be evaded. The laws in the one case are as certain in their action as in the other, and cannot be outraged with impunity. The mind can no more be brought into contact with defilement without taint, than the body can touch pitch and be clean. Uncleanliness of mind and body act and react, and perfect

health of one is incompatible with an unhealthy state of the other.

After this brief introduction the practical consideration of health will be proceeded with, and for the better furthering of this end the subject will be divided into three sections: the first embracing the period of growth; the second that of adult life; while the third will treat of the important period of decay.

For the convenience of the reader a brief summary of each chapter will be given at the end of it in the form of a series of propositions.

PROPOSITIONS.

1. There are different types of health.
2. The various parts of the body are ever being renewed.
3. The heat of the body is maintained by the combustion of its material--like a slow fire.
4. This is kept equal in all parts by the circulating blood, and sustained by the food consumed.
5. Movements are made by muscular contractions, under the control of the nervous system.
6. Through nerves the brain communicates with all parts of the body.
7. The activity of the brain is in direct proportion to the amount of blood passing through it.
8. The action of the stomach, liver, intestines, and other involuntary organs, is maintained by a special nervous system.
9. During sleep the brain rests, and is nourished.
10. The acting power of the body and its vital forces, may be likened to an army and its commissariat: the real power of the first rests upon the efficiency of the latter.
11. Bodily health and mental health go hand in hand.

CHAPTER II.

IN YOUTH—THE PERIOD OF GROWTH.

THE most helpless and dependent of creatures is the human infant, not even excepting the featherless chicks. Whatever man may be in his prime, by his intellect the master of the creatures of the earth, on his first entrance into this world he is absolutely unable to take any steps towards self-preservation, and his cries and struggles would only have the effect of procuring more speedy exhaustion. Without the care of others he must inevitably perish. There is something weirdly interesting about this helplessness of the human infant.

In the first place he would die of cold if left alone, and that, too, quickly. He has not the advantage of the covering which is more or less freely accorded to the young of other beings, and would speedily die from loss of heat. Hitherto the little creature has been surrounded by a medium of 100° Fahrenheit, a high temperature either as a bath or an atmosphere, and now it is surrounded by a temperature of usually at most 60°. The loss of heat from its surface, destitute of a non-conducting medium like hair or feathers, is therefore considerable, and unless the child is quickly clad in a substitute for these coverings, and also nestled in a warm place, as in its mother's bosom for instance, it must quickly perish. And the more immature the

infant the greater its susceptibility, as is well known to all nurses in the care which children born at too early a period demand. This especial care is necessary until the time when the normal term would have elapsed has arrived; after that the infant resembles other babies.

For many months after birth, the baby is a source of ceaseless care. If exposed to cold it is quickly chilled, and has an inflammatory attack in some part, especially in the lungs. If exposed to light it is very liable to have inflammation of the eyes; the younger the more liable. Its nasal passages, hitherto utterly unused, are easily irritated; a condition of matters shared by the other mucous membranes, especially the bowels. The susceptible skin should only be washed by warm water at first, and by degrees the temperature of the water should be lowered; but for months the exposure should be for the briefest period compatible with perfect cleanliness—a matter of such immense importance in babyhood. Thus we secure the perfect action of the skin; only to be ensured by frequent ablutions. The clothes should be warm and such as to thoroughly protect the little organism, but they should not be too heavy or oppressive.

Next in importance comes the question of food. The natural food of the new-born child is milk—mother's milk pure and simple. This fluid contains all that is required for the sustenance of man at any period of life, even in old age; for who does not remember the story of the Italian prisoner whom his enemies were proposing to condemn to the cruel death of starvation, but whose life was saved by the devotion of his daughter. She had daily access to him, and from her breasts he drew the nourishment otherwise

denied him. Milk contains fat, sugar, and a nitrogenised body, caseine, the cheesy part of milk, and in small quantities the salts of soda, lime, and potash, &c. The mother's milk is not quite so rich as cow's milk, but contains a larger proportion of sugar. In fact, however, it is nearer cow's milk in richness than is commonly supposed, and water is added to cow's milk in immoderate proportions too frequently, in cases where children are brought up by hand. While this last is unfortunately but too commonly necessary, it is still more frequently resorted to from want of affection, a frivolous desire for society, or the multitude of matters which in an artificial society are permitted to interfere betwixt a mother and her infant. Now that feeding-bottles are in common use, the difficulties of hand-feeding, and those abominations, rusks and water, are chiefly matters of the past. The hungered and old look of those wretched infants whose diet was rusks and water standing always warm in a pannikin on the hob, haunts one yet, and gives an importance to the feeding-bottle which may seem almost ridiculous; but it really is a great boon. Frequently a mother ruined her own health in order to save her child if possible; drinking stout in order to supply the lacteal fluid when insufficient; and secreting a fluid which while it was a great drain upon herself, was a most insufficient food for her infant. In many cases a mother can only suckle her infant during the hours of night, and in the day the bottle should be called into service. The bottle is a handy affair, and only requires two cautions; one, that it be scrupulously clean, free from all chance of unwashed corners where the old milk lingers, setting up fermentation in the new milk, and so creating a disturbance in the infant's bowels, the common cause

of the diarrhœa of bottle-fed children; and secondly, the artificial teat must always be full of milk when placed between the infant's lips, for a baby is not satisfied to pull away and get only air when it seeks milk, so it declines to suck, and not unnaturally; this is the common explanation why these little recusants won't take the bottle. A little warm water and sugar may be added; while the milk should always be luke-warm and not cold.

A not unimportant matter is the feeding of a child when something more than milk may be desirable, and flour, cornflour, &c. are commonly given in milk or in a little beef-tea, and sometimes by the ignorant in water. Along with the two first flour is food, and milk is to be preferred, and can now always be procured condensed in tins even in the most crowded neighbourhoods. Beef-tea, not essence of meat, is less desirable, but is much to be preferred to water. When milk 'curds' with an infant, a little soda-water or, better still, lime-water, may be added. This neutralises the acidity, and in the case of lime-water without giving off much gas. Lime-water also furnishes lime for the growing bones. Diarrhœa is often an attempt to get rid of the indigestible curd, and a dose of castor-oil or rhubarb is commonly the best thing to be given in infantile diarrhœa. When the first tooth makes its welcome appearance, especially in a firstborn child, the exultation of the parents often incites them to give it gravy mixed with bread-crumb and potato. In moderation this is not positively injurious; but it is usually overdone, and then intestinal disturbance follows, a condition of uneasiness often aggravated by the effect of the nitrogen (gravy) upon the brain. The salts of meat are too exciting, and are a ques-

tionable food at the best. Infants allowed to take too much gravy or meat are commonly sufferers from excoriation of the thighs and nates, due to the scalding quality of the urine, and are also of an irritable temper (Hufeland).

In time, usually at or about the end of the first twelve months of existence, it becomes time to wean the infant. By this time the existence of teeth indicates not only the desirability of this on the mother's account, but also the child's fitness for other food than that procured by suction. At first other food should be given once or twice a day in small quantities, and of suitable material. Nor is diarrhœa necessarily an indication that the food is unsuitable, for it is almost a normal condition at this time. In teething there is great irritation of the gums and a profuse flow of saliva. This saliva is slightly purgative, and the purgation so produced relieves the general irritability and feverishness which usually accompany teething. Observant mothers know that the child who wets his bib most has most trouble in teething. On the bib the saliva is useless and troublesome; when swallowed its action is far from undesirable.

When weaning is too long deferred or the mother's milk has, from any cause, lost its nourishing qualities, the stools of the infant become clay-coloured, or more often of a spinach-green colour. When these appear medical advice should be sought, and other food given. At other times the food is passed by the bowels unaltered, and therefore necessarily undigested, and a similar course is the best thing here too. During this time the child is growing in stature and in weight, and is usually a fat little creature until it commences to walk, and then its ceaseless activity often 'runs the flesh off it.' A

reserve store of fat is far from undesirable in a young child: it preserves it against cold, so that it sleeps better and thrives better; and further it forms a capital reserve store against accidents of ill-health, often enabling the child to ride out a storm it could never otherwise have weathered. For the young child has innumerable troubles before it. It is subject to the diseases of childhood as well as the affections, especially inflammatory, common to adult life. Thus the eruptive fevers are common at this period, and hooping-cough and croup are frequent. Hooping-cough is an intractable malady, its chief danger being starvation from the food being vomited; and the great matter is to always feed the child immediately after it has vomited, so that its food is digested ere the next recurrent fit of coughing comes on. The food is not rejected from any unfitness in the stomach, but simply as the result of the coughing. Croup is ordinarily induced by a child, usually not quite well, being taken suddenly from a warm temperature and put into a cold room. Inflammation of the windpipe follows, and with it imminent danger. It is a very different matter from the mere noisy breathing with raising of phlegm which young mothers love to call croup. The perils which many infants undergo exist fortunately often only in their mother's imagination—a very safe place for them. Children, too, run many risks from the ignorance or self-sufficiency of their mothers, especially the firstborn; and the law of primogeniture is not altogether unjust, for if the firstborn survives it almost deserves to be recompensed for all it has endured; for it is too often an experiment by which its successors profit, and is frequently less fitted to fight its own way in the world than those who in following it have had a less experimental rearing.

The abolition of corals in favour of rings is not an improvement, as the child cannot get the ring to his back teeth, and teething pads supply a want. The unrelieved irritability of the gums, often more insupportable than pain, as evidenced by the readiness with which children will seize a finger offered to them and gnaw it with their hinder teeth, is a fruitful source of nervous troubles, even of convulsive seizures.

At this time of life inflammatory affections are very common, from the mobility of the life-balances, and the active nutrition of every part. Slight disturbances produce attacks varying from almost imperceptible disturbances of nutrition to grave inflammation. The reparative powers of children are immense, however, especially when circumstances favour them.

The child is now growing rapidly, its bones growing from the two ends; its joints are firmer, and its muscles are developing and learning to obey the will. But the development and education of the cerebro-spinal system is the most striking matter.

The organic nervous system, as described before, is almost perfect at first, as indispensable to organic life. It may be in its integrity whilst the child is a perfect idiot, without power to do anything more than swallow its food when offered to it. In such miserable condition have human beings lived to maturity, bereft of thought and motion, and yet all the functions of organic life have been perfectly performed. But the brain and its appendages have almost everything to learn, and a description of how they are gradually educated is not only interesting, but very instructive. At first the movements of a baby indicate little of the brain and will, to which they are soon to be subordinate. The little thing kicks vigorously and screams lustily, but the movements are

not purposive, they are aimless and probably almost involuntary. The face which ere long will be so mobile and expressive, is now a blank, doing little more than express pleasure and pain, the latter much more decidedly; and the attitude of the infant is expressionless, unless it be the idea of cosiness as it nestles in its mother's bosom. But soon the eye begins to sparkle, and the lips to gather themselves into a smile; at times evidences of will are manifested in rebellion to some action, and shrill cries are emitted; the little one's brain is giving forth indications of its growing power. A little longer, and the hand develops its prehensible power in a clutch at some coveted object, and the lower limbs kick out in a rude primitive attempt at walking. A little later, again, and the toddling thing, easily falling over and losing its balance, is learning to walk. See, with what difficulty it maintains itself erect and how readily it trips; yet, in a few months, its movements have acquired precision, and it runs quickly without difficulty. Much does the baby learn in its first two years, for in addition to learning to walk, it is also commencing to know something of judging distances by its eye, and no longer clutches at the moon. It is also attempting to imitate the sounds it hears around it, especially the easy simple sounds its mother lovingly encourages it to attempt; by this means it learns to communicate with others, and not only that, but is learning to recognise and distinguish the various sounds it hears.

Slowly and gradually is the tiny creature developing its special senses, of which, perhaps, smell is the latest to develop; and the nervous system is being evolved, which, in time, will be such a remarkable feature. And well it is if that process of brain evolution be free from

disturbance. At first it is not disturbed from within itself, except in convulsions, but it is very susceptible to maternal influences, and passion or mental excitement on the mother's part influence and affect the child. A fit of passion, of ungoverned temper on the mother's part, will disturb the nervous system of the babe she is bearing, and increase its mobility and sensitiveness to impressions; if oft repeated, the child may be an imbecile. The majority of imbeciles are first-born children, and their pitiful condition is the consequence of the mental perturbations of the mother during the term of pregnancy. This is not generally known, but it is the fact.

In suckling too, mental disturbance in the mother or wet-nurse will commonly produce indigestion and diarrhœa in the baby. These gusts of passion pass like storms over the nervous system of the infant, unsettling its nerve equilibrium, and too commonly laying the foundation of a mobility which will manifest itself in spontaneous nerve storms of childish passion, each leaving the system more predisposed to other storms. It is a terrible thing to contemplate how certainly this tendency to gusts will grow in the child, often gathering force until the unfortunate creature's brain and mind are utterly wrecked. The responsibility incurred in rearing a child is a serious matter, not lightly to be undertaken; as on this rearing, before it can judge for itself, does so much depend—even the power to judge may never become practicable. Gentle restraint, combined with firmness, is imperative, in order that the little being may be taught self-control, for it quickly notices any vacillation or lack of firmness in its mother, and profits by it to its own hindrance. It is most lamentable to see a child permitted to overrule its parents, dis-

regarding their wishes first, and disobeying their commands afterwards. What a future is in prospect!

A weak but natural desire to spare the infant pain is but too often the foundation of a career of self-indulgence, which terminates disastrously, involving in its misery alike the mistaken parents and their lost, because indulged child.

This may perhaps appear out of place here, but surely the health of parents grieving over a child lost, either by their inability to control it when illness comes and disagreeable measures are necessary, or in after-life from the effects of uncontrolled will, must be affected thereby, as well as the life of their child; and here, prevention, by knowledge of the possible consequences, is a direct means for the maintenance of health. The wilful and obstinate firstborn ever getting himself into trouble is frequently ill, as the consequence of his unrestrained self-indulgence.

For years this great susceptibility of the nervous system persists, and its use is most valuable in endowing the child with aptness and perseverance; in its abuse, giving a tendency to imitation indiscriminate and undiscerning, as seen in the readiness with which a child will learn to squint if in contact with a squinting individual, or to lie if among liars. The effect of this susceptibility too, is to give what is called a predisposition towards brain disease, to which children are so subject, and especially to that form of meningitis ending in hydrocephalus, which is almost unknown among adults.

Precocity is the characteristic of many children; our pet children, the beautiful and the gifted! Little fairy creatures with large eyes, long eyelashes, well cut eyebrows, full lips, a beautiful complexion, and fine silken hair, are usually the most precocious. They are

encouraged to manifest their mental powers, which are often remarkable, and there is really something fascinating about them. But commonly they never survive childhood, being carried off by brain disease or some form of tubercle; in other cases by acute disease. The over-stimulated nervous system possesses little resistive power, and exhaustion setting in early in the disease is quickly fatal. They have used their nerve force too freely, instead of storing it up, and when the hour of trial comes that force is spent which would have enabled them to weather the storm. The loss of these children is always keenly felt, and regret at having borne a hand in the production of the ultimate result is often very acutely realised by the parents; still this has little effect upon others.

The children of towns are much more precocious than country children, and this is especially true of London gamins. The little city Arab can see fifty mischiefs that would pass undiscerned by a little clown, and get into them and out of them too. The rustic looks dull beside the precocious town youngster, but in middle age he is usually much the better man; while the town child has been expending his nerve force, the rustic has been storing his up for future use, and in the course of time the brain of the rustic surpasses in power the brain of the city-born individual. This is especially seen in London, where, from their earliest years, the children are taken about to theatres and sights, even in their mothers' arms; they are reared in excitement, in fact, and thus use up their nerve force, a process which is usually accompanied by rapid development of the nervous power, and an early and precocious maturity is induced. At fifteen, the cockney, especially of the lower class, is far ahead of a country boy of the same age; at

twenty-five, the distance is diminished; at thirty-five the country-bred man in turn is a good way ahead; at forty-five, the cockney is not in the race. 'You can't eat a cake and have it.' Old proverb! This is well known in the matter of racehorses, and a very youthful reputation is incompatible with pre-eminence in after years. Sharp children are the better of discouragement, of cold water being thrown upon them and their efforts; while the stimulating effect of rewards and punishments is salutary for sluggish children.

Children are much more liable to suffering, the consequence of ignorance, than are adults. They do not see that the ditch or causeway is not to be preferred to the footway for a walk, because they have not learnt the unpleasant consequences which may and usually do result from an indulgence in such preference; or that playing in the rain till wet through is injudicious, especially when they sit in school afterwards in their wet clothes. Childhood is a time of troubles, when the individual is learning, amidst other things, what to avoid. Still, the system of coddling children too much is very undesirable. The power of throwing off a cold readily, or of resisting its oncome, is largely affected by habit, and the constant practice entailed by an active and largely out-door existence, results in a form of health quite unattainable by children who are kept much within doors, and only permitted out when the weather is fine, and then only when well wrapped up. The first is inured to vicissitudes of weather and temperature, and the system learns to look after itself; the other, a hot-house exotic, is scarcely safe from the effects of the slightest exposure. The system of guarding against cold generally leaves the child the victim of the most trivial disturbing action, and the more it is coddled up,

the more sensitive it becomes. It is impossible too, that such a bringing up can ever lead to robust health, and the result is a weakly, delicate system, susceptible to the most trivial influences. This system of coddling up is now much more prevalent than the opposite one of 'hardening children,' and is equally objectionable, or even more so. Under the hardening plan, the weak are certainly killed, weeded out, which is not always desirable, for a bright intellect often goes with a delicate frame; while under the opposite plan, children are rendered artificially delicate, ever the victim of illness which they cannot resist, and too commonly the parents of really feeble infants; and so the delicacy, actually fostered and cultivated, becomes an heirloom of questionable desirability.

Children should be warmly clad, rather with reference to their needs than to the chameleon changes of fashion; which at one time leaves them almost defenceless against the blast, and then at another overloads them with coverings. The clothing should be comfortably loose and not of too expensive material, so that it may frequently be changed as growth progresses. This is much better than cutting down old clothes, or keeping them till the next child grows up to wear them. Especially is this last to be avoided in the matter of shoes, which, however, are never now-a-days too durable, for the comfort of the individual as well as his activity is often much affected by the growth of the feet: to say nothing of the charm of a neat foot in the softer sex, in which respect my fair countrywomen do not compare favourably with their American and Continental sisters.

The food, too, is an important matter, as the demands for it are great, are two-fold, in fact; for the necessities of growth and of daily wear and tear have now

both to be met. The tissues of the body are being rapidly built up, while the restless energy of childhood demands a large supply of food: the two combined necessitate liberal meals. The food of childhood should be ample: it should be given at intervals not too far distant; it should be simple in character, for the appetite is a sufficient sauce; it should also contain the requisite ingredients in good proportion. If these points are attended to the child will not usually be otherwise than healthy, so far as health is concerned with diet at least. The bulk of food a growing child will eat is surprising, and it needs not to be further tempted by any specially attractive character of its viands. There is nothing, however, which brings out the perception and artfulness of children more than the matter of food. Observing that their guardians are very anxious to see them eat, they decline unless the nature of the food is to their own liking. This rebellion should always meet with determined resistance. The intervals should not be those of the meals of adults, any more than the material. The plan of bringing in children to dessert about the hour of tea is not very desirable: the child loses its appetite for its own simple food, and has a natural craving after the diet of its elders, which is very unsuitable to its needs. Further, too, the food should contain the proper ingredients. In milk there is much fat as well as sugar, and children when suckling are commonly plump and fat; afterwards they grow lean and spare. This is too commonly the result of their being allowed to object to the eating of fat. There is a perfect craze amidst children upon this head; to whatever due, it is most foolish and deleterious. Fat is most necessary to the proper growth of tissues, and such being the case it is still more necessary to children.

Imperatively necessary indeed is it; and when milk still formed a large portion of the food of the child up to adult life, fat was furnished to the system. Now, however, except as cream, milk is comparatively rarely used. Butter is a good substitute, as is also the fat of animals. But the rule among children is to object to fat, and how the little rebels ever came to so unanimous a conclusion as now exists, it is difficult to say. Probably from some impression that eating fat is vulgar and unrefined! It is painful to see children at table permitted to reject every particle of fat, and then too commonly in time compelled to take cod-liver oil; the fears of their parents restoring to them that firmness they should never have laid aside. Still more painful is it to know that the absurd caprice, if persisted in, will in all probability lead to such a condition as may result in tubercle. For there is no doubt, however strong the inclination to wish it were otherwise, but that this abstinence from fatty food too commonly paves the way for consumption. The tissues do not get their fair and necessary supply of fat; no more does the blood; the consequence of which is that these tissues are not only more liable to inflammatory change, but also that the inflammation, instead of running the course usually pursued in a perfectly healthy physique, degenerates into a development of tubercle; which is too commonly fatal, in spite of efforts which, had they been made in time, might have been effectually preservative.

It must be a painful reflection for parents when standing by the bedside of a dying child to think that this early death, often after painful sufferings, is largely their own work, and the direct consequence of their lack of will and firmness! There is, however, much reason to hope that ground cereals and milk will again

become the favourite food for children, and that the taste for fat will be revived. When that day arrives, the death-rate from tubercle, especially among the young, will be materially lowered!

Next in importance to the food itself is the matter of attention to the digestive system. This is obviously a grave and important matter during a period when construction is so marked a feature. The health often hinges on the state of the intestinal canal, and the administration of laxatives is a development of therapeutics not to be wholly condemned in the rearing of children. Most medicinal interference is meddlesome and uncalled for; but simple laxatives need not be prohibited, except under medical advice—which, when called in, should always supersede what is written here—but their administration should not be needlessly frequent, nor should their constituents be other than of a vegetable character, oatmeal porridge, a fig or prune, manna, or, best of all, castor oil. Too much interference will almost do away with the natural action of the bowels, and render the use of laxatives almost imperative, and a system of drugging will be engendered; especially when rhubarb is used, which moves the bowels first and locks them up afterwards, as a secondary action. On the other hand, neglect of the bowels is a very fertile source of disease in childhood, and the different diseases and disorders to which children are liable are very prevalent amongst those whose digestive organs have been neglected, and where morbid matters have been allowed to accumulate in the primæ viæ (Copland). When the bowels are loaded, assimilation is but imperfectly performed, and constant constipation is incompatible with health and comfort. This constipation is often not only the forerunner of indigestion,

but of chronic enfeeblement of the digestive organs. For children, wheat-meal bread containing the bran is much better than white bread made of flour, and is to most minds a more agreeable vehicle for butter.

Next to attention to the bowels comes attention to the skin. Its importance in babyhood is generally recognised, and any neglect of perfect cleanliness is quickly followed by scalding rawness of the skin where a fold necessitates the meeting of two skin-surfaces. The cleansing of the skin is materially serviceable in aiding its excretory action; the dry skin of the unwashed contrasting forcibly with the skin of the believer in ablution. Skin diseases are commonly the result of a neglected skin and intestinal canal, and attention to these two systems is the first step in treatment. A good washing ere the re-application of an ointment will often make the difference betwixt unsatisfactory and successful treatment. Young children often suffer from the use of common soap, the rough scurfy appearance so produced vanishing before a better and milder soap.

There is something more than mere cleanliness involved in the relations of the skin and water. Bathing is a most excellent exercise when practised in moderation. It develops the different muscles, and perhaps more than any other exercise teaches self-reliance and coolness. The art of swimming is not only directly conducive to health, but often makes the difference betwixt life and death. The continuance of life no less than the maintenance of health may hang on the power to swim. It is often said that colds are caught in bathing. No statement could be more true; and a great amount of discussion has gone on from time to time as to the date and the season when bathing is to be permitted, or as to whether the bather should sit

still on the bank cooling in his shirt, or plunge in when hot; but the real question lies in the duration of the stay in the water. It should not be prolonged until the body temperature falls too far: this is what is meant by taking cold; it is the becoming cold. It is not easy, however, to state how this is to be known by a boy, and so the best broad rule is 'not to stay in the water until the second sensation of cold comes on.' If this is felt strongly, a good run until perspiration is induced is the best thing to be done. If this rule were followed out there would be few colds caught when bathing. Children rarely catch cold when their bathing is supervised; if by themselves they prowl about naked, often a long time, under the idea that that is harmless. It does not matter how the heat is lost, whether in air or water, so long as it is lost!

Another matter of great importance is fresh air; of this there should be no stint. Not only should a child be much in the open air, at play like a colt or a fawn, but the rooms in which it lives should be well supplied with fresh air. The sensitiveness of children to any vitiation of the atmosphere is shown by their susceptibility to take typhoid fever, and by their tendency to fall asleep in crowded assemblies, whether amused or not. It is cruel to expect a child to keep its attention up when in an ill-ventilated school. In my early days at a village school I well remember many a child being beaten for inattentiveness when really the building was at fault; but the master, one of the old school, was too ignorant to know this and too prejudiced to believe it if anyone had pointed it out to him. The day rooms of children should be well ventilated, with a good supply of fresh air, as well as a good cubic space to each child. Neither should the hours of confinement be too long

without an intermission. A 'blow' of fresh air, an accession of oxygen to the blood, is a famous stimulus to a child's intellect. But it is in the night rooms of children that this neglect of ventilation becomes most marked and disgraceful. These rooms, even in good houses, are often simply shameful. In schools the superintendents are becoming more alive to their own interests—having the matter brought strongly before their notice—than to permit the old crammed bedroom to remain. In the cottage it is, perhaps, simply impossible to have anything else. The faded washed-out look of children who sleep in crowded rooms and have little fresh air next day to make up for it, strikes one at once. In the country, long hours in the open air make up for stuffy close rooms, and this long inhalation of fresh air in the day compensates for the want of it at night; in the city this is impossible. The fact is, that during the night oxygen is actually stored up in the system, endowing one with the feeling of briskness on awaking, a pleasant sensation to which too many of us are strangers; and this store supplements the ordinary needs of the day and aids in growth. The feeling on awaking in the air of the open country as compared to awaking in a crowded city is a contrast which must have struck everyone; and a run out of town from Saturday to Monday is an excellent practice. The objection to children sleeping in crowded apartments, especially with older persons, is well founded, and the practice cannot be too strongly condemned. Want of attention to this, or ignorance of it, is one of the commonest factors in the production of disease amidst children.

Change of air is often recommended by the profession, and now quite as commonly instituted without

medical action and merely as the result of experience. Children especially benefit by it, and after the above explanation it is easily seen why and how it should be so. The change is usually from town to country, and especially to the seaside, with its unpolluted breezes. The difference lies in the amount of oxygen so supplied to the tissues, the system being actually as cleansed by the oxidation of the waste matter in it as the skin is by washing it. No wonder then that children return from the seaside improved. The removal of the waste is followed by new growth and a general improvement. Hence the importance of change of air in the case of children with chronic suppuration, from bone disease, or other ailment. The improvement effected by a residence at the seaside is often marvellous; and if change of air is so potent in recovery and repair, how desirable must it be in the prevention of disease?

One of the advantages to be derived from seaside life is the facilities it affords for exercise and the temptation to walk about out of doors. The enthusiasm of children in burying in the sand an adult friend, and the energy they throw into their work, is a proof, not only of juvenile pertinacity, but of the invigorating effects of fresh air; and the children by instinct prefer to be out late and early. There is danger in excess. True, but there is more in too great restraint. Exercise is of great importance with the growing. The action of the muscles leads to their growth directly, and the bones, ligaments, and nerves, grow *pari passu*. Especially does exercise develop the chest and enlarge the lungs, and for this purpose all exercise is good; the best is found in the combination at once of exercise of both upper and lower limbs. Cricket, football, swimming, and boating, are all salutary and excellent. The gymna-

sium lacks the element of fresh air, but is otherwise good, so long as too great feats are not attempted; for with them the exercise amounts to strain, an evil to be considered further on. For small children any romp is acceptable. Delicate or weakly children can only take restricted exercise, as walking or driving. The perambulator is too often an abomination, but frequently it is the only means by which small children can get exercise in the open air at all. Croquet has much to be said for it, and is an excellent means of inducing sedentary persons to get out into the open air. It also exercises all the muscles of the body, albeit though mildly. When a child is crippled and cannot take exercise, it should be carefully clad and then permitted to read or work out of doors. For those whose means permit of it, carriage exercise is very desirable.

Exercise is always desirable, even in the feeblest, and by its means is the perfection of health attained, as in the training of athletes. Great and severe exercise should only be undergone by those who are naturally healthy, and they should be upon their guard as to the development of the muscular system beyond the powers of the system, especially of the viscera, as the heart, stomach, and brain. In smaller children such risk is not great; it is when emulation and ambition begin to assert their sway that excess becomes a real danger; and this brings us to the consideration of more advanced childhood.

Exercise is ever desirable, and more or less of it is requisite indeed to health, but work is another matter. This is not a question for the affluent, whose children are free from the pressure which too frequently grinds the children of the poor into the dust; but for the poor, whose children have to work, to toil, from almost infancy,

in the struggle for existence. Into the fields with a rattle to frighten the birds, or with a whip to drive the horses while his father guides the plough, goes the little clown, when he ought only to be playing about and attending school; down into the dark pit goes the collier's son to push the tiny coal waggons along the low levels; and in the manufacturing districts a mass of little 'half-timers' crowd around the gates when the bell rings at 6 A.M. While yet at a tender age these little folks have to earn their bread by the sweat of their brow, too frequently in order to permit their father to spend a larger portion of his earnings in drunkenness and vice. Of the collier and the mill-hand this is sadly too true. Sustained toil in an impure atmosphere at an early age, when rapid evolution of the body should go on, exercises a most deleterious influence over the processes of growth, as the stunted and ungainly figures of the manufacturing districts amply demonstrate. This was still more marked ere the passing of the Factory Act, which limits the hours of labour to half the day; the other half being spent in school by children under a certain age. The extension of this act to other occupations is very desirable. The agricultural gangs of Cambridgeshire, so recently abolished, were a terrible blot upon a nation who long years before had freed the negro, while its own children lay under a much heavier yoke. But the fresh air of the field work counteracted to a great extent the effects of severe toil, and the physique of the peasantry has not suffered so much as has that of the mill-population. Toil and growth are incompatible; and with the enhanced value of labour there is room for hope that the servitude of our young children will be abolished. But with the thriftless habits and gross improvidence of many of our working populace, such

time is not too near at hand, and an improvement in the habits and in the thoughts of the parents must precede any general improvement. The question is a most serious one, and almost demands more space than can be accorded to it here. This much may be unhesitatingly credited. Sustained work is not proper for growing children, and retards, if it does not arrest their development. Many may outgrow the effects, but more suffer more or less, and the child who is stunted or deformed by labour is not likely to retain a very warm feeling of gratitude to the parent who occasioned it, when the day comes that that parent himself may be in need of assistance. These imperfectly developed frames are also much more liable to disease in all its forms than is the more perfectly developed being.

There is no difficulty in comprehending this when it is borne in mind that the diseases of this period of life are associated so closely with growth. Arrested growth renders the frame more liable to many diseases, while growth, especially if at all fast, is frequently only an additional burden cast upon the powers of the system. We all know well how debilitating for the time is the effect of rapid growth upon children even under the most favourable circumstances; how much more, then, is it likely to try them when growth is added to long hours of labour? The labour or the growth usually must one or other give way; often the growth is checked and a small, ill-developed frame results; at other times growth goes on and the child breaks down, illness at last procuring for it the respite which would never otherwise have been accorded to it.

Rapid growth is a great tax upon the system, the more so that it is not unseldom accompanied by loss of appetite and even a feverish condition. Under these

circumstances the growth goes on at the expense of the material of the body: hence the listlessness, the rapid emaciation, the tendency to disease. Tubercle, which is really a lowly form of tissue, a degraded growth indeed, hangs around, ever threatening the period of evolution. The mere presence of the tubercle would not so much matter, if it only remained quiet and gave rise to no disturbance. But unfortunately it is too frequently of too low a form to permit of organisation, and undergoing a process of gradual death, particle by particle, it acts like a foreign body, and causes general constitutional disturbance, often indeed amounting to severe hectic fever; it softens from its centre, while around it there is ulceration; and if this opens up an exit, as when an air-tube is perforated, the tubercular material finds its way out, and healing of the cavity may and not unfrequently does follow. Often, however, death results. But tubercle is nothing unique or new, it is merely an alteration of normal nutrition, to which, however, some families are infinitely more liable than others. Under proper care and supervision many children of what are called consumptive families survive growth and reach old age, but much more frequently members of healthy families succumb to tubercle as a consequence of neglect of trivial complaints or of the commonest laws of health. No one, almost, can feel any certainty that he or she may not some day become the subject of tubercle, any more than that they are secure against bronchitis. The sooner the old views of tubercle, as a something peculiar and special, are done away with, the better for all of us. Erroneous views are the chief obstruction to the spread of truth. And we all know how much easier it is to hold to our already-formed impressions than to take the trouble to weigh a matter, and see how unsound the old

view is, and therefore the necessity for abandoning it. It moreover demands individual thought, which is very unpopular now-a-days.

In all the ailments of youth the great danger to be avoided is debility. That is the besetting risk above all others, and is the rock upon which so many young organisms are wrecked. It is imperatively necessary in the case of the young to secure good assimilation, for which ample, but not inordinate, supplies of food are requisite, in small quantities at once, so as not to make too great a demand upon the digestive powers. Wine even may be required, but only in moderate and even stinted quantities; but free supplies of milk are ever desirable. Easily digestible food and good air, with warm clothing, are the essentials of the treatment of the diseases incident to growth.

The most eventful period of evolution is that when childhood merges into manhood, when the last changes requisite to maturity are inaugurated. Growth is now effecting those changes which render possible the reproduction of the species. This change is called puberty.

This change and the questions connected with it form a delicate and difficult matter to discuss in a work which must be in frequent use and often consulted; a work which may be found on the library table as well as in the nursery, and probably read by the young as well as perused by the mature. With a full consciousness of the difficulties before him will the writer, with such skill as he can command, enter upon this subject, well knowing how necessary wider knowledge of this question has become; as we see more and more clearly that it will not do to taboo so important a matter; and do what we will, children must and will form

some ideas on the subject, and have their thoughts about their new sensations, and the new aspirations which now begin to crowd upon their mental horizon. Nor is it wise to leave them to themselves in this matter. We are awakening to the injudiciousness of that.

There are practical difficulties in the way, I know. It is scarcely the thing for the school-teacher to take up; it can scarcely be delegated to the family medical man; and the clergyman is the last person of all others to touch a subject so intimately connected with the natural man. Parents too commonly avoid it, partly from a natural and intelligible disinclination, partly from a vivid consciousness of unfitness to go into the subject. It requires that the matter should be fairly comprehended, not only as to the adult, but as to the ideas and conceptions of the child; and most people have forgotten, in the cares of this world, their own impressions at that period, no matter how vivid or how acute they were at the time. As to which parent should assume the post of instructor must depend upon the natural character of each, and upon their relations to their children.

Whether ideas or sensations precede each other is not quite unimportant, though probably this depends much upon surroundings. Whichever comes first in the order of time, the other soon follows. In crowds of the young mental impurity unquestionably precedes the sensations, while in children brought up in houses of the better classes probably the reverse is true; much depending upon the class of servant in the house, and not a little on the inherited constitution of the child. In the latter class of children the simple preferences of childhood give way to a more special choice, and the child singles out some one, not uncommonly an adult, to

be its hero or its empress. There is romantic sentiment only in this selection, and not the slightest taint of earth is associated with the affection; it is as pure as the driven snow. For long indeed is child-love entirely spiritual, and untainted by grossness. The very thought of such a thing is spurned as unworthy, and the first love of childhood is the type upon which all other affections should be based—it is perfect purity. It is a dream of affection without dross, of love free from its baser elements.

There is, however, ground for fear that another condition is too much the case amidst the youth of larger aggregations of people. Here too frequently physical impurity exists ere the mind can throw a halo of romance over the merely animal gratification. Contamination spreads quickly among children. Their little brains are more active than we often give them credit for, and little scraps of bad as well as good are woven by them quickly and subtilely into new mental structures and combinations. Hence the more early division of sexes necessitated amidst large populations. It is, indeed, painful to see little creatures who should be joining promiscuously in play already conscious of a difference between them, and divided into boys and girls. The carelessness and indifference of their parents, and too often the almost impossibility of supervision, render the position of these children anything but a pleasant matter to think of, whether considered physically or morally. Whatever may be the faults of the educated and the affluent as compared to those of the working classes, the sin of the latter in their disregard of the moral life of their children is deep and terrible. In making this statement I am far from underrating the difficulties in the way, or wishing to suggest that many

parents in humble life do not manifest a warm and creditable interest in the subject, and take all possible pains to preserve the purity of their children; still this renders the general disregard all the more painfully apparent. Such expression, too, is not the result of imagination or of reading, it is the serious outcome of personal observation.

The changes inaugurated at puberty are often preceded, as it were, by a shadow projected forward; trivial changes of little moment in themselves, but gradually becoming more numerous, accumulate until almost suddenly at last a consciousness dawns upon the individuals themselves and those in contact with them that a radical change has been accomplished. The doll until recently not entirely discarded is again taken up by the girl, but now only to see to it as an amusement for the juniors; a quiet self-possession and a more staid demeanour have usurped the place of romp and fun. The boy leaves his rabbits and marbles, and aspires to the amusements of the man. The effect of the inrush of new ideas, of new thoughts, of new mental combinations is often very marked, in its effect upon the character of the individual; the rude and forward boy becomes shy, is morbidly self-conscious, and suddenly keenly sensitive to female opinion, a matter he had previously utterly disregarded in his boyish mental processes. The good opinion or indifference of girls hitherto he has held in utter contempt, but now it is borne in upon him with a novel and irresistible force, against which he is powerless, indeed he does not have the inclination to resist. He blushes painfully at an awkwardness which before would never have occasioned a question in him, and his thoughts are no less sensitive. Girls grow wayward and fanciful or demure; and the intense dislike hitherto ac-

corded to boys, who were up to this time regarded as pests, not unsimilar to wasps and spiders, gives way, not to any alteration of feeling toward her old playfellows and tormentors, so much as to a distant but respectful demeanour towards others of the opposite sex, often blended with romantic and impracticable attachment. The new impulses, invested with all the exquisiteness of novelty, build up worlds in imagination, and crown with laurel chivalrous heroes, who seen by the experience of after-life are terribly commonplace creatures. This is the age of sentiment, of high feeling soaring far above the dross of the world, whose intrigues are regarded with a feeling of lofty contempt. Would but somewhat of the latter feeling lingered longer! New springs of action now suggest themselves, and self-sacrifice is a leading feature; the affection now felt towards some ideal object, or actual object invested with the attributes of the ideal, is an ennobling source of action; the aspirations and affections combined furnish high-toned motives.

New forces are in action which will exercise the most powerful influence over the future of the individual, stimulating him or her to noble action or its repulsive antithesis, degrading thought. In too many the balance swings evenly, and some extrinsic force determines its ultimate gravitation. Important, very important indeed, are the surroundings of this period over the development of the individual. The old mental equilibrium must now give place to a new one, and amidst the agitations and perturbations of this period a new and safe balance is not quickly nor readily found. The companions and associates, the direction given to the thoughts by the influence of others, are now of great importance in guiding the selection of the individual;

and the effect of previous habits of life and thought will manifest themselves. As surely as inborn physical tendencies now develop themselves, so certainly will psychical leadings unfold themselves, and the effect of inheritance and individual thought become apparent. Now evil influences and practices will come to light; as hidden buds become developed and show themselves in sunlight, so will the hidden feelings unveil themselves under the fire of passion, with consequences often tragic. Habits of self-restraint now bear fruit in enabling the individual to preserve the requisite self-control; habits of self-indulgence, habits which weaken the power that bows the will, will now reveal themselves in the hour of trial. The child whose mind is pure and its body healthy will come out of the trial scathless, and mental purity will exercise its control in restraining the animal impulses; but the precocious, mentally impure child is left the prey of consuming passion, incapable of resisting the force of the new impulses.

These varied developments exercise a most material effect upon the health of the individual. Where mental purity gives its helping-hand to physical self-restraint the health of the individual may remain unaffected, and the time of trial pass away without leaving many traces of the struggle; but where mental undevelopment is linked with physical precocity, habits and practices will become established which will exercise a most malign influence over the individual, leading directly to serious and grave nervous diseases, or indirectly to constitutional ruin in the future. The disturbing effect upon the nervous system leads to terrible and incurable maladies in the victim of malpractices, which will sooner or later overtake him, whether he err in ignorance or sin from depravity. And the results will be in direct

proportion to the offences; and though not apparent to his vision at the time, will at length loom in the future and then speedily become a grim reality. The laws of nature are inexorable, and no plea of extenuating circumstances is of the slightest avail; the reward will be rigidly meted out in strict proportion to the offence, and the sentence take effect in due course. A knowledge, no matter how acquired, of the consequences may snatch the victim from the fate which lies before him, and by forsaking his ways he may escape a severer punishment; still the day will come when 'his sin shall find him out.'

After puberty another potent sensation is added to the stimuli which move us to action. The natural love of the opposite sex will in one form an incentive to high and ennobling action, in another the motive power to brutalising indulgence. With one man a deeply rooted affection towards a worthy object will raise him up to a higher platform of thought and action; with another man a resistless passion for some worthless or designing woman will drag his name and honour through the dust. With woman this new power is even more potent.[1] Forbidden to her speech, it preys too often upon her thought. It is to one a pure sentiment leading to self-denial, to perfect subordination of self to another, and from a devoted daughter develops a perfect wife and mother; to another it is an absorbing passion, which entails loss of name, fame, family, and self-respect, and leaves the victim of it a hopeless outcast. It becomes a ruling power, and after puberty is one of the great mainsprings of human action, whose influence must never be left out of our calculations, either in estimating

[1] 'Love is but an episode in the life of man: it is the whole history of the life of woman.'—*Madame de Stael.*

the sinner or the saint, and in it will we find the explanation of many an unaccountable and inconsistent action. The religions of the earth have all attempted to bend this passion to their yoke, but with little success. It is not to be bound in chains as if it were an escaped demon; it is the ruling passion, the privilege of maturity, and it has not to be fought with: it has to be understood. Neither does it follow that those by whom the perturbations of this period are most keenly felt are not those who will ride out the storm most gallantly. The shy, distant boy whose imagination is fed by poetry or other lofty thought, and who is reserved and distant, will in time come out of this moodiness with a strong and healthful spirit in an untainted body, with the elements of strength for an after-day; the girl who is wayward and reticent, holding herself aloof in mind and presence from those around her, may emerge in time from this self-enforced seclusion and be a high-souled, true woman, with holy aspirations and lofty ideas, combined with a consistent practice and walk in life; who lives an example and an ever-existing stimulus to higher thought and nobler action in others. Their very susceptibility at this period testifies that they possess something which lifts them above that mediocrity which is alike the ruin of individuals and of nations. It often happens that the greatest obvious disturbance is to be found in those who are courageously struggling to subordinate the animal impulses to the aspirations of the mind; there is less outward sign in those who either do not feel the struggle, or, feeling it, ignominiously submit the better part, and take their lower place without any outward show of sense of degradation. They feel no high calls of duty demanding their allegiance, no matter at what cost to their peace

or comfort; they have done nothing but compromise betwixt their desires and their dreads; they have done nothing to entitle them either to our regard or their own respect.

From out of this mixture of chaos and trial all in time emerge; some but wrecks drifting on the face of the troubled waters still seething and foaming from the recent storm; while others, almost intact, sail steadily away along the path of life, their remembrance of the hurricane gradually becoming less and less vivid, and its characters growing less and less distinct. But none emerge without an alteration of figure and character. The outlines of childhood are exchanged for the characteristics of maturity, the features lose their smooth contour and come out in the stronger lines of early manhood, soon to develop into still more marked features; or the prettiness of girlhood, often temporarily obscured, emerges in the form of the beauty of budding womanhood, and the girlish figure of the favourite child develops into the fuller figure of the object of the aspirations of the ruder sex, the future empress of the hearth, the light of later life. Nor does a proper consideration of this period and its influences interfere with our keen relish for purity in woman—not mere continence in action, but chastity of thought—which has always been so marked a characteristic of the Saxon people, in this at least the highest of the noble Teuton race. There is a healthy knowledge and an unhealthy unclean ignorance. It is not the knowledge, but how we regard it: that is the point!

At this period great attention to the health is imperative; not only that, but sufficient mental occupation is absolutely necessary to divert the thoughts from self-introspection, and to divert the energies, now quickly

developing, into healthy channels. In woman there is much to be attended to, to which no allusion can be made here: it lies betwixt their nearest female relative and their family medical man; but especial care is often required to ward off in girls that painful blended compound of mental mobility and actual physical disorder denominated hysteria. And each case has its own individual peculiarities and demands especial treatment. No rules can be laid down here. If the above analysis of the condition called puberty is insufficient to enable each parent and reader to understand the case, further explanation would not be more successful. Boys need less care; the more robust but less sensitive nervous system of the male carries him more easily through this trial, and the distractions of his age, his emulation and ambition, and perhaps his lower standard of mental purity, permit of the change being brought about with less disturbance, and he slips more readily into the new groove.

Many dangers beset this period which are only to be obviated by an intelligent comprehension, both of the nature of the change inaugurated and of the exigencies of the individual. Consumption is still an ever-present possible danger, too rapid growth rendering its oncome a source of much anxiety; the effect of the changes undergone upon the nervous system, now freighted with a new burden, renders it liable to disease and disorder, which bear out and illustrate the importance of what has been written above. Much, indeed, of the health, or the want of it, of after-life will depend upon the consequences of this change, and the mode of its accomplishment; though its importance is generally disguised, and the consideration even of the matter objected to and even forbidden. The effects of a com-

bination of bodily and moral health will be persistently apparent, and so will the consequences of the opposite condition.

There is nothing special in the growth after puberty to call for comment here; the rules and instructions given as suitable to early childhood are applicable still; if insufficient, they must be combined with the explanations and directions to be given in the next chapter, in which will be considered the maintenance of health in maturity; the mere maintenance of integrity.

PROPOSITIONS.

1. Infants are very susceptible to cold, and consequently need much care and warmth.
2. Milk is the natural food of infants; and farinaceous food and water are not a proper substitute for it.
3. Diarrhœa is the natural means of removing indigestible material from the bowels.
4. Animal food may be given to children in small quantities after the appearance of the molar teeth.
5. The nervous system of the infant is very sensitive to impressions communicated from the mother, both during pregnancy and the period of suckling.
6. Fits of passion or 'nerve-storms' in childhood are very injurious.
7. Precocity in a child is undesirable.
8. Both 'coddling' and 'hardening' children are unadvisable, when carried too far.
9. Growing children demand ample supplies of food to meet the double demands of growth and of daily wear and tear.
10. Fat is a necessary constituent of the food of growing children; and persistent refusal of it is a common cause of tubercle. (See Prop. 14.)

11. Bathing is a very wholesome practice, but certain precautions are necessary, especially against too long exposure to cold—either in the water or out of it.
12. Fresh air is absolutely necessary to growing children, and exercise may be profitably combined with it, as in outdoor games.
13. Toil is incompatible with health and growth.
14. 'Tubercle' is merely a modified form of tissue-growth, to which some families are more prone than others.
15. The period of puberty is a trying time: both as regards mental and bodily health.*
16. More acquaintance with the effects of this change upon mind and body is desirable.

* See Appendix.

CHAPTER III.

IN MATURITY—THE MAINTENANCE OF INTEGRITY.

We have seen in the preceding chapter how the human infant gradually develops from its first baby existence up to the time when it reaches the initiation of maturity, and emerges from its chrysalis condition of growth into the fulness of its reproductive existence. At this period the vault of the forehead takes on a more marked character; the expression of the features indicates a growing self-reliance, and tells of the busy intellect learning to accustom itself to its new ideas and sensations; and the gait shows us how the walk of childhood is giving way to 'the sure and steady step of man.' The perceptive powers are undergoing rapid development, and the changes in the external appearance go on hand-in-hand with mental changes and evolution. That during such rapid change and growth great care of the health is requisite is at once obvious to all; and if the indications and suggestions made in the foregoing chapter are carefully followed out, and the constitution be fairly good, maturity is usually reached without any untoward accompaniments.

Man in his maturity is the most wonderful of all living beings. His remarkable powers of construction, of aiding his natural powers by tools and weapons, his adaptability to various modes of life, to an existence

either upon land or water, his capacity to endure the tropical heat, or by means of clothes to sustain with impunity all the vigour of an arctic winter—all excite our admiration.

In the matter of clothes there is a wide gap betwixt man and the brute creation beneath him. No animal, however naturally acute or quickened by association with man, has ever reached an idea of clothing themselves: they may wear, and evince pleasure in doing so, the coverings provided for them by man, but they never provide any for themselves: they voluntarily seek shelter and a warm corner, but that is all. But man has not only coverings to protect him, but they are soon seen to be ornamental as well as useful. So, too, elaborate buildings house him, his family, his domestics, and his animals; and complicated contrivances secure to him a free supply of fresh air, without the active current called a draught. Animals he has subordinated to his use: the wool of one he weaves into raiment, the skin of another protects his hands and feet, while a third he converts into his bond slave, uses him for the hardest parts of his labour and as an aid to his locomotion, or an auxiliary in his wars. All these are the outcomes of the brain now approaching its full perfection.

His frame, having ceased to grow in height, becomes firmer and more compact, and the joints more closely knit. The lax limbs of boyhood merge into the firmly-borne extremities of man. The shoulders become broader, the body better poised, and the carriage more erect. The dignity of manhood is as perceptible in his gait as in his face, now becoming more or less covered with hair. The games of childhood are being abandoned for the more profitable pursuits of adult life, and the

frame now becoming broad and well set is fitted for the arduous occupations which may be the result of choice, or more frequently the consequence of necessity. The dexterity of his right hand may secure for one a less arduous existence as a handicraftsman of the higher grades: the mature intellect enables another to exist by the fruits of his thought as a professional man. And here education exercises a powerful control over the choice of an occupation, and consequently over the health of man as affected by his occupation. Where education has been neglected man must fall back upon his thews and sinews, and labour more or less unskilled is his lot; with all the exposure and other outcomes of his toil affecting him. Where the intellect has been cultivated the choice is not so restricted, and occupations exercising both body and mind become practicable. These are the best pursuits for man as regards the preservation of his health.

Where man is left too much to his mere muscular efforts, without the mind being engaged, we find disease engendered, and that too to a decided extent. The monotonous occupations entailed by the division of labour, and the mental lethargy entailed by a form of labour making no demand upon the intellectual powers, leave the persons engaged in such labour a prey to every form of excitement when the work hours are over. Drunkenness, political and theological agitation, bursts of excitement, and a sensational literature of the lowest order, are part of the price mankind pays for the development of industrial enterprise. Insanity dogs the neglect of the intellect even more than over-use of it, aud the percentage of insanity among field labourers is much higher than among the professional classes. Education, and even still more, self-education, is of the

highest service in maintaining the health of the adult where his labour is entirely bodily. Some forms of labour however which entail only a constant but slight attention of the mind have been productive of many leading intellects, and of these pursuits cobbling is perhaps the most remarkable. In past times the shoemaker was the politician and controversialist of the village *par excellence*.

On the other hand, where the occupations pursued entail the application of the mental powers, exercise of the body, and especially outdoor exercise, has been found almost indispensable to health. Hence the cricket clubs, football clubs, the boat races, the athletic sports, now found everywhere in the neighbourhood of communities of young men who live by labour not entailing bodily exercise. The gymnasium, the billiard room, dumb-bells, Indian clubs, and a thousand other indoor exercises, testify to the widespread conviction of their utility in the preservation of health. The healthful outdoor exercises furnish to men whose occupation is indoor, and whose pursuits are sedentary, that muscular action which is so desirable. So great is the attention now paid to athletic sports, that the danger most imminent at present is that by a combination of occupation chiefly routine, and making small demands upon the intellect, and an almost exclusive devotion to field sports, Young England is neglecting his mental cultivation and is becoming pronouncedly unintellectual. But really, betwixt a 'cold logic engine,' like John Stuart Mill, and a mere muscular brute like Geoffrey Delamayne,[1] the choice is somewhat an invidious one. But betwixt these two extremes lie scores of combina-

[1] Wilkie Collins' *Man and Wife*. The character, however, is certainly overdrawn.

tions; and there are many profound thinkers who enjoy muscular exercises and benefit by them, finding their thought fresher, keener, and clearer for their bodily exertion; and hundreds of young men fond of athletic pursuits who have good mental qualities, and possess self-denial, a heroism often terribly unromantic, and warm generous hearts with affectionate dispositions. The proper combination of bodily exercise and intellectual labour, no matter which is the one entailed by the pursuit, the other being the self-selected choice, is one of the best preservatives of health, of really good and perfect health, embracing a good physique and a sound intellect.

The impossibility almost of genuine intellectual activity in the actual life of the handicraftsman and the artizan in large industrial centres, has rendered them always a source of uneasiness to their rulers and governments, from the unquestionable tendency that exists in such congregations to outbreaks, periodical and emotional, which take their origin in uncultivated, untrained thought. And I presume the question of a severe blow from a policeman's truncheon, with its consequences, the result of unhealthy thought, is just as worthy and deserving of our attention, as that of typhoid fever from systematic neglect of sanitary laws. Both alike affect the health.

The artizan is indeed an object for our solicitous thought and care. Not by any means that he is unfit and incapable of taking proper care of himself; for he is perfectly competent to tell what it is that he wants, but too often he cannot get it. The myriads of families on the Surrey side of London, or along the course of the Great Eastern Railway from Bishopsgate Street, remain there not from a natural and instinctive prefer-

ence for these dingy, smoky quarters, with the re-breathed air the stranger feels so stifling, but simply because nothing better is feasible. The expense, the consumption of time, or the exertion involved in living out of town, in spite of strikes, workman's trains, &c. all unite to compel him to remain in his old quarters; no matter how strong the wish to escape, or the desire to see his children enjoying the fresher air of the suburbs. There is no question but that the artizan could do a much better day's work, more valuable to his employer and more profitable to himself, if he could sleep in country air and come into town reinvigorated with a sense of energy, by a reserve fund of pure oxygen, every morning, to his labour. But while this is feasible enough to the city man speeding away in his special fast trains, and his carriage to meet him if wet, it is far from practicable to the handicraftsman or labourer of Whitechapel. All that the latter can do is to make the best of existing possibilities, as far as he knows, and so far as he is able.

And it is obvious that personal habits must exercise a profound influence over each of these men, and tend to modify the effects of their surroundings. Thus the Whitechapel man may be fond of a bath whenever practicable; he may be sober and continent, and by longer hours of sleep atone for the imperfect rest entailed by want of oxygen; he may make the best of what is possible, and so be in actually better health than the man who, while coming in and out of town daily, lives in an insanitary, ill-drained, damp house; eats unsuitable and indigestible food, and drinks large quantities of fluids more or less adulterated and deleterious; plays billiards till after midnight, and, while having the opportunity of fresh air, contaminates

it continually by the products of gas combustion and cigar smoke; and cuts down his hours of sleep to the practicable minimum. In fact if the artizan would but take somewhat more care of himself, his death rate would not be nearly so high, but how he is to be brought to see this, it is not so easy to say. The large amount of his income which he expends upon himself is out of all due proportion, and is in excess of that of persons in a higher walk of life who would be called extravagant. Even a couple of pints of sound ale per diem, however satisfactory from a gustatory point of view, or even from the standpoint of enabling a man to work better, is a serious expenditure out of an income of twenty shillings weekly. The ale costs eight pence per diem, four shillings and eightpence a week; nearly a fourth of the wages, and allowing for an extra pint on Saturday night, fully 25 per cent. of the entire income. But a yearly bill of 250*l.* for wine, spirits, and beer, in an income of 1,000*l.* per annum, would be thought very disproportionate. There is this difference betwixt the alcoholic indulgence of the two classes; the one exercises it at the cost of denial in really important matters, which ought to come first; in the other the alcoholic excess necessitates no such privation. The effects of stimulation cannot so easily be compared, but the effect of it upon the health of all classes and its terrible influence in the production of disease, especially during the period of man's maturity when his liability to disease is at its lowest, must not be underrated. The fatal consequences of alcoholic excess every year transcend by far the loss of life entailed even by a bloody war.

How long it will be ere the artizan can leave his work in the evening and rejoin his family in a spread-

ing village along the crest of a Surrey hill, and play with his children in the light of a brilliant sunset, or go with them for a stroll till green fields and leafy hedgerows steep in oblivion, for a brief while, his consciousness of warehouses, vans, and thoroughfares, it is impossible to say. But such an existence would not only be much more healthful, but much more attractive than a dingy street, incessant noise from the children strenuously endeavouring to amuse themselves in their limited playground, and the flaring tavern which is there incessantly inviting him and tempting him. The artizan must not be blamed too severely for not being better than what he is; given better opportunities, doubtless he would be a better man.

But the two classes of wealthy city men and London labourers are after all but a small section of the people of England and her colonies, and the peculiarities of their existence on the part of many other classes claim our attention. The agricultural labourer is quite as deserving of our notice. He is certainly in better circumstances than the town artizan as regards fresh air, at least in the day time, but the frequently villanous condition of his cottage, the outrage of all sanitary laws, of cleanliness, of purity other than bodily, entailed by the huddling together promiscuously of both sexes and all ages, his aversion to ventilation and his insufficient dietary, all tell upon his health. The deterioration of the physique of the labourer in many of the southern counties as compared to the border counties is really a very grave matter. From such parents healthy children cannot be expected. Abundant food alone could rescue them from the condition which otherwise lies before them, and that abundance of food is not forthcoming; after the father's needs are

supplied and his daily necessities met,—the food absolutely demanded by his system in order to perform his labour and to sustain him in his toil being furnished to him,—no superabundance remains to improve the physique of his children; in whom to an unhealthy inherited frame must be added the effects of a chronic semi-starvation. The prospects of the agricultural labourer in many counties do not form a pleasant subject for thought, when it is engaged upon health.

The collier is a subject of interest to us, for in addition to the dangers arising from an insanitary village, crowded round the mouth of a pit or lying in its immediate neighbourhood, and a thorough and complete ignorance of hygiene, he is exposed to the dangers inseparable from his occupation, and to the consequences of an imperfect ventilation. The high temperature in which he works, the rapid changes from the warm pit into the cold air, with his clothes drenched with perspiration, and the natural resistance of the body lowered by physical exhaustion, leave the collier excessively liable to inflammation.

Domestic servants form a very large section of our population, and the peculiarities of their position claim our attention and sympathy. Removed from home, amidst strangers, with a character to earn, a great many temptations to resist, and not always the most perfect of examples set by the family where she finds her home for the time being, the maidservant of England is not placed in circumstances always favourable to her bodily or moral health. There is generally, however, an abundance of food, fair sleeping-rooms, and good day rooms, in the better families; while personal cleanliness is essential to their position. This is the case in the better houses, and such domestic service is

hygienically much better than the half-starved existence of the occupation where the girl is permitted to dress as she pleases, to call herself Miss So-and-so, and to regard herself as a young lady. But even in the best of houses the health of servants suffers, running up and down stairs, often carrying heavy weights, late hours to bed and early ones to rise at; brief intermissions of out-door existence, monotony of thought leading to quarrelling, or the depression arising from the callous indifference usually displayed to their psychical wants and necessities on the part of their employers; the constant pressure of their duties making no allowance for sickness or exhaustion: all combine to break down the health of domestic servants. Much too must be laid at the door of inconsiderate mistresses, of wives who are ignorant of proper house management, who overtask the servants on the one hand, and permit them on the other to run into danger from want of proper supervision. For it must be remembered that the domestic, attending daily to others' wishes while her own cravings and thoughts are matters of the most thorough indifference to all around and above her, is likely to seek the interest and sympathy of some one, and so her young man becomes all in all to her—not always for her good. While the condition of the above class of servants is far from exciting our pity—indeed, as times go they are as well off as the best—the servant in a large family where the mother keeps a little shop, or in the lower lodging-house and the humbler eating-house, is indeed an object for sympathy. Any attention to health is almost out of all question, and the condition of these poor creatures, when in ill-health they present themselves to the out-patient room of a hospital or dispensary, is simply heartrending. Any

directions or advice seems hopeless, and they are prescribed for with almost a sensation of despair. The sanitary condition of the labourer and his family, even in crowded neighbourhoods, is not more deplorably bad or profoundly pitiable than is that of the overworked, ill-fed, badly couched, and utterly neglected and not unfrequently imbecile low class maid-of-all-work.

The growth of a family, or the other exigencies of the individual, together with the inborn roving habits which the Anglo-Saxon has derived from his adventurous ancestors the old Norse pirates, often demand a change of residence, a removal to some less crowded country, a change now so easily accomplished.

Emigration has been for long and still remains a great movement. Its effect upon the health is probably the last of the many considerations which are entertained in the matter. And yet this removal to a new country is not without important effects. Who can fancy the exposure to a Canadian winter, or an Australian summer, without proper precautions suited to each, as being without effect? Constantly comes back the report that one or more of the members of a family have been ill soon after their arrival at the land of their adoption. The wonder rather is that the occurrence of such disease is not more regular and constant than it is. The mild winter of England gives one no idea of the necessities of a winter away from the Gulf Stream, with its demands and requirements for thick clothing and stout gloves. Not only so, but there is danger in the recklessness shown in the retention of English habits in an almost tropical climate. When we think how cold weather alone enables most of us to go through the course of festivities which Christmas seems to demand, without suffering for our efforts, what must be the

consequences of a Christmas dinner after a hot toiling walk under an Australian sun in his summer solstice? Exposure to malaria, the consequences of which are commonly called 'fever and ague,' is often the consequence of change of residence to some marshy undrained district, against which the emigrant should be upon his guard. He should always too adopt any custom, which, however new and strange, he finds in use among the settlers of a new country. Those who have preceded him have had the like Saxon unwillingness to adopt a new habit, and have only done so from necessity, the reasons for which may not always be apparent. It is better to fall into it at once, and then seek for its explanation. Especially is this caution necessary in the matter of food. Thus the newly arrived emigrant in India goes on with his English food, his bottled beer, wine, &c., and is ere long a broken-down, jaundiced creature, whose liver has been ruined, firstly by the work thrown upon it in the accumulation of bile in it in excess, the climate only requiring sparing quantities of food, and secondly by the medicine taken to relieve this condition. Where the habits of the natives are adopted, and rice, rendered palatable and healthful by the addition of spices in the form of currie, forms the staple of existence, and the beverages in use by the natives are consumed instead of European drinks, the health is often little disturbed. A well-known physician, now deceased, met in inter-tropical Africa an Englishman who had lived there between thirty and forty years in the enjoyment of perfect health. At first his health had suffered, but after various futile attempts to improve it, he pursued as closely as possible the mode of life of the native, and from that time had experienced no serious illness.

(Copland.) It is no answer to this to point to the undoubted fact that occasionally natives have suffered more severely than Europeans from their own endemic diseases. In these cases the health of the native is already broken, and though acclimatised, they possess less resisting power than the unseasoned stranger.

In hot climates the rice diet, along with juicy fruits, is the one best suited to maintain the health, and to ward off as far as is practicable the diseases of the locality.

On the other hand, removal to a decidedly colder climate demands free supplies of fatty food, which are readily digested and burnt off to maintain the body temperature. The Esquimaux will drink his two gallons of oil daily, along with enormous quantities of food chiefly animal, not only with impunity, but without it his very existence would be endangered. Were he to be put upon the diet of the Hindoo, no matter how liberal the quantity, he would quickly perish of cold. Even with the stomach of an ox he could not extract enough of heat-giving material from boiled rice to maintain his temperature. In his case death would probably come quickly, but if the starvation was more gradual he would die a more lingering death. Thus the negro and the monkey are very apt indeed to die of consumption in this country, because their digestive organs are not accustomed to digest other than farinaceous food, and they cannot assimilate the fat required to maintain their temperature and their tissue changes in an English winter. The consequence is they are the victims of tubercle and consumption. The unusual liability of the Irish in America to die of consumption is also probably due to some inadaptability to the requirements of their new country.

In travelling the same thing is seen, though to a less extent than in emigration, and the superior power of adaptation to the wants and requirements of the country explains the health of one person, and the want of it much of the ill-health of another. The light food, consisting largely of fruits, and confined to vegetables, which obtains in southern Europe, especially in summer, is suited to the needs of the inhabitants, and should be adopted by the traveller. But usually the British traveller goes to hotels where he can have the dietary of his native land, and then when he becomes ill he lays his illness at the door of the unhealthy climate, or to the neglect of sanitary arrangements, and but rarely to its real cause, viz. his own stiff-necked adherence to a diet unsuited to the clime in which he is.

Abroad as well as at home the personal habits of each man and woman exercise a great influence over the health, and indifference to those laws, called sanitary, is usually followed by sickness and disease. Since the painter and the pewterer have learnt to wash their hands ere eating, there is much less lead poisoning than there was, while the growing attention to the skin and the prevailing use of the bath are doing much to counteract forces which would otherwise, and do somewhat in spite of them, act unfavourably. But the use of the bath to produce a feeling of energy, of complete wakefulness, which is awanting from the scanty hours of sleep or from defective supplies of oxygen, will not maintain even its most devoted votary in health: there is no panacea for outraged laws.

Amidst the most fertile causes of disease at present is overwork, a constant strain upon the system, or undue demand upon the forces of the individual. So

important indeed is the part it plays in the production of disease, that a special chapter will be devoted to it further on, where the effects of intellectual overwork and bodily overwork will be discussed with something like an approach to the importance the subject deserves.

But the exciting causes of disease in the period of maturity, after the system is fully developed and ere it is commencing to give way to those changes which constitute decay, are to a great extent luxury, intemperance, and indulgence.

Except amidst the most indigent, some excess in diet is the rule, even amidst dyspeptics. Those last almost habitually test the stretching power of the endurance of their digestive organs, in their attempts to consume food in something like the proportions taken by other people. The systematic indulgence in alcoholic beverages is sadly too common, and these, in spite of their costliness, the most indigent will have, hook or crook. The indulgence of our favourite desires, no matter what, is often the exciting cause of disease. The combination of this last with the one immediately before us is the cause of disease *par excellence* during this period of life in both sexes. The blending of these different factors produces those constitutional diseases which tell upon the individual and press upon his progeny. Thus gout and syphilis are introduced; two baneful diseases which too often constitute an inheritance.

On the other hand we find that consumption is the destiny before many, partly from neglect of passing pulmonary ailments which ought to be attended to at once—a far more fertile cause of it than is commonly imagined; partly as the consequence of imperfect

nutrition grafted on constitutional weakness. A delicate child who has to labour for its sustenance finds at once its choice terribly limited, and the clerkship or shopman's place to which the choice is almost confined are too often unattainable amidst the crowd of applicants. But grant that it is attained, it is a meagre existence which too commonly is alone possible. The duties do not demand a high order of intellect, and as the supply is great the salaries are small: that is, at first; a more liberal salary follows sustained health and enduring fitness for the post. Ordinarily it is a mere pittance which will scarcely keep body and soul together as long as the young man is single. But very frequently he prefers to marry, and finds no difficulty in prevailing upon some non-reflecting or self-denying girl to join him in solving the impracticable problem of how to enable two to live on what is insufficient for one. The terrible sufferings endured by such people, especially when there comes one, and then several additions to their family, are simply indescribable. A condition of imperfect nutrition, which may not unfairly be termed semi-starvation, obtains, and the consequence is disease in the father or mother, more self-denial and privation; then tubercle, the outcome of malnutrition, and general disease with several deaths. There is nothing overdrawn in this picture; the saddest part about it is its grim truthfulness.

Another fertile cause of disease is decay of the teeth. In spite of dentists, of modern inventions, and every form of tooth powder, disease in these necessary articles is steadily on the increase. The most recent views are that this is due to acids in the saliva, or in the articles of food, especially in the increasing use of sugar (to compensate the modern aversion to fat) which readily

breaks up into acid, and of course to the omnipresent germs. About the unfortunate consequences of the great amount of sugar both added to our food, and in the perfectly gratuitous abuse of it so prevalent under the name of sweets, now used among us, there is no doubt. In old days fruit was eaten with milk to take away its sourness, or it was accompanied by paste, the action of which was to mechanically remove the sugar from the teeth, and so do away with its deposit, and subsequent fermentation and effect upon the teeth: but now the sweetened fruit is picked out and the paste rejected. The lessened consumption of fat also increases the demand for hydrocarbons, especially for the pleasant tasted saccharine forms. The substitution of sweets for fat, and the increasing consumption indulged in by both children and adults alike, are acting ruinously upon the teeth, to the prejudice both of health and appearance. When the teeth are decayed mastication is imperfect, and so the food is not prepared for the stomach, and consequently is not digested, while during the agonies of toothache all food almost is rejected. The effects of the decay of the teeth soon manifest themselves in the general appearance. Brushing the teeth is not required to keep them white, as the best teeth, as well as the whitest, are found in savage tribes, among sailors and gipsies, who certainly do not regard tooth-brushes as part of their necessaries of life. Many of the dentifrices contain an acid which by constantly eating away a thin surface of the enamel keeps the teeth brilliantly white, but in time leads to their utter destruction.

Not that there is anything of disease in spareness itself. Indeed, a great many people are extremely thin and yet enjoy good health; but spareness in those not

so disposed by inheritance is not a pleasant sign. It is often, indeed commonly, the precursor of serious wasting disease. In the majority of cases the condition is a natural one, and no pains almost will produce a condition of plumpness. In Dahomey the king's wives are fattened by being kept quiet and being fed with boiled rice and butter; nor does failure of the plan seem to be anticipated, any more than the farmer fears failure when fattening his stock. But such a régime would scarcely be endured by any sylph, however sighing after plumpness.

The opposite condition, obesity, is more amenable to control in most instances, but Mr. Banting found it no easy task to reduce his proportions. He did at last succeed by cutting off all the material of his food which was calculated to produce fat; but he substituted for it any amount of lean food, a most unwise plan of action. Excessive quantities of lean food greatly tax the kidneys, upon which organs falls chiefly the labour of the elimination of the waste matters of such food, and that condition of chronic kidney disease called 'Bright's disease,' is so engendered. Great abstinence, especially in fat-forming material, will alone safely induce reduction; the substitution of one form of food for another showed a lack of physiological knowledge in Mr. Banting's adviser. The stout and the spare must alike learn to bear patiently a condition which is little more under their control than the shape of their nose or the nature of their complexion.

Two very ruinous practices are commonly resorted to by girls who are becoming alarmed at their plumpness, and upon whom the dread of being fat weighs like an incubus; and these are the consumption of vinegar to produce thinness, and of rice, to cause the complexion

to become paler. The first acts by so affecting the nutrition as in reality to artificially procure starvation; the vinegar in smaller doses retarding digestion, in larger ones arresting it. 'The amount of acid which will keep persons thin, will destroy their digestive powers.' Those who will persist in reducing themselves by taking vinegar must bear in mind what has been said before about the relation of consumption to chronic semi-starvation. Rice is eaten raw in large quantities by girls who are afraid of excessive rosiness, with the effect of diminishing their appetite for suitable food, of interfering with assimilation, and locking up the bowels. By this combined action the desired pallor is induced; this pallor, however, is the consequence of impaired health, and the practice is one which cannot be too strongly condemned or forbidden. The desire to look attractive by modifying or altering the appearance is the foundation of a great portion of ill-health among females. This desire does not, in all probability, take its origin so much in individual and personal vanity, as in a slavish devotion to the social laws which women have imposed upon themselves, and which rule them with such stern severity. It requires, indeed, a great exercise of moral courage for a woman to set at defiance any one of these social demands upon them, no matter how great the necessity for doing so. The social ostracism which would follow any rebellion against the decrees of 'fashion' and 'society' is too much for the great majority of the affluent classes, and in unspoken protestation they bow to the decrees, and alternately present a handbell-like appearance, and at another a painfully crippling narrowness of skirt: at one time exposing the head and face almost unprotected to the blast in the tiniest of bonnets, and then loading the

head with masses of seaweed and false hair, until a weight, equal almost to a guardsman's bearskin, is imposed; and with this head-covering they go through the long evenings at the theatre &c., or even through the still severer trial of the heated ball-room. The exposure to a fierce March blast of a large crowd of ladies shivering in their low dresses at a recent royal levée called forth many appropriate remarks from the press. What an amount of disease and suffering followed that single morning's exposure, it is impossible to calculate! Those ladies had come from a warm bedroom into an equally warm breakfast-room, and then into a dressing-room of equally high temperature; had been clothed (?) in a dress which, while it hung with a heavy drag upon the hips from the weight of the train, left the upper part of the chest completely exposed—the parts usually so well covered by shawl &c.—and were then conveyed carefully in a close carriage to their destination, to be suddenly exposed to a piercing blast, and that too for no inconsiderable time.

We can all see how unavoidably disease can be so induced, and are conscious of the absurdity, if not something worse, of such conduct; but to a less marked extent such exposure is being constantly undergone. The solemn dictates of fashion and of custom do not permit the softer sex to follow the suggestions of common sense and of the knowledge of the natural man. More especially in those ceremonials connected with our religious life do we see the subordination of the desirable to the production of effect, and the attire of bridal parties and of catechumens at confirmation, is usually in flagrant violation of the dictates of health. Perhaps the greatest violation of these dictates is shown in the matter of shoes and boots. We are all of us susceptible

to a pretty, well-formed foot, more especially if of small dimensions; and this, together with the routine of feminine existence, has led to the adoption of slight materials in the construction of female shoes. This is not objectionable as long as the wearer is indoors or in a carriage, but when walking the shoes should be of fairly substantial character, not only to prevent the feet from spreading out and the ankles from yielding, but also to avoid that great source of trouble to females, cold feet. There is neither health nor comfort in cold feet, as too many women know only too well. They are the fertile parents of no end of discomfort and ill-health. The avoidance then of cold feet is one of the most direct steps to the improvement of the health. For such end to be attained the shoes must be fairly substantial and not of too soft and porous leather. Women's boots and shoes are largely made of leather tanned with terra Japonica, which is far inferior to leather tanned with bark, especially as regards the absorption of moisture. Such leather forms the soles of all cheap boots, to which class women's boots too exclusively belong. When then such boots are placed on a wet flagstone, or on damp roads, the leather becomes moist, and then the feet become cold at once. Leather when dry is a very bad conductor of heat, and so a stocking and a leather shoe are sufficient protection for the feet in climates so cold that furs are requisite for the clothing; when wet, however, heat is quickly conducted off, and so the damp shoe leads directly to cold feet. Anyone who has lived much in the saddle knows the difference felt by the wet foot and the dry foot in reference to the iron stirrup in cold weather; when the boot is dry the stirrup is not felt, that is, as regards the sensation of heat and cold, but let the foot be put where the boot becomes moist,

and then the stirrup is felt quickly and distinctly enough. For delicate women who are very susceptible to cold feet, the boots should be stout and large enough to admit of a cork sole. More particularly is such precaution necessary where there is a clay soil; this remains damp for days after rain has ceased, and strikes cold to the feet when looking temptingly dry, consequently stout boots are absolutely necessary on such soils. On the sandy gravel bed of the Thames, in summer especially, the surface is dry in an hour or so after rain, and a walk out in thin shoes may produce no bad effect, but for outdoor exercise on most subsoils good soles are requisite.

If this subject has taken up a somewhat large portion of this section it is not out of proportion to its importance; indeed, the subject ought to have been discussed at greater length.

Next to this grave matter of shoes comes the question of female dress. This is usually hung from the hips and drags heavily upon the waistband, tightly encircling the abdomen, and so pressing down its contents. This is not quite so great an evil since the introduction of drawers into the list of articles of feminine apparel, but still heavy masses of dress, petticoats and skirts, are too frequently worn. The skirt of the dress is really only to conceal the lower limbs in conformity with custom, and a pair of doeskin or flannel drawers will give more comfort than several layers of dress, flannel or quilted work, fashioned as a skirt or petticoat.

The corset, too, which within certain limits is not objectionable, is too often an utter abomination, and in the older days of stays, with a huge wooden 'staysbone' in front, and eyelet holes with a lace at the back, a

maid might be seen lacing up, hole by hole, her unhappy mistress; whose bust was driven out at the top of the stays in a most repulsive manner, her respiratory movements almost arrested, and her abdominal viscera squeezed till the indentations of the ribs upon the liver could be distinctly seen on examination after death. The pressure exerted by the combined action of stays and heavy skirts upon the contents of the abdomen and pelvis is most baneful, and displacement of the womb is one of the commonest consequences. The dress arrangements of women are radically bad and need great reform.

The habits of women exercise great influence over their health, especially in combination with their dress. Mostly the habits of women tend to an indoor and a sedentary life. Social exigencies too frequently aggravate this action, and the space of time which too commonly intervenes betwixt each evacuation of the bladder and bowels is much too prolonged. This loading of the pelvis, in addition to the action of hanging skirts and compressing corsets, is a fertile source of female ailments, and is a large factor in the production of those feminine troubles which constitute the great portion of the ill-health of the adult female. The absence of sufficient bodily exercise also tends to foster the imperfect action of the bowels. Constant and regular exercise, the use of the cold bath, especially of the hip bath, and even still more the bidet, a laxative pill occasionally, firmer beds and fewer bedclothes, would soon make a decided change for the better in the health of most females; and some modifications in the dress, if more radical change be impracticable, would aid much in the production of such result.

In the more affluent classes the demands made by

usage and by social customs counteract to a great extent the advantages which they possess from their freedom from toil and its results, and from exposure to the weather—two important excitants of disease in women as well as men of the poorer classes—so that the comparative health of women in different ranks of life is much more equal than is commonly supposed.

We will now glance at the health of woman in the three divisions ordinarily found in woman's adult existence, viz., as spinster, wife, and matron.

During the first period of this life woman is maturing those changes inaugurated at puberty, and the system is becoming accustomed to the new forces whose first effects are so disturbing. The mind is equally affected along with the body, and new studies and new occupations mark the change. The mind is susceptible and emotional, and works of fiction of a sentimental character are agreeable and fall in with the ideas belonging to this time, while those of a sensational character relieve the monotony of her quiet existence. Having a restricted life herself, the mind revels in scenes and positions contrasting so strongly with the calm reality of her own life; and too commonly a distaste to the actual life is engendered, or a distraction of the mind from the reality is induced. In others a religious life better meets the cravings after something above and beyond their real life, and many a self-sacrifice is patiently endured and self-denial practised at the dictates of this higher aspiration; too often, however, with injurious effects upon the health. At other times and in others, a life of self-indulgence or of gaiety, frivolous and debasing, becomes the rule. The effects of each form of mental development upon the health are not unimportant; and the bodily lethargy of the novel

reader, the fasts and early prayers—interfering with the bodily claims—of the religious devotee, the ill-regulated life of the flirt, and the *abandon* of a life of pleasure, all tell upon the health. The effects of constrained celibacy often tell distinctly upon the physique, mental and bodily, of the spinster, and the ungratified aspirations lead to much actual suffering and ill-health. The breaking off of an engagement is frequently followed by ill-health, as much due to the destruction of physical hopes as to the psychical disappointment and chagrin. It is not given to all to be able to completely subordinate their passions and instincts, and we are all, far more than we think or wish, under their influence.

There is room for fear that many practices exercising a most baneful influence over both mind and body find their origin in these ungratified aspirations; and further, that these practices obtain to an extent far beyond the ordinary estimate. When, however, the period of spinsterhood gives way to the second period, and the maid becomes a wife, a total change of ideas and habits, indeed of life itself, is inaugurated. There are new hopes, new positions, and new duties; nor is it a matter for surprise if the young wife should be impressed with her own position, and her mental equilibrium be somewhat rudely shaken. The importance and dignity conferred by marriage is a severe test of her good sense and self-control. In many ways does the change affect the health. Often there is a great change from a life of much outdoor activity to an indoor life of domestic supervision, with brief intervals of making calls. There is often a strong wish to demonstrate the fitness for married duties by a rigorous discharge of them, and a strict attention to household matters. But, after all, this life is monotonous and dull; and it is said that the

absence of company, and the change from life in a large family to the self-denying quietness of a married life, have led many a well-meaning, striving wife to the vice of taking stimulants. Then there is the change from the self-denial of a maiden life to the freedom and even licence of a married existence; a licence frequently too unlimited. The importance of continence to the unmarried is always dilated upon; but the desirability of restraint and limitation in the married is too little insisted on. And yet the temptation to the latter is obvious, and the yielding to it intelligible enough.

In married life the importance of attending to the directions given above becomes still more imperative, and the use of the bath is more desirable than ever. Great attention to the health is necessary after conception, and many troubles crowd upon that period which intervenes ere the wife becomes the matron. It is impossible, even if it were not out of place here, to go into the ailments commonly found during pregnancy; all that can be said is that comparative quiet, steady unexciting exercise, a fair amount of rest, mental and bodily, attention to the bowels, &c., are all of much importance. There is a liability to mental emotion, a certain excitability and mobility of mind at this time which makes the coming mother a source of solicitous care and anxiety, not only for her own sake but also for the child's.

The most common trouble, morning sickness, is best met by an extra hour in bed, small quantities of iced milk or beef tea &c., instead of the usual breakfast; a mustard blister over the pit of the stomach, night and morning, and general quiet, and care in diet during the period the sickness obtains. Frequently the use of an

abdominal belt in the latter months of pregnancy gives great relief, and is found to be very comfortable.

When the wife becomes a mother a new phase of existence is inaugurated and many new sources of ill-health are added to those already in existence, against which it is necessary to guard. The two great matters are, the severe drain upon the system from suckling, and too frequently recurring pregnancies. These two demands combined break down the physique of a mother in a most ruinous manner, and when no intermission betwixt the two drains is permitted, the disastrous consequences manifest themselves at an early period; and the gay, sprightly girl of half-a-dozen years ago becomes a broken-down, unhappy, because unwell, and too often dyspeptic and prematurely old woman. The suckling should never be continued too long, as in that case the milk secreted is no longer a proper food for the infant, while it continues a severe tax upon the mother's strength. With the demands of society, or of other duties, upon most women, and the imperfect physical development of others, the question may be raised, how far the majority of women are physically fit to suckle a child without collateral assistance by the use of the feeding-bottle, &c. In a great number of instances such aid is absolutely required, and the mother's milk should be chiefly reserved for the child's use in the night. The use of porter and ale in order to increase the secretion of milk is of highly questionable value, and in most cases had best be avoided. If it achieves the end in view it can only do so by increasing the tax upon the mother's strength, and so is detrimental to her health. The probability is that the bulk of milk merely is increased by an excess of water, and the child is really no nearer. Repeated imperfect pregnancies

are still more detrimental to the health of the young matron, and a temporary separation may become imperative. It is not only the consequences of the generative expenditure which act deleteriously upon the health, the indulgence of the appetite itself is not without effect. 'The violence of the passions seems to have considerable influence in shortening the duration of human life,' says Quetelet in his famous work 'On Man,' and from this conclusion it is impossible to dissent. Continence is incumbent upon the married, and the marriage service should not open the way to ungoverned licence. This is not an agreeable subject to dilate upon, but it is unavoidable, so serious are the effects upon both sexes of excessive indulgence. Not only is the health more or less actually deteriorated and a less perfect physical condition induced, but the effect of intercurrent disease is very marked. 'It is particularly in epidemics that we are enabled to recognise the influence of morals on the number of deaths,' says Quetelet, so pointedly that it is impossible to put the matter more strikingly. And the effect of intercurrent disease is the best test of the genuineness of the health, and of the resistive powers of the constitution.

Indeed, it is during the period of early maturity when the necessity for keeping the body in 'temperance, soberness, and chastity' is most imperative; because this is the period when the life's forces are in their flood tide and the tendency to excess is most marked, while the capacity to undergo it is most established. After a number of years of more or less perfect integrity the system begins to manifest traces of the wear and tear of this world, and forthcoming Age places his mark upon each side of the head in a silver tint of grey. What the chief points are which merit our

attention during that slow decline whose bourne is the inevitable grave, will next engage us.

There are many points specially belonging to this second period of human existence which have been omitted, as they will be better considered in chapters specially devoted to them; these are the effects of overwork, the consideration of the different constitutions which are inherited (*diatheses* as they are termed), the effect of stimulants, &c., whose discussion had best be postponed until after the next chapter is perused.

PROPOSITIONS.

1. Education increases the choice of occupations; and so exercises an influence over the health of man.
2. Mere labour without thought tends to insanity: while exercise is essential to the health of those engaged in sedentary occupations.
3. Fresh air and sobriety are important matters in relation to health.
4. Position in life is not without its influence.
5. Children who are chronically half-starved, do not make healthy men and women.
6. There are dangers incident to emigration; especially in disregarding the habits and practices of the aborigines.[1]
7. The diet suitable to one clime is inappropriate to another.
8. Personal habits exercise a great effect on the health.
9. Luxury, intemperance, and indulgence often produce baneful results.
10. Genteel poverty leads to much ill-health.
11. Indigestion is frequently the result of bad teeth.
12. The action of acids and the presence of parasites are the causes of decay in the teeth.
13. Spareness and stoutness do not necessarily constitute disease.

[1] See Appendix.

14. The use of vinegar and of rice as cosmetics is injurious.
15. The effects of fashion upon the health of females are often baneful.
16. Different soils require different shoes; and the nature of the covering of the feet is not unimportant. (Heavy soils require stout boots, which resist damp.)[1]
17. Light corsets and heavy skirts dragging from the hips are injurious.
18. The ill-effects of these last (Prop. 17) are furthered by personal habits.
19. Involuntary celibacy is a cause of much ill-health in the spinster.
20. The discharge of her new duties often affects the health of the wife.
21. Great care is desirable when the wife becomes a matron.
22. Morality tends to longevity.

[1] See Appendix.

CHAPTER IV.

IN ADVANCED LIFE—THE PERIOD OF DECAY.

As man gradually and progressively reaches advanced life, so likewise does he by imperceptible steps lose that integrity of mind and body which has hitherto characterised him, by those changes becoming inaugurated which lead in time to decrepitude and decay. Such change is the history of all organic life, vegetable and animal. There is firstly free growth, then the attainment of a certain size, growth becoming gradually slower, and afterwards a period when growth merges into mere maintenance of integrity; and then ultimately that fails, and decay commences its destructive work. The beauty of early womanhood gives place to the comeliness of middle life, and it, in turn, yields to the wrinkling traces of age. The stalwart manhood of the sterner sex undergoes like changes, and the elastic gait and easy carriage gives place to a slow and steady step, and in time that becomes a stiff and ungraceful halt. For many years no doubt, under favourable circumstances, is integrity maintained, that is, a practicable and serviceable integrity, conferring great power of endurance and of sustained exertion; but sooner or later all must, if surviving, feel the gradual oncome of age.

Not only is the locomotion affected and the features

altered, but the working of every part of the organism becomes modified and less efficient. The eye becomes gradually worn out, especially at the distances most commonly used, necessitating the aid of glasses or lenses; and the skilful limber hand grows stiff and loses its cunning. The ear no longer possesses its acuteness of hearing, and receives but imperfectly the air-vibrations which it converts into sound. The internal organs perform their functions but sluggishly, and often inefficiently; the breathing becomes laborious, and the heart is less equal to the demands upon it; the bowels are less active and the stomach enfeebled; the kidneys no longer preserve their integrity, and great variations become manifest in their secretion; the skin is no longer soft, pliable, and capable of free secreting action, but is dry, wrinkled, and inactive. The nervous system loses its grasp, and the once enterprising brain becomes essentially conservative and indisposed to change; the once tenacious memory becomes treacherous and untrustworthy; and the reasoning powers, once clear and judicial, become enfeebled, and petulance and obstinacy obtain where breadth of thought and tolerance were once supreme.

The whilome respected and revered head of the house becomes at last, after various changes, a doting old gaffer; and the active domestic ruler a helpless old gammer.

But these changes do not come about swiftly: slowly and steadily are they wrought, and every external indication is accompanied by an equal internal change. It will perhaps tend most to elucidate these different changes if each different function be examined in turn.

To commence with, the digestive organs, on whose

integrity and capacity to fulfil their function so much depends, may be profitably considered. In early life the digestive powers are strong and keen, and few things disagree with the growing youth; but as maturity is attained there is no longer that keen relish for food, and the appetite falls off, or requires the stimulus of temptation in the nature of the viands themselves. But such constantly recurring temptation tends to weaken the digestive organs, and rich food and generous wine may only be consumed with impunity when taken in moderation. As time goes on, first one thing is found to disagree and then another, a little only being tolerated at first, but ultimately total abstinence is necessitated,—no portion, however small, is without its disturbing effect. No rules, however, can be laid down as to this, for one thing will disagree with one and another with another. Quantity, however, is always an important matter, and small loads alone can be borne by the enfeebled organs. Digestion is much slower as well as less vigorous in the old, and consequently easily digestible food becomes necessary. The richer dishes and savoury food, once so esteemed, are gradually given up, after repeated admonitions; and the quantity of meat, especially lean meat, consumed is usually much diminished, instinctively and intuitively. There is indeed a distinct tendency to return to the simpler forms of food proper to and preferred during childhood. In very old people the diet becomes once more largely farinaceous and saccharine, and meat is little craved after. This is a fortunate selective choice, as the digestibility of these forms of food suits the enfeebled organs. While the stomach has lost much of its power, and the digestion is impaired, the action of the bowels has lost much of its pristine energy, and

constipation is commonly present, and is a great source of discomfort. Laxatives are commonly found indispensable, and the mineral waters of Vichy, Carlsbad, Pullna, and Friedrichshall are indicated, and form with a glass of wine, or spirits, a useful and not unpalatable medicine as well as a beverage.

Some such medication is indicated in most elderly people whose digestive systems are very sensitive to any load in the bowels. There is another strong reason why such medications should be resorted to, viz. the injurious effects of straining at stool upon the different parts of the body. This should always be avoided, and if the bowels do not move easily the attempt should be desisted from, and some time allowed to elapse, and if necessary some medicine taken, ere another attempt be made. Long exposure to cold should also be avoided, and the elderly should avoid conveniences which are so situated as to be cold or draughty. Piles or hæmorrhoids are also outcomes of neglected bowels. In many cases the enema may be resorted to with advantage, especially to avoid straining.

This attention to the bowels is desirable for its effects upon other organs, and especially upon the liver. In early and adult life the exercise taken is usually sufficient to maintain the action of the liver and to secure its efficient working; but as age creeps on and the locomotive powers are affected, the liver is deprived of these collateral aids, and so is liable to be laden with bile and to be easily deranged. An accumulation is not so easily cast off now as it was when the bowels were active, and so slighter causes are found to be disturbing, and restoration to the healthy condition is slower and less easily effected. Rich food, especially when consisting largely of fat, is very apt to disagree

with elderly people, and they commonly suffer for any such indulgence. Not only are these passing ailments to be avoided for themselves and the discomfort they occasion, but they act perniciously in inducing repeated congestions of the liver, which in time lead to disease.

The kidneys too are affected by any loading of the bowels, and at these times the secretion is thick, odorous, and high-coloured, and not unfrequently scanty. At other times in the elderly this secretion is profuse and troublesome, especially at nights, disturbing the persons' rest, and exposing them to cold from having to get out of bed to attend to these calls. Such arrangements should be made as to reduce the exposure to a minimum, and various appliances are now procurable at most surgical-instrument makers. There is also no greater trouble connected with the oncome of age than a highly sensitive condition of the urinary organs, so that not only are the calls frequent, but there is an urgency about them unknown to the young. Travelling becomes, under these circumstances, a source of much discomfort to the aged, especially in our express trains with their long runs betwixt station and station. This long run and the brief stay, scarcely admitting of time to reach a convenience when the halt is made, make travelling very irksome to the aged; but here again the surgical-instrument maker may be resorted to with advantage. This irritability of the urinary system is often so great as to interfere much with the avocations of the aged, and is a source of much inconvenience to them. The varying changes in the bulk as well as in the appearance of the urine are often sources of anxiety to elderly persons, often unnecessarily so; especially after a common cold, and mostly when it is 'breaking,' the urine is scanty, with a heavy

deposit of a white or pink-red colour, often occasioning some alarm. It is really not an untoward sign—indeed is an acceptable circumstance, preceding and indicating the yielding of the cold. Retention of urine of course needs surgical aid, and so does incontinence in the male, however difficult it is at first sight to believe this. Incontinence here means not that the bladder will not retain its contents (the ordinary impression), but that it is permanently and persistently over-full; as the surgeon will soon demonstrate.

In all the medication of the old, it is desirable that carminative and stimulant substances be added to the remedial agents employed, and this should never be forgotten.

In the aged the organs do not and cannot assist each other to the same extent that they do in earlier years, and so when the kidneys are unequal to their work, the skin no longer affords the aid it once furnished. Indeed, the skin gradually becomes very inactive and dry, and no longer responds so readily to the bath and other stimuli as it once did. It is said that this inactivity of the skin is the origin of the foul and disagreeable odour found in the breath of many middle-aged and elderly people. Attention to the skin is a desirable matter, both from a hygienic and a social point of view. This inactivity of the skin demands further that the bowels should not be neglected. (While thus insisting upon attention to the bowels, it must not be supposed that I am an advocate for habitual purgation.) Any load will make the breath all the more offensive.

At the time that these changes are going on in the abdominal viscera, certain changes are inaugurated in the chest and the organs contained therein. The lungs are less elastic than they once were; they play less readily,

and are more easily torn by respiratory efforts. The air tubes become liable to attacks of inflammation—bronchitis—an ailment which infests both extremes of life, and is a fatal malady to children, especially babies, and to elderly people; more especially if the strength be already failing. Not only do acute attacks of bronchitis often supervene, but a chronic condition of inflammation is not uncommon. This leads to shortness of breath, cough, and expectoration, and not uncommonly to serious organic changes. Great and rapid changes of temperature should always be avoided by the old, as very liable to set up inflammatory mischief. The respiration of the elderly is more laboured, and more a visible effort than it is in earlier days, and so the general movements should be slower and quieter. This change of locomotion is often irksome though imperative, and is the more necessary that the heart in old persons is not equal to sudden demands upon it. It is often altered both in size and in its textural integrity, and is not able to cope with urgent demands upon it. What would only produce a fit of violent action or palpitation in the young, produces fatal disturbance in the action of the heart in the old. This is very commonly seen in the results of chasing an omnibus. In the young, a little violent action of the heart is felt, which soon goes off without any unpleasant consequences; in the elderly a dangerous attack of cardiac asthma may be so induced, and not uncommonly sudden death is the penalty paid for such exertion. All sudden action on the part of old persons is very undesirable, and tests too severely the internal organs, no longer in their pristine integrity.

Elderly persons are much more liable than are the young to sudden death, either from failure of the heart's action, or from rupture of a bloodvessel in the brain

(apoplexy) or elsewhere. For the bloodvessels become less elastic and even brittle in old age, and the heart grows larger in order to carry on the circulation in these rigid vessels; consequently rupture of a diseased bloodvessel is no uncommon thing. All effort, all sudden exertion, all straining are to be avoided as age comes on, as being dangerous or harmful in their effects upon the internal organs; not only that, but hernia, or rupture of the abdominal wall, is now easily induced. This latter is a common accident to elderly persons, especially those who must labour for a living, and is a source of danger as well as discomfort. Herniæ should always be attended to, and trussed up by a proper and well-fitting truss, under which circumstances the danger to life is small. But trusses must fit well and closely to be of use, and a broken, or mended, or worn-out truss is of no real use, and only lulls its owner into a false sense of security.

The altered conditions of the organs of respiration and circulation, no less than the impaired condition of the muscular system, entail a change of habits as years creep on. Elderly people, however, are extremely unwilling to admit even to themselves, let alone to others, any feeling of failing strength or power, and often persist in their old habits long after they feel that some modification is desirable. Thus they will go out for their accustomed walk and run the risk of showers, or of accidents, and then suffer afterwards for the efforts they have made to escape the primary troublesome consequences of their persistency. There is every reason to believe that, in a large proportion of the cases of sudden death in elderly persons, which seem almost unaccountable and without provoking cause, there has been some effort, or other harmful action, not long

preceding the death, which has been carefully concealed, with the reticence habitual to the aged.

Not only is the ageing frame less equal to effort and more liable to suffer from the consequences of it, but it is less fitted to avoid accidents, to escape from difficult situations, than of yore. Thus there is a great liability to falls, to be run over, &c., with a lessened power of escape from any dangerous predicament; consequently the walks of old people are wisely and properly confined to safe and quiet promenades, away from bustle and excitement. These quiet walks are very desirable, and should always be sedulously practised, as having an excellent effect in the preservation of health, and the maintenance of the functions of the body in all, or nearly all, their functional usefulness, and are much better than more active exertion. It is impossible however for any one to comprehend properly the changes undergone in age, and the thousand alterations which then either manifest themselves or become necessitated, without a full consideration of the condition of the nervous system in declining life. These changes are not in the organic nervous system which rules digestion and the involuntary actions; although this suffers from the decaying action going on in the cerebro-spinal system, and is gradually enfeebled by the small quantity of nerve force sent into it from the other, or force-generating system; so that the action of the organs under its control is rendered sluggish. The actions of organic life still go on comparatively unimpaired. It is in the brain, and its allies, that the marked changes manifest themselves. These actual anatomical changes go on hand in hand with the loss of intellectual power, with changes in temper, and even in disposition. Such changes are gradual, they commence insidiously and grow almost

imperceptibly. They are distinctly visible to the close observer long ere the condition called dotage is recognisable by the ordinary eye. There is a condition of impaired brain-power, of loss of intellectual grasp, of diminished power of observation and of reasoning; a time when the mental processes are no longer so efficient, and the balancing or summing up powers so trustworthy as they have been, long ere obvious unfitness for the duties of life is reached. Consequently it often happens that a person is permitted to exercise their wonted authority and to hold their accustomed influence and weight, when they no longer really merit it, nor should have it accorded to them; not that it is any demerit of theirs, but merely that their nervous system is decaying, and their intellectual power is waning. Thus elderly people become irritable, querulous or suspicious, vacillating or capricious, or wilful and unrestrainable. They no longer tolerate argument and resent any attempt at being reasoned with, as if it were intended to deliberately insult them. They pursue their own way with obstinate tenacity, and justify the old proverb that 'there is no fool like an old fool.' It is not difficult to understand how this is. They have been for years accustomed to think for themselves, to sketch out their plans and to steadily pursue them; they have learnt by experience to trust themselves, and it is long indeed, and only after accumulated evidence, that they can admit to themselves that their mental powers are no longer what they were. This is a bitter and painful admission to make to themselves, and a very difficult matter to admit to others. Hence the habits and practices of their past life are retained tenaciously, as if the giving up of any meant the admission

of all the infirmities of age. Much injury is often done by such unwillingness to give up old habits, and frequently what was once a pleasant task is persisted in till it becomes a tedious toil, a laborious and exhausting duty,—albeit it is but imperfectly performed by the declining powers. Commonly in business the duties of a chief or head of the firm are so merely routine, so confined to simply overlooking and assenting to what is done by others, that a semblance of active mental work is maintained long after all actual power to fulfil such function has fled. This routine duty, almost become an instinctive habit, does not test the declining powers, nor indicate their impairment: while it gives a delusive impression of unaffected integrity, and induces many to regard the brain as still in its pristine vigour and soundness when many instances to the contrary have actually come to light. More especially is such mental change the case when there is latent disease of the heart or kidneys, and the extent to which diseases of these two organs affect the nervous system and the mental processes, is far beyond what could be conjectured by any mind unfamiliar with the observation of such action. When there is disease of the heart the brain is but feebly supplied with blood and its action is unsustained or imperfect. When there is chronic Bright's disease, or latent gout, there is active irritability and a condition of persistent ill-temper; a condition of unreasonableness with a teazing consciousness that they are unreasonable, which is most trying to the sufferers.

Frequently elderly or aged persons are allowed to pursue courses which are inimical to health, such consequences being obvious to others, and yet their children

do not actively oppose it, because they have never yet sat in judgment upon the actions of their parents, and feel a strong unwillingness to do so; and yet it is their duty to take action in the interest of their parent whose reasoning powers are no longer in their integrity. We are all familiar with instances where old persons have persisted in doing things obviously hurtful to them or to others, such as adhering to a peculiar diet, some form of exercise, or in maintaining some peculiar attitude towards one member of the family, or some similar action. Yet it is not the rule to regard this as evidence of loss of brain power, though a remark may be made as to 'how peculiar old people become.' It is better, however, for all parties to recognise distinctly the fact that there is a long period of decaying mental power ere complete dotage is reached, and that the difference is not in kind but merely in degree. This cannot be too strongly insisted upon in order that a correct comprehension may exist as to the condition of elderly persons; without which those near and around them would scarcely feel justified in offering a quiet but persistent opposition to their caprices, and in gently disregarding their whims. From what has just been said it must be apparent to all that a blind submission to the wishes of old folks would often be most detrimental and injurious to themselves; and that it is real unkindness to them to permit them to have their own way as a matter of sentiment. They are no longer capable of thinking correctly and reasoning soundly for themselves; and the same control must be exercised over them, and their actions, as is exercised over the child, ere its mental powers have reached their full development.

It is obvious from the foregoing that a control must

often be exercised over old people in their own interests. What the caprices of each may be it is impossible to say, and only a general statement can be made here which must be applied according to the good sense of each reader.

Elderly people do not usually sleep so much or such long hours as do their juniors, but when very advanced life is reached much time is spent in sleep. In this respect the extremely aged again show the approach made by age towards the practice and habits of early childhood. But ere this condition of sleepy extreme age is reached, a period is passed through when the hours of sleep are very much diminished. If this diminution be within reasonable limits the powers are not much impaired; it still being obvious that the brain would be all the better for longer hours of rest. The explanation of this sleeplessness lies commonly in the condition of the circulatory system which becomes so modified that the brain is not so easily relieved of its blood as before, and therefore sleep is not permissible. Consequently the habit of elderly people of taking sleep when they can get it, especially in the after-dinner sleep which ensues upon digestion, when the blood is largely attracted to the digestive organs, is well-founded; and should not be interfered with unnecessarily. In many elderly people with latent gout nocturnal sleeplessness is a marked feature. They are not kept awake by pain, but they cannot 'catch' sleep. Their thoughts are active but their reasoning is generally in a circle, and they come back to the exact point from whence they started. This is exhausting to the brain, and when they do have a short sleep they awaken up unrefreshed, and the tired brain is very irritable; all through the day they are easily 'put out,' and that, too,

to an extent far out of all proportion to the exciting cause. They are conscious often of there being an element of unreasonableness in their case which is very exasperating. This is the condition of elderly persons who are a terror to their relations and a plague to their domestics. The expression in common use is, 'there is no living with them, and no pleasing them.' Nor is it difficult to understand that these wearied, unrested brains should be very irritable. Many, feeling their shortcomings, try the consolations of religion, and beg to have patience given them, and suffer much at finding no relief therefrom. In reality it is a physical condition of the brain, not an infirmity of the mind or an unregenerateness of the spirit, and as such finds its true remedy in medical treatment. This condition is always aggravated by the consumption of animal food, which should be avoided.

The sleeplessness of elderly people generally is troublesome to them, and the best hypnotic here is a dose of alcohol at bedtime. We all know how intensely awake we feel when getting into a cold chill bed, but with young people this soon gives way to sound refreshing sleep. Not so, however, in the old. With them the cold contracts the blood-vessels of the skin, which do not readily relax again, and so admit of the blood leaving the brain, a necessary factor of sleep; and their rest is broken and fitful when they do fall asleep. The chilled blood in the skin which, under these circumstances, makes all of us gasp as it passes along the blood current swiftly into the lungs, disturbs the circulation through the lungs in elderly persons, and causes those attacks of difficulty of breathing in the aged which are common in the small hours of the morning. Such action is aggravated by the change in

the temperature of the air in the bedroom from that of the dayroom. A combination of all these leads to the attacks of disease of the respiratory system which accrue without any external exposure. A dose of alcohol last thing when getting into bed relaxes the vessels of the skin just as they are again dilating, as the bed grows warm, after their contraction, and the action of the alcohol aiding the natural action, full dilatation of the blood-vessels of the skin ensues and sleep follows; and the pulmonary attacks are also thus avoided. It is obvious that taking the chill off the air of the bedroom either by a little fire, or where that is not practicable, by a bucketful of hot water being put down in the room half-an-hour before the time of retiring, is a useful adjunct. The bed may also be aired or even warmed with advantage. It must be borne in mind that fires in a bedroom at night, though perhaps absolutely required, are not in themselves desirable; they consume too much of the oxygen in the air which is in the room; and at night, during sleep, full supplies of oxygen are desirable. If the air of the room be just warmed, a draught of alcohol and hot water taken when getting into bed, and the exposure of undressing be not too prolonged, the sleep of the elderly and the old would be much sounder, especially in the colder months.

As extreme age is reached the tendency to sleep is much increased, and in dotage the hours of sleep are equal to those of the waking time. There is little difference in the activity of the brain now, whether awake or asleep, and the inactive brain easily 'drops off.' The memory of the enterprising years of life is being blotted out, and the impressions first made in childhood, the last to be obliterated, assume much

vividness and freshness. The doting grandparents recounting the memories of their early years to their grandchildren form an affecting sight as well as an instructive lesson. After brief periods of such wakefulness they slumber off again into oblivion. One thing it is well to remember in connection with this sleepfulness, and that is this: old people resist cold almost as feebly as infants; their temperature soon falls, and then they catch cold. In sleep, when the vessels of the skin are full of blood, the tendency to lose heat is much increased. Consequently, when very old people sleep much they are apt to catch cold, and should be well looked to when up and dressed. This is the more necessary as they do not know so well how to take care of themselves, and often let their wraps fall off. Very old people feel cold very acutely and are fond of sitting over the fire, and in doing so often set their clothes on fire, or at other times burn their shins from too free exposure. They should be attended to to see that these accidents do not occur.

In advanced life the system becomes subject to many diseases to which it is less subject during the years of earlier life. For example cancer is now much more frequent; but on the other hand its activity is lessened by the advance of age. In the young the forms of cancer are those of the quickly growing and rapidly fatal varieties, in the aged they approach more to the condition of mere cartilage. There is also a marked tendency to 'rheums,' *i.e.*, flows from the different mucous surfaces, just as we saw was the case in the child. Attacks of diarrhœa are easily induced by trifling variations or errors in diet. To these, their loss of teeth and consequent inability to masticate their food render them very liable. The resistive power of the system is much

lowered, and acute disease is apt to run its course very quickly; the powers of the system being easily and readily exhausted. Complaints which cause old people to be bedridden often prolong their lives; as is seen in the case of people who break the neck of their thigh-bone. This fracture but rarely unites in the very old, and so its occurrence often confines the recipients to bed, where they live years; as the condition itself is not dangerous to life. Bedsores do not usually form on the bedridden if the attention paid is not practically inefficient, but when they do form they are very ominous and indicate much loss of vitality and impaired vital force. The different forms of water-beds and water-cushions now in vogue are very useful, and should be resorted to on the least threatening, as in bedsores prevention is indeed preferable to cure, the latter being rarely practicable.

The clothes of the aged should always be of flannel frequently changed, otherwise they smell strongly, and the human odour is very unpleasant. Cleanliness indeed is as absolutely requisite in the aged as it is in early childhood.

Much is spoken now-a-days of senile degeneration or decay, and as its discussion lies almost directly across our path at this point, it may be described briefly. At the earlier periods of life the tissues are succulent and vascular, and when injured are capable of ready repair. But as time goes on they become firmer and harder, less elastic and less vascular; they are readily injured, and are repaired but slowly, if ever. Thus the brain becomes firm and tough, and a growth of simple tissue, called connective tissue, or basement membrane—the simple tissue which forms the mere padding or packing material of the body—takes the place of proper nerve

tissue. The nerves also undergo the same changes, and insensitiveness to impressions accompanies failing brain power. The different special senses, as sight and hearing, become impaired. The different organs of the body, as the lungs, liver, kidneys, and spleen, also grow firmer and harder from this growth of connective tissue, and their functions are less efficiently performed. The blood vessels become brittle and less elastic from a similar growth, and they are thus more liable to rupture. The bones become more largely earthy, and are more readily fractured as well as less inclined to unite. The cartilages become ossified and are less elastic and more brittle, especially the cartilages of the ribs, and so the movements of the thorax are restrained, and the breathing is less perfect and more laboured. A similar growth of connective tissue is often found in the skin, which becomes hard, or often parchment-like, and at other times covered with wrinkles. These latter are due to the disappearance of the subcutaneous fat, which is to a great extent absorbed, leaving the skin loose over the shrunken muscles. The embonpoint of middle age gives way to the spareness of advanced life, as the different pads of subcutaneous fat which add to the comeliness of middle age are absorbed. This is remarkably seen in the busts of women. Other changes by absorption go on, and produce those changes of involution which mark the decline of the bodily powers. The characteristics of mature life wane not only anatomically but physiologically, and the passions of adult life fade out hand in hand with changes in the reproductive system. The amative passions, so long predominant, die out with little of the excitement which characterised their development, except in occasional cases: and the characteristics of sex soon become practically obliterated,

and in this respect again the aged approach the condition of childhood.

It is at this period of retrocession—called involution, or folding in, as compared to evolution or evolving—that many diseases attack the system, especially in connection with the organs of reproduction in the female, and also to a less extent in the male. They are inseparable from this period, and are only to a very slight extent avoidable. The change of life, as this period is called, rarely presses hardly on man, whose powers and passions usually fade out gradually and imperceptibly; but in the other sex it always forms a trying period, and broken health is the lot of most women at this time. Consequently the greatest attention to the health is now incumbent, and rest, quietness, and numerous collaterals become requisite. The greater the care now exercised the less broken the health will be, but no amount of care will entirely relieve any woman from the trials of this time. The stronger the health on entering this period the better. As certain inherited tendencies manifest themselves at puberty, so does the past life come out now, and the trials to which the system has been subjected reveal themselves. In the matron with many children the constitutional exhaustion induced by child-bearing usually leads to very broken health: in the involuntary spinster there is often such sexual excitement as leads to mental derangement: in the barren bride conception not unfrequently takes place. In the widow and the spinster this period is one of great trial; either from ill-health, often the result of uterine derangement, or from a recrudescence of the generative instinct. At this period of life many respectable and pure-minded women make foolish marriages, or form unfortunate or even disreputable attach-

ments. That there may be much excuse to themselves, for what they do is comprehensible enough, but the consequences are none the less unfortunate; and the miserable attachment remains an ugly fact, or the unworthy husband soon ceases to be an attraction: in either case the future happiness is utterly destroyed. Women, thus liable to err, should not only themselves strive to pass through this trial with as little disturbance as possible, but it behoves their friends also to be upon their guard, and by solicitous care, without unnecessary interference, and great kindness and considerateness, to obviate any chance of the perturbed spirit taking some rash step, and throwing aside the future and the past in obedience to some imperative dictate of the present. Would that it were possible to think otherwise; but in this period lies one of the greatest trials to which women are subject. The records of the divorce court, the annals of asylums, the dates on the tombstones in the churchyards, all tell us of the severe strain put upon the system of the woman during this change of life.

Having passed this critical period, and been relieved from the liability to disease and ill-health which the reproductive capacity engenders, woman enters into a period of comparative freedom from illness, and consequently from death. In advanced life, indeed, the proportion of women to men is most marked, and very old women are comparatively frequently found. This is even more markedly the case amidst the affluent classes, and the question of sex is commonly considered in the purchase of properties saddled with annuitants. Calmly and unperturbedly does the life of women proceed after this stormy termination of the affectional life, with a most marked influence upon their health. Probably

their habits have much to do with their comparatively high standard of health in advanced life; and of these their abstinence probably stands first. It may be an assured fact that the taste for a little gin and water is wonderfully prevalent among elderly women, and within bounds it is a wholesome and not a pernicious practice, especially when taken at bedtime; yet unquestionably aged women do not indulge in the pleasures of the tumbler and the table to anything like the same extent to which men of similar age do, among whom such indulgence is very prevalent; and to this must be attributed much of their superior longevity.

For it must be acknowledged unreservedly that though the degenerative changes described above are unavoidable and are normal to age, as ripeness merging into rottenness is to the apple, still an impetus can be given to these changes by the habits and practices of the individual. It is well known that in the drunkard the degenerative changes go on quickly, and so lead to an earlier death than is the case with a temperate man, their original constitutions being equal; so in one given to free living the changes will go on more swiftly than where moderation in food as well as drink is practised. Indeed, the habits of the individual from an early period bear directly on the question of longevity. The spoiled, wayward, and wilful child permitted to follow its own course, and consequently to commit many an act of folly seriously affecting the health, is not likely to survive to a green old age; no matter how good the inherited constitution may be. It is no palliation of the inevitable results that the acts were committed through ignorance and not from wilfulness. Outraged nature's laws know nothing of the plea of extenuating circumstances. We repeat, if a certain course detrimental to

health be pursued, its effects cannot be obviated; a life of severe self-denial and rigid care may alone permit of a continuation of the existence imperilled by the follies of youth. So too in youth itself the habits and the walk of life of the individual exert a direct influence upon the system, and often predispose it to sickness, and to its not unfrequent consequence, an early death. The constitution becomes broken, and an after-life of invalidism alone intervenes betwixt this and the final change. Little think many, and fewer reck, what may be the ultimate consequences of a frolic, an excursion, or a debauch. They are well and will get over it, is the reflection, if a thought of possible consequences intrudes itself. True: but the consequences of many a piece of thoughtless enjoyment have to be borne like a cross through life. A young friend of my own, a tall, stalwart fellow, once determined to attend a ball in threatening weather, and did so. He had some miles to travel on leaving the heated ballroom, and in driving home he caught a severe cold which terminated in double pneumonia. He swam for his life at the time, and rose from his bed a confirmed invalid. Tubercle set in, and in a couple of years carried him off in spite of everything. There is room for fear that similar histories abound. In more advanced life the same thing occurs. The man leads deliberately a fast life, and fast he finds it; for it quickly comes to an end. Another, perhaps, devotes himself too assiduously to labour, and works beyond his powers: a railway accident comes, and then the overwork reveals itself in a lessened power of endurance, a yielding of the powers, and serious injury; where, if the forces had been husbanded, the system could easily have thrown off the effects.

It is not only that habits of life implicate the health, they too often strike directly at the resistive powers of the individual; who succumbs to a disease or an accident which he could with other habits have successfully resisted or undergone.

The extrinsic influences which bear upon health and indirectly upon longevity are in action incessantly, and the life led will tell in the long end. It matters not how that life is led as regards the result; unlicensed and unbridled indulgence is not the less deleterious that it is done with propriety under the guise of marriage freedom, and by the Church's permission. These may whiten the outside of the sepulchre, but the sepulchre remains. Nature knows nothing of conventionality, or the necessity for keeping up appearances. Her awards are sternly just, and the consequences, call them punishments if you will, are in strict proportion to the offence. In her eyes the intoxication and riotousness which is strictly confined to the domestic roof, and of which the world hears no whisper, is not to be distinguished from the less guarded revelry which manifests itself in the club-house or the tavern. Constantly and uninterruptedly are the forces in action around us, which will in addition to our own habits determine the question of health or the absence of it, and with the latter the ultimate question of survivorship. The constitution may not only be subjected to open and visible assaults leaving distinct traces of themselves behind, indelible and never to be obliterated, but it may also be insidiously undermined. A sapping process may and too often does go on, until the foundations of health and strength have been utterly destroyed, and a sudden collapse is the first outward intimation of the fact. A man may be able to boast that he never had a day's

illness in his life, and yet an insurance company would not take him on any terms. Nor does such a sapping process go on without the consciousness of the individual, if he would but listen to the ominous warnings, which are as distinct as the sapper's pick is in beleaguered citadel when the garrison are on the alert. But whether there be consciousness or unconsciousness, and whether the latter be simple or from voluntary effort, it matters not; the work is pressing steadily forward as the result demonstrates. Even when life is approaching its close, health and life are not removed altogether from the action of the habits of the individual himself. A determined persistence in the habits and practices of early life now utterly unsuited to the ageing frame, will surely imperil the chances of a prolonged existence, no matter how proper at one time the exercises were. Long and severe hours of toil are not unhealthful to man in his prime, but they are certainly unsuited to the sunset of life. In age as in youth the individual can exercise an unmistakeable influence over his own health.

So too with the other sex; a thousand little acts of indiscretion, of thoughtless folly, tell in time with their accumulated weight upon the health. The obvious effect may be far away off, hidden in the shrouded future, but it is nevertheless there, and in time will become visible enough. The consequence, or penalty, will be in strict proportion to the offence; but much will depend upon what goes before and comes after. An isolated piece of indiscretion may produce a severe cold, but a system not overtaxed soon rebounds from the stroke, and the after-effects may be entirely recovered from. Another act trifling in itself may just be the last straw which breaks the camel's back, but in

such case its effects will depend almost entirely on what has preceded it.

The line of health has on each side a margin within which it may vibrate according to disturbing causes without actual illness resulting. Without that margin is another permitting of still further oscillation, compatible with life but not with health. This is the limit of possible recovery. The oscillations may approach the outside of the margin and yet the equilibrium be recovered: the nearer the margin is approached the greater the danger. Beyond that outer margin life is permissible for a little time longer, but the equilibrium is too rudely shaken ever to recover itself. For instance, the normal temperature of the body is assumed to be 99° Fahrenheit. This is the ideal line of health. On each side of this is the first margin within which oscillations can go on without what is termed illness being induced; the margin extends downwards to 97° and upwards to 101°. On each side of this again is an outer limit of possible recovery: it extends to 92° and 108°. Beyond these extremes recovery is impossible; or the exceptional cases are so rare as not to practically invalidate the statement.

But this is on the assumption that the individual is healthy; with perfect soundness only are such limits possible. One of the most certain effects of illness and disease is the limitation of these boundaries within which the oscillations may rock. The margins of each are more easily reached after serious illness, or repeated and persistent assaults upon the health, and consequently lesser exciting causes of disease become serious. An oscillation arising from some disturbing cause which would in health scarcely extend beyond the first margin will reach far into the second margin, if those limits

have been previously reduced; and a disturbance which would have scarcely amounted to sickness now reaches into serious illness. A ruder oscillation, which in a healthy person would not exceed the limits of possible recovery, in another extends beyond that margin, and death quickly follows. Such is the explanation of the suddenness with which many apparently healthy persons succumb to what is regarded as scarcely serious disease.

The importance of maintaining these limits in their pristine integrity must be obvious to all, and the serious consequences of any reduction of them must be apparent; no matter whether that reduction is the result of severe illness permanently crippling the system, or of a persistently improper or erroneous career of life, the results are the same. In young children violent oscillations are readily produced, yet the balance rocks steadily back to its wonted equilibrium; but as life progresses these oscillations are less readily induced, and at the same time the consequences are more grave, i.e. the mobility of the balance is much diminished, and a much more serious disturbing cause is required to produce an equal oscillation, but that oscillation is a much graver matter when produced. For example, a sharp attack of indigestion in a child will often produce a temperature of 105° without any serious anxiety being induced; serious disease alone would occasion such a temperature in an old person, and the prospects of life would be very gloomy. Much of the rebounding or recovering power of children is due to the system being unshaken by repeated previous assaults, and so its recuperative powers are undiminished.

The foregoing illustration will demonstrate pointedly the great importance of caring for the health all through

life, not only for the enjoyment of health and the avoidance of the discomfort of illness, but also for the maintenance of the existence of the organism. Longevity depends much upon the past history, as every one who has passed the threshold of an insurance company must know. Nevertheless in some cases of recurrent disease in the elderly, previous attacks of illness seem to enable the system to recover from attacks which would seem almost necessarily fatal. 'The creaking door hangs long' is a proverb which illustrates this. In these cases habit seems to endow the system with a certain amount of endurance.

With these remarks this chapter must come to a close; and after this survey of human existence in relation to health we may proceed to consider certain other matters which affect the health, such as the use and abuse of food and clothes; the effects of stimulants and of overwork, both very important matters; the action of external forces through the houses in which we live; the importance of selecting an occupation in life for which the system is fitted; the influence of inheritance; and the impressions of accident. Separate chapters must be devoted to each in order to do anything like a semblance of justice to these important matters, which exercise so potent an influence over the health and life of man.

PROPOSITIONS.

1. The gradual changes of age are felt in every organ of the body.
2. The digestive organs become enfeebled; and many favourite foods no longer agree with the consumer.
3. Great attention to the bowels is requisite in advanced life.
4. Alterations in the renal secretion are common in old age; and trouble in connection therewith is a fruitful source of suffering in the aged.
5. The skin is inactive, and respiration laborious at this period of life.
6. Sudden and quick movement is fraught with danger to the aged, and should be avoided by them.
7. Herniæ should always be well trussed.
8. Old people are unwilling to admit the oncome of old age.
9. A long period of mental impairment precedes obvious dotage.
10. Certain diseases affect the mental processes.
11. Sleep becomes uncertain, and an after-dinner nap is not objectionable.
12. In latent gout there is much sleeplessness and mental irritability.
13. Old people often sleep badly from being chilled in getting into bed.

    (Here spirits and hot water at getting into bed are useful.)
14. The very old sleep much, and resist cold very feebly.
15. The prevention of disease in them is very desirable.
16. Senile degeneration is a general decay.
17. The change of life is a very trying time for women.
18. There are, however, more very old women than very old men.
19. The life led affects both the health and the duration of life.
20. The line of health has a margin, and a certain amount of disturbance may go on without actual disease. There

is also an outer margin—of disease with possible recovery.

21. When the oscillations extend beyond this outer limit, recovery is no longer possible.
22. These margins are narrowed by chronic disease: and also by the oncome of age.

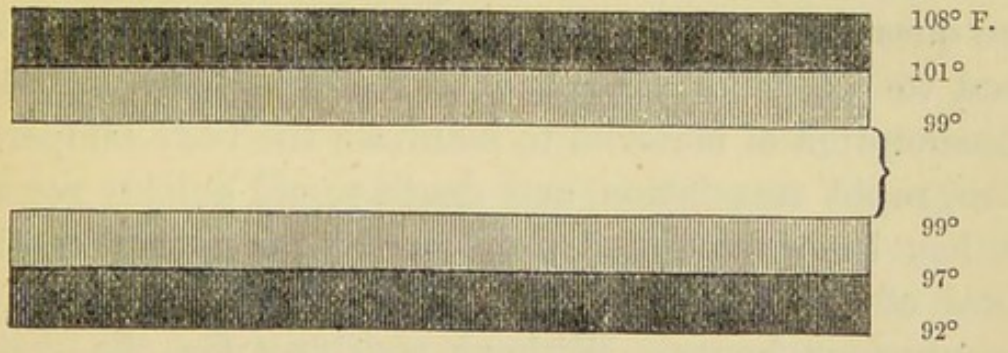
A diagrammatic scheme of these lines.

The central space is the line of health.

The lighter shaded spaces indicate disturbance not necessarily amounting to disease.

The outer darker spaces mark disease with possibility of recovery.

Beyond these outer margins lies inevitable death.



The middle line has been designedly widened in order to convey a more actually truthful impression than if it had been made a mere line, which would have made no allowance for the various forces which combine to maintain the line of health. The sharp lines of demarcation at 101° and 97° are not so pronounced in reality, but render the diagram more effective.

CHAPTER V.

FOOD AND CLOTHES.

NOTHING is of more importance to man, either in the maintenance of health or the preservation of life, than the question of the food he eats. Without supplies of food to meet the wear and tear of the body, and the consumption of material to maintain the body-temperature, rapid emaciation and death would quickly result. It has been calculated that one twenty-fourth of the total of the body-material is changed every day of twenty-four hours. Without vouching for the strict accuracy of the statement, it is certain that the change is much more rapid, infinitely more rapid, than is usually supposed. In order then to meet these changes, food is consumed; of various natures to meet varied wants. The chief division adopted commonly is that of dividing food into Liebig's divisions of respiratory, those which are burnt off by the respired air to maintain the body-heat; and plastic, those which go to form the tissues of the body. This is a good broad division, but not exactly true, for a quantity of the first division is absolutely required to be added to the second in order to procure healthy tissue-formation; at the same time a small combustion of the second division is always going on in the body, especially in febrile conditions. This melting down of the nitrogenised tissues in fever constitutes one of the chief dangers, and is in strict

proportion to the rise of the temperature. Liebig's division, though not strictly correct, is the best and simplest, and is more generally true than any other yet devised.

The great difference betwixt these two divisions of food is the presence of nitrogen. Respiratory foods consist essentially of carbon and hydrogen in varied proportions, and more or less oxygen; this latter however being unimportant. Nitrogenised or plastic foods contain nitrogen and various substances, as phosphoric acid, lime, soda, potash, iron, &c.

The term respiratory food indicates the nature of the foods. They are really fuel, and are burnt up by union with the respired oxygen, and maintain that slow and regulated combustion which gives the body its heat. In this respect the body is simply a furnace into which so much fuel is thrown every day; this is burnt up, and in the process of burning gives off so much heat. It will be obvious that the colder the climate the more fuel must be furnished to the furnace. This is the case in reality, and the food daily consumed by an Esquimaux would serve an Arab for weeks.

The respiratory foods of man are divided into the three subdivisions: 1. Farinaceous, 2. Saccharine, and 3. Oleaginous or fatty.

1. Farinaceous foods are those which contain starch, and this is a large class. It includes the cereals—wheat, barley, rye, oats, maize or Indian corn; the pulses—peas, beans, and lentils; the pith of trees, as sago; or roots, as arrow-root, tapioca, and potatoes, &c. It is exclusively vegetable. This starch is converted by the saliva into sugar, and as sugar is assimilated in the system.

2. Saccharine foods are those containing sugar, and

the list includes grape-sugar, honey, cane-sugar, figs, dates, prunes, beet-root, mangolds, carrots, turnips, &c.; or animal sugar as found in milk. This sugar is readily assimilated as such. The chemical difference betwixt starch and sugar is slight, and consists of somewhat more water in the composition of sugar.

3. Oleaginous or fatty foods are drawn from both the animal and vegetable kingdoms, but here those derived from the animal kingdom preponderate. The list includes vegetable oils, of which that derived from the olive is chiefly consumed by man, though linseed oil and rape oil are equally nutritious; animal oils and fats, and butter. The animal fats are the products of the two first divisions of respiratory foods stored up in the bodies of animals.

These respiratory foods are absolutely necessary to our existence as living animals, and on them and water alone can life be maintained for a limited time. With very small proportions of other foods life can be maintained in its integrity for years. Much of the best agricultural work of the world is done on a diet almost entirely composed of these respiratory foods. In Ireland, first-class agricultural work is performed—not only on potatoes and milk, the milk containing a certain amount of nitrogen—but on maize flour, and treacle. Certain experiments lead however to the strong assumption that under these circumstances of a dietary very defective in nitrogen, some nitrogen is absorbed from the respired air. (Air consists of oxygen largely diluted with nitrogen.)

Plastic or albuminous foods are those containing nitrogen, of which albumen is the type. Albumen is found largely in the vegetable world, and is a constituent of every seed, as the pea and bean for instance.

It constitutes the great portion of the egg, not only in birds, but in the eggs of reptiles, and of fishes (roe). The white of egg is pure albumen. The flesh of animals, of beasts, birds, and fishes, and the curd of milk, cheese, are also albuminous foods. These albuminous materials go to form the tissues of the body, and in combination with them are found the different salts and mineral matters necessary for the wants of the system.

In addition to these foods there are two other forms of food, called gluten or vegetable matter, and gelatine, an animal product. These two foods are interesting. The first is found in the different cereals, but especially in wheat, and it is from the presence of the gluten in large quantities that wheat has been unconsciously, and in ignorance of the why, chosen as the food of man *par excellence*. It is this gluten which makes the paste of flour tenacious, and causes flour to be manufactured into macaroni, vermicelli, &c. Gluten has been utilised in a peculiar way, viz., in the treatment of diabetes. Here all the starch is washed out of the flour, and the residue, the gluten, is made into bread, and eaten with butter, or other non-saccharine-furnishing material.

The second, gelatine, is the albuminous material of bones, and is also a product of cartilages. It is the constituent *par excellence* of calves-foot jelly. It was long thought the most nutritive of all foods, and was specially selected for the use of sick persons and of invalids. Doubts, however, arose as to its digestibility, and the French Academy appointed the famous 'Gelatine Commission' to report upon it as a food. The report appeared in 1841, and disposed of gelatine as a nutritive material. Raw bones, containing fat, albumen, and salts, as well as gelatine, along with water, would

support life in dogs, but gelatine would not. And what will not maintain life in a healthy dog is scarcely likely to be a suitable food for a sick human being. Along with other material gelatine is not wholly indigestible or valueless; nor as jelly, with sherry, port wine, or other agreeable adjuncts, is it altogether useless to an invalid.

There are also other constituents of food without which life could not be maintained. These are the earthy salts, &c. First of all comes phosphate of lime, the chief constituent, along with gelatine, of bones. (Phosphorus is also a large factor in the composition of the brain.) These phosphates are found in cereals, and it is on their presence that the selection of cereals over pulses, as the food of man, is founded. Various other mineral matters, as soda, potash, magnesia, and iron, are requisite to maintain the integrity of the body.

But while admitting the value of these divisions of foods, and the importance of the classifications from a scientific point of view, the practical utility of a knowledge of the constituents of foods is the power such knowledge confers of combining these foods according to our wants. The instinctive selective choice of man has long since arranged the combinations of foods most palatable and suitable to our needs, long indeed ere science came to explain the why of the combinations. What we now know is this: certain combinations of the various foods of man are absolutely necessary for the nutrition of his tissues, the maintenance of the body-heat, and the evolution of force. Consequently, we find meat, especially lean meat, and potatoes taken together; pork and boiled peas; liver and bacon; bacon and beans; lean beef and fat bacon; bread and butter and

cheese; raisins and almonds, &c. In these combinations the different forms of food are included, the one constituent supplementing what is deficient in the other. The most perfect combination, both chemically and for bulk and keeping qualities, is the sausage invented for the German army in the war with France in 1870. It consists of two concentrated forms of food, or, to speak more correctly, of food in a form to give the maximum of nutrition with the minimum of bulk, pea-meal and bacon fat, with condiments. It is a combination at first sight scarcely likely to form an article of common use, but it suits its purpose well, and supplied the absolutely essential material for nutrition, leaving the soldier to add bulk in any form he found agreeable and palatable.[1]

A well-known and excellent combination of foods is that of milk and some farinaceous material. It forms the best food for the growing child—indeed, it is or ought to be the staple food of childhood. Not only so, but in Scotland this combination is adhered to throughout life. A story is related of a Perthshire ploughman who, when asked about his diet, declared that milk and oatmeal porridge had formed his only food for five-and-thirty years.

In addition to our ordinary food we use additions called spices or condiments, which render the food either more palatable or more wholesome. This last comprises salt, a universal necessity—fortunately for us so cheap that we scarcely know its cost, but in some parts of the globe so scarce that the expression used to indicate a rich man is 'He eats salt to his food'—without which digestion would be but imperfect, and health

[1] It is very palatable, and makes the best artificial pea-soup I have yet encountered.

could not be long maintained. This was seen in the terrible effects of a Dutch punishment, which consisted of imprisonment on a diet of bread, made without salt, and water. Pepper, for which the Romans exchanged equal weights of gold; cayenne; currie, by means of which the Hindoo makes his boiled rice palatable and wholesome; cinnamon; the numerous sauces now in such universal request, all more or less wholesome and agreeable; vinegar, which the Romans always served out to their soldiers as a refreshing beverage; pickles of various kinds, chutnee, &c., &c.: are all valuable and agreeable condiments in moderation.

Other articles are consumed by us either because pleasant to eat, or as furnishing bulk—an essential matter to meet our cravings. Such articles as contain cellulose, mere vegetable matter—the bulk of all leaves, not being the ribs or vessels—are in great request; as lettuces, spinach, celery, endive, onions, &c., all furnishing bulk or flavour rather than nutritive material. Other articles consumed as food are far removed from our ordinary impressions as to what is food. Some tribes in South America eat large quantities of a peculiar clay with their food when the pressure of famine is upon them and the necessity for the presence of something in the stomach becomes imperative; and this clay-eating at times becomes a passion quickly destructive of life. Ehrenberg found the edible sand of Scandinavia to consist largely of tiny organisms of past geologic ages. Many countries have clay-eating tribes. In famines roots are resorted to, then the bark of trees, and straw and thatch have not unfrequently been consumed to appease the pangs of hunger. In the recent siege of Paris, straw, ground husks, &c., formed the bulk of the bread served out. Even less

suitable materials are reported to have been added. This craving after something to fill the stomach and so to appease the pangs of hunger induces men to consume anything which is edible at all. At the siege of Rome by Totila, where the Teutons sat down round the city 'like wolves round a dying buffalo,' when the final capitulation came, the Romans, brown with famine, were found dead and dying with half-chewed nettles in their mouths.

Another form of food is also requisite to health, and this division consists of the subacid fruits, as the apple, pear, plum, apricot, peach, cherry, strawberry, nectarine, melon, pineapple, orange, &c., and the still more acid fruits, as the citron, lemon, and lime. These last are not so agreeable and palatable, but the acid contained in them is a pleasant febrifuge and cooling agent. They are all more or less laxative. There is too much fear about allowing children to have fruit. It should form a regular article of their diet, and as such is wholesome. The occasional supplies of fruit, on which children will readily gorge themselves if permitted, are apt to lead to a surfeit; and the child is ill and purged, especially when the fruit is either consumed ravenously or is itself either unripe or unwholesomely overripe or decayed.

These fruits and their juices are very desirable as articles of diet; especially on shipboard where fresh vegetables are not to be had, and daily rations of lime-juice are now served out as an effectual preventive of scurvy, from which our early navigators suffered terribly. Scurvy is also seen on land in persons who restrict themselves to a diet of which fresh vegetables are not a constituent part. The combination of these vegetable acids and their salts is not, however, to be

made as yet artificially, and still remains a part of the inimitable chemistry of nature. In hot climates these refreshing fruits grow in great abundance, and render a residence in the tropics tolerable. A slice of melon or other fruit is the common gratuity given in addition to the regular charge for any service in hot climates, and forms a contrast to the lump of fat which is its equivalent with the Esquimaux.

The presence of the different salts in our articles of food is most important, and without them food is unpalatable, unwholesome, and repugnant to our instinctive choice. Meat, deprived of its salts by long boiling, will not sustain life, and dogs placed on it as a diet, after one meal will hunger to death sooner than again eat it.

Having gone roughly over the different forms of our foods, and pointed out the peculiarities and qualities of each, we may now proceed to some further considerations about our food in relation to ourselves.

Food furnishes the force which the system evolves. The material of food is requisite to the performance of all action, and the force involved in every movement is the equivalent of so much food. The drawing of a bowstring, each step we take, every stroke of the pen, the movements of the intestines, all involve the expenditure of force; which force is supplied to us in our food, and chiefly in that division called respiratory food. This food not only furnishes the great portion of our heat, but also of our acting force.

According to different climates and different occupations and pursuits are the requirements for various foods. In hot climates a quantity of farinaceous food containing little heat-forming power, as in the common staple *rice*, is sufficient for the needs even of those who labour, especially when combined with succulent fruits;

indeed, the persistence in the diet of the temperate zone in the tropics is a fertile source of disease. In cold climates large quantities of the stronger heat-giving foods, as fat, are absolutely necessary, and the inability to digest fats on the part of the negro and the monkey, as said before, is the cause of their mal-nutrition and tendency to die of tubercle in cold climates. While the people of Africa and Asia are largely vegetarians, many of the inhabitants of America are almost exclusively meat-eaters. Ere the introduction of cereals by the white man, the flesh of animals was the staple food of most North American Indian tribes—lean, restless, savage, carnivorous, animal kind of human beings they were. Flesh is the chief food of the Gaucho of the Pampas—a restless, untiring race, living almost wholly on horseback. The flesh-eating Mahometan is a powerful, active-minded, zealous fanatic, much more actively dangerous than the quiet, inoffensive, rice-eating Hindoo.

This is as certain as it seems at first sight singular. Still we are all more or less acquainted with the action of food upon the character. Bread and water, with confinement, was the old treatment of stubbornly refractory boys, and was certainly effective. The denial of nitrogen had its effect upon the will. The late M. Metz of Mettray, the benefactor of the reformatory children of France, found the kind of food given to have a great effect upon the boys; and a generous diet with wine was found requisite to enable some weak-willed, soft boys to keep to their resolutions, the 'sluggish boys of lymphatic temperament who were liable to relapse into evil ways, apparently from inability to remain in the right groove like the more energetic boy.' ('Daily News,' November 19, 1873).

The energy of the British soldier has always been attributed, and rightly so, to his liberal dietary of beef. The effect of food upon the nature of the consumer holds good of all the higher forms of life. 'The carnivora are in general stronger, bolder, and more pugnacious than the herbivorous animals on which they prey; in like manner, those nations who live on vegetable food differ in disposition from such as live on flesh' (Liebig). A bear at Giessen was very gentle when fed on bread, a day or two on meat made him savage and dangerous. This effect of food upon the disposition may often be utilised with advantage, either in allaying the excessive determination of the child or in bracing a man up to his work. The effect of the nitrogen upon the brain is to evolve and discharge nerve force freely, and this rules and regulates the actual force which takes its origin in the respiratory foods consumed. These respiratory foods furnish the force itself, but the nitrogenised food supplies the manifesters of force. 'The hunted deer will outrun the leopard in a fair open chase, because the force supplied to its muscles by the vegetable food is capable of being given out continuously for a long period of time; but in a sudden rush at a near distance, the leopard will infallibly overtake the deer, because its flesh food stores up in the blood a reserve of force capable of being given out instantaneously in the form of exceedingly rapid muscular actions.' (Haughton.) Nitrogen is the essential factor in all explosive compounds, from gunpowder to nerve force. It endows the consumer of it with energy, and enables him to discharge his force quickly and rapidly. Nitrogenised food is requisite for all active work, it gives active, positive courage, and its properties may consequently

be utilised: on the other hand the explosions of passion in the gouty man contrast with the calm of the vegetarian. For all intellectual work, entailing the expenditure of much brain force, a nitrogenised diet is desirable; for long and slow continuous muscular work it is not so imperatively necessary.

Ere leaving the question of the effect of different foods on the will and energy, it may be not unprofitable to glance at their effect upon our noble bondslave, the horse. A diet of hay, carrots, &c. will keep him docile, tractable, and quiet, but sluggish and unenergetic. Corn, and especially when combined with beans, makes him sprightly and energetic, but restless and difficult to manage. His food affects his speed and endurance, and without his nitrogenised food he would cut a poor figure at a race, because without it he could not discharge his force fast enough; without his other food the agricultural horse could never sustain his long hours of labour. The patient, docile, long-enduring farm-horse is a perfect contrast to the restless, high-mettled, quick-moving racehorse; nor does it all lie in the effect of inheritance, there is much in food, as the trainer both of men and horses well knows. The form of food consumed has a great effect upon the nutrition, and the excess of respiratory foods is stored up as fat. Thus the farmer fattens his stock on rich hydrocarbonaceous food, and in Dahomey the king's wives are artificially fattened by similar means. On the other hand, recently there has sprung up a plan of reducing the amount of fat borne by a person when this reaches what is termed obesity. This plan is called Bantingism. It consists of the withdrawal of all hydrocarbons, as far as possible, and the substitution for them of albuminous food. As mentioned

before, it is effective but not free from risk, and the attempt to suddenly convert omnivorous man into a simply carnivorous creature, has entailed much disease from the overloading of the system with the products of nitrogenised waste. However simple upon paper, the modification of the system by food is much more difficult in practice; and a spare person often sighs in vain for plumpness, and the obese vainly seek reduction. Of the two, perhaps a reduction of bulk is to be attained with more certainty than can the spare be fattened.

One of the great problems of the day is the food-supply. This question has arisen from the necessities of modern commercial and manufacturing enterprise, and the increase of the population, especially in the great manufacturing centres. In primitive times when the resources of a district were becoming exhausted, it was enough to strike the tent-pole, and 'seek pastures new,' the old district recovering itself in the meantime. When the population became more numerous and fixed, the priests made certain forms of food sacred, and so saved them from extinction when necessary. Thus the Hindoo was taught to consider the cow as sacred, without which protection the cow would long ago have disappeared, vanished before their wants; its milk would no longer have been procurable, a great deprivation in itself amidst a vegetable-eating people, and of course there would also have been no butter to their boiled rice. By making the cow sacred these dangers are averted. In Central Africa the same plan is in vogue, and certain animals are made sacred from time to time when their extinction is impending; when they again become numerous the restriction is withdrawn. These primitive practices were well enough

when feasible, but no such plan would now be of avail with our hungry working millions. Food they must have, and England is no longer equal to producing a sufficiency of food for their needs.

Commercial enterprise alone is equal to meeting the emergency. The carriage of corn and dry vegetable growths has never presented any difficulty. But the problem of how to bring the rich wealth of animal food, worthless in its abundance, in one country to the craving needs of other regions has been found very difficult of solution. The prohibitory price of butcher's meat in England, while in other parts of the world cattle were only valued for the fat and their hides, two readily transportable articles, has set in motion many ingenious projects, some impracticable, others working well. Of all the plans adopted, that of tinned meats has been found the most successful. The prejudices against this form of food are fast waning out, and common sense is now prevailing in the matter, so that tinned meats are alike used for provisioning armies and providing for the cravings of numerous households. Any advocacy of these welcome additions to our dietary is almost superfluous now, and all that remains to be desired is the further supply of such food at reduced prices, with a wider range of articles. The plan of hermetically sealing up vegetables in tins is rapidly spreading, and furnishes to us at all times what were once the delicacies of a brief season. Liebig writes, 'This valuable method of preparing food has been adopted by many persons in my neighbourhood (Bavaria) and other parts of Germany, and has enabled our housewives to adorn their tables with green vegetables in the midst of winter, and with dishes at all times which otherwise could be obtained only at particular seasons.'

Milk too, is now brought from the rich grazing districts into the open market in tins, being previously condensed for the convenience of carriage. This condensed milk is a mighty boon, especially to our infant population; for it is often well borne by children and babies who cannot take milk as furnished to them by the ordinary milk-sellers, as well as providing a supply of pure milk to the denizens of the most crowded or squalid districts.

Another useful form of aliment is Liebig's essence of meat, and though not by any means the equivalent of fresh meat juice, properly prepared, it contains a quantity of useful salts, and the flavouring ingredients of meat. It may be added with advantage to the bread and water on which infants are fed, though this combination is far inferior to milk and bread; it can be added to a basinful of arrowroot or sago, it may be combined with pea flour, or bread crumb, and so, combined with pepper and salt and a small knob of butter, forms a useful and palatable food.

More expensive preparations of meat juice are made, and are suitable to the sick person and the invalid. They contain albumen &c., as well as the salts and the flavouring ingredients of meat, and are real unmistakeable foods. They are very palatable, especially those of Gillon of Leith, as a good personal experience in a severe attack of scarlatina can testify.

This brings us to the question of the food of sick persons, a consideration which will bring the subject of food to an appropriate close.

Firstly, the food of an invalid must be readily digestible.

Secondly, it must be in such a form as admits of its being easily taken.

Thirdly, it must be of such a character as not to load the bowels.

Fourthly, it must be nutritious.

It is obvious that solid food is unsuitable; and the selection of fluid food is correct. Milk, either plain or mixed with lime water, seltzer water, or soda water, is agreeable and almost always suitable. Freshly prepared meat tea, either beef, mutton, or chicken, is a suitable form of food, and may be thickened with sago, arrow-root, or bread crumb. It is prepared by cutting a pound of the best lean meat into little pieces like small dice, adding a pint of cold water, and then putting it in the stew-pan and permitting it to simmer for several hours, allowing the pan to grow warmer by slow and gradual steps. After three or four hours of such simmering the boiling point is nearly reached, and it should then be taken off, run through a sieve, and given to the patient in small quantities, diluted and flavoured with a little pepper and salt, or even with some sauce.

Light puddings, as tapioca, or sago, and eggs lightly beaten up, are also suitable.

Acute indigestion is apt to follow food unsuitable either in quality or quantity; and in all cases the directions of the medical attendant must supersede anything written here. As convalescence progresses the ordinary food may be gradually and cautiously resumed.

Drinks.—These may be considered as coming under the heading of food, as they are simply indispensable to the perfect assimilation of food. Not only that, but water, either as simple water or in combination with some flavouring ingredient, is absolutely necessary to man's existence. There is a constant flow of water throughout the tissues of every animal, and this must be met by the imbibition of fluids. Great are the

tortures which are experienced by shipwrecked mariners and desert travellers in consequence of an imperfect supply of water, and death is more quickly induced by thirst than by hunger; not only so, but the agonies of thirst are terrible. About three pints of fluids are the normal allowance of water to human beings in a temperate clime under ordinary circumstances, but when there is much perspiration induced by exertion or other cause, a much larger quantity is necessary. In iron-works the men, exposed to high temperatures and bathed in perspiration, when at work drink from two to four gallons of fluids per diem. There is a popular prejudice against drinking freely of cold fluids when heated, and no doubt death is sometimes so induced; but the consumption of cold and even chilled drinks is now much on the increase. Ice is no longer regarded as a mere luxury, it has become a necessary of life in hot weather, and its addition to a beverage adds much to its agreeableness. The chilled fluid directly lowers the heat of the body, and abstracts from it as much heat as is requisite to raise the temperature of the chilled fluid to that of the body, that is, from about 32° to 99°; this exercises a distinct influence over the body temperature for some time. It is obvious from this that the quantity of the chilled fluid has much to do with the effect, and a pint will take twice as much heat to raise its temperature as will half a pint. Consequently it is not unimportant to the imbiber what the amount of his fluid is, as well as its temperature; and to those who produce heat but slowly a sip of iced fluid is as cooling as a draught of it to another whose heat-forming power is great. The draught of the latter would be as dangerous to the first, as the sip of the first would be useless and ineffective to the latter. At all entertainments, dancing

and other, where the heat becomes great, ice, both as a beverage and in the more solid form of ice cream, forms now the essential matter of the refreshment table, and is very acceptable. It must be remembered, however, that free indulgence in iced fluids is very apt to induce a sharp diarrhœa in many persons. Also the free consumption of ice has not unfrequently the effect of creating even a stronger craving than ever for fluids, from the same action upon the throat that snowballs have on boys' hands—the persistent cold causes a free flow of arterial blood to the part. In such case a drink of warm fluid often gives relief.

In febrile affections ice is most grateful and acceptable, not only to the sensations of the patient, but it exercises a distinct cooling influence and lowers the high temperature of the body. Chips of ice are very welcome to the parched mouth, as any one who has had a personal experience of fever well remembers. In the hiccough and sickness which accompany the final stage of many diseases nothing is more effective than ice in affording relief from these distressing phenomena.

One word more as to how to keep ice. It should of course be kept in a cool place—that is obvious enough. But it should be kept dry also. If kept in anything where its water collects it will melt away speedily. It should be kept wrapt up in a non-conductor like a piece of flannel, and then placed in sawdust. When so treated it melts but slowly. The Norwegian oven, in hot weather, makes a capital ice cupboard.

On the other hand warm drinks are most useful in cold weather, or when the body is chilled. Here the heat of the warm fluid passes off into the body and so raises the body temperature; an actual saving of material in cold weather. Also when a person is chilled

either by long exposure to cold or from wet clothes, a draught of warm or even hot fluid quickly restores the body to its normal temperature, and this frequently obviates the after consequences denominated a cold. By the use of hot drinks in winter and ice in summer, man regulates his temperature, much as he does by varying his clothes.

CLOTHES.

Clothes are the external coverings of the body. Theologically they were instituted to cover our nakedness; physiologically they are utilised to protect us from external influences. They vary from a mere breech-clout to a suit of furs, according to climate and region. In Burmah the young grandee has himself magnificently tattooed, because in that country it would be inconvenient to have to wear clothes ordinarily as ornamental appendages. In Siberia the skins of animals with their fur unremoved are the common wear of the people. Indeed, if it were not for such clothing the human inhabitants of very cold climates would perish from cold, no matter how much fatty food might be consumed. The heat producing powers of the system would not be equal, if unassisted, to maintaining a body temperature compatible with life. The heat would pass off faster than it could be produced if it were not for these clothes, which being bad conductors of heat prevent the radiation away of the body-heat. Liebig says, 'Our clothing is merely an equivalent for a certain amount of food; the more warmly we are clad, the less urgent becomes the appetite for food, because the loss of heat by cooling, and consequently the amount of heat to be supplied by food, is diminished.' This is as true as anything ever said by that great master-mind: and the giving away of

flannel and blankets to the poor at Christmas is as appropriate as the distribution of food. Warm clothes are as desirable in winter as are sufficient supplies of food, and to a great extent these are interchangeable; the well-fed person withstands cold well, and needs but light clothing compared to the ill-fed person, who must be warmly clad. Unfortunately the good clothing and the ample supplies of food are usually found together, and their opposites also allied. The hybernating animals, as the hedgehog, the mole, and the viper or the frog, could not maintain themselves alive on the material stored up in the body, if they did not also locate themselves so that their heat is not readily radiated away. This is most so in the case of the warm-blooded hedgehog and mole: the so-called cold-blooded viper and frog being little above the temperature of the surrounding atmosphere. To enable them to get through the winter a cosy place, where their heat is well retained, is as necessary as the combustible fat stored up in their bodies. The animals of cold regions have much thicker coats of fur than similar animals in more temperate climates. In winter animals have thicker coats than in summer, as is well seen in the horse.

Man has utilised for his wants not only the coats of animals, but also their wool, and different vegetable fibres, which are capable of being woven or interlaced. Those in common use are the fibres of the line, or linen; the fibres of the cotton plant; and jute, the fibres of a plant growing freely in Russia and India; and even the fibres made by the silkworm.

All these are useful for various purposes and various textures: cotton made up into slight fabrics being the material in use in warm climates, while woollen goods are more suitable to colder climes. This selection

depends upon the amount of heat-conducting power each material possesses. In hot climates a material permitting of the heat being readily given off is desirable; in cold regions, a non-conducting material permitting the heat to pass off but slowly is indicated. Direct experiment shows the conducting power of each substance used for clothes most instructively, and a vessel full of boiling water has been found to cool down to a certain point under coverings of various material in the following order. The quickest in linen, next in cotton, or in hemp, all three being nearly alike; more slowly in light flannel, and slowest in thick blue cloth.

Linen, ere the growing of cotton became so important a matter, was used for underclothing, and up to a recent period a maiden's dowry contained so much linen, called home-spun; that is, the linen thread which constituted the material itself, was of her own spinning. But linen shirts and sheets are comfortless things, and permit of rapid dispersion of the body-heat.

Cotton goods are now most in demand for underclothing, ordinarily, and are very suitable for the purpose. Their manufacture is something enormous, and the percentage of cotton in the clothing of man is high. In warm climates, cotton goods form the clothing *par excellence*, from the blouse of the West Indian to the shirt of the Chinaman. In colder weather, a flannel undershirt, however, is often better than a cotton jerkin; and the same is the case where there is free perspiration. Colds are much more common when cotton is worn next the skin than when a woollen garment is substituted for it; especially where there is a liability to its being soaked with the water of perspiration.

Woollen goods are not only used for the undercloth-

ing, but also for the outer covering of man. A glance at a hosier's window tells of worsted socks, shirts, drawers, jerkins, guernseys, gloves, and mufflers; the whole contrasting with the draper's and tailor's, where there are woollen goods of all weights, from the thin cloth used for the lining of coats up to the thick material of the Ulster. Woollen goods are next to furs in their non-conducting power, and are the clothing *par excellence* of cold climates.

Silk is rather an ornamental material than used for practical purposes; still, with some imperfectly acting skins, silk next to the skin is desirable, especially in those who cannot tolerate wool in this position.

Not only are our day-clothes chiefly composed of cotton, wool, &c., but similar materials cover us at night when asleep. There is a difference, however, in this; the material of bedclothes is much more substantial than that worn when awake. There are several reasons for this:—1. The night is colder than the day, and so thicker coverings are indicated. 2. The radiation away of heat by the skin in sleep is much greater than in waking moments. This is well-known among travellers in cold regions: 'the man who sleeps dies, the man who keeps awake survives.' In selecting a comfortable couch for sleep, man acts in a manner similar to animals, which always secure a cosy lair or retreat, as far as is possible, for their sleeping moments. The effect of cold during sleep tells on them as well as on us, and all instinctively seek a place where their heat will not be quickly conducted away.

As well as linen or cotton sheets and woollen blankets, man uses the feathers of animals, not only to sleep on, but also to cover him at night. The light toralium, or quilted cover of feathers or down, is much better than

the heavier quilt or counterpane of cotton: it is as warm and much lighter. In Germany, a small feather-bed covers you as well as lies beneath you.

The material on which we lie is not unimportant; the cosy but enervating feather-bed is rapidly becoming a thing of the past, and firm hair mattresses are taking their place, and are much healthier. Rest on a hair mattress is much more refreshing than that on a feather-bed, and the effects upon the health and energy are often widely different. Many female complaints are simply incurable so long as the patient sleeps on a feather-bed, on account of the relaxing action of the heat. Spring mattresses are cool, healthful, delicious, and conducive to sound, refreshing sleep.

In addition to these materials the skins of animals and the juice of trees are utilised by man to cover him and protect him. The first forms leather, of different kinds for different purposes; the latter furnishes india-rubber and gutta-percha.

Leather forms the greater portion of our gloves, and as such is derived from deer, kids, goats, rats, and other animals which furnish a thin and fine leather. In addition to these, as protectors against cold, are added cloth, lambswool, &c., as linings; or the glove itself may be of fur for cold climates. Wet gloves are very unpleasant, and india-rubber driving-gloves, comfortably lined, for wet weather, are now procurable. Tight gloves, by interfering with the circulation, often cause great coldness of the hands, and the long finger is often much colder than the rest, from the pressure of the glove-finger upon it. Woollen coverings to the hands are commonly worn, especially when the gloves are thin, and as muffatees, or mittens are very comfortable. Ladies, whose gloves are almost always thin, carry muffs, a

comfortable article, usually consisting of the fur of animals externally, and lined with thick layers of cotton-wool.

But much more important than gloves are the matter of boots and shoes; much of our comfort and not a little of our health is involved in that question. Cold or damp feet cause much discomfort, and no little disease, and death is not infrequent as a consequence of disturbance caused by wet feet originally. Leather forms the staple of our boots; thinner leather forming the upper part, and stouter leather the sole. Leather is tanned skin, and when made with honest bark and a sufficient time allowed in the tanning, merited fully the old well-known encomium, that there is 'nothing like leather.' But now it is very different, and leather has suffered more at the hands of modern commerce than anything else, not even excepting wool. Good leather does not readily absorb moisture, and, being a bad heat-conductor itself, keeps the feet warm. When boots are wet, we all know how readily our feet become cold, especially if we are not in motion. Everyone knows the difference betwixt laying hold of a pair of dry boots, and of a pair still wet from a previous soaking; the latter are cold and chilly, and convey away the heat quickly. Wet leather is a ready conductor of heat, and is in this respect widely different from dry leather. In very cold countries, where all moisture is quickly frozen, long leather boots are in common use, and a long boot and a stocking cover and protect the lower limbs perfectly, when thick furs are required for the rest of the body. Waterproof boots have often been tried without success, but the difficulty lies in this: the waterproof material, while resisting external moisture, retains the perspiration of the feet, and this is very

objectionable. Gutta-percha soles are good in some respects, but are undesirable in other points. Heat spoils them, they are dangerously slippery in frosty weather, and they are not very healthy. Gutta-percha boots and shoes, uppers and soles, are never worn long by anyone; sooner or later they are given up for their discomfort or their effect upon the health.

Waterproof materials made up with indiarubber are, however, most serviceable as outer covers. The mackintosh, the indiarubber-covered blanket, fishing boots, rubber overshoes, and leggings, are all good in their way; and are less injurious to the health than would be exposure without them. A waterproof cover is not only useful against rain, but it is the best protection against a cold wind. All these materials, however, retain the perspiration unpleasantly.

Finally, man finds it comfortable to cover his head, and numerous are the devices he adopts against cold, heat, and rain. For the first he uses the skins of animals lined with quilted cotton, or woollen as in the Scotch cap, or the Tyrolean felt; for the second, long folds of light material are used, as the turban, especially in Eastern countries where the heat is much more trying to the head than in an equal latitude in other countries; and against the third, cloth coverings, and waterproof tarpaulins &c. Under what head the high-crowned hat in common use, called in Germany a cylinder, and here vulgarly a 'chimneypot,' comes, it is impossible to say. It possesses every objectionable quality a head covering can have, and has no corresponding advantages; it is neither comfortable nor pleasing to the eye, it is most objectionable in a wind, and requires the umbrella to protect it from the ruinous action of rain; it serves but ill the purpose of a supple-

mentary pocket; it is inconvenient in entering vehicles, always getting bumped against something; it is an eternal temptation to a man to put it down and throw his gloves into it on entering a strange house, thus involving him awkwardly in the eyes of conventional people; and finally it is not very durable. Any comment upon a lady's head covering would be very impolitic, and might lead to lady-readers closing this book in indignation. Such a very particular matter as a bonnet or hat belongs to the sex itself, and can never safely be subjected to calculations of utility. Ladies will stand comments on jackets, cloaks, and other over-coverings, but bonnets are sacred against criticism. On this matter I bow to the innate convictions of my fair countrywomen, and always get as quickly as possible past the crowd usually found round the windows where there are exhibited those wonderful, intricate, and, to the male mind, incomprehensible head-coverings, on which are lavished so many expressions of affection.

As to the actual use of clothes, Parkes (on Hygiene) sums up thus:

'*Protection against Cold.*—For equal thicknesses, wool is much superior to either cotton or linen, and should be worn for all under-clothing. In case of extreme cold, besides wool, leather or waterproof clothing is useful. Cotton and linen are nearly equal.

'*Protection against Heat.*—Texture has nothing to do with protection from the direct solar rays; this depends entirely on colour. White is the best colour: then grey, yellow, pink, blue, black. In hot countries therefore, white or light grey clothing should be chosen.

'In the shade the effect of colour is not marked. The thickness and the conducting power of the material

are the conditions (especially the former) which influence heat.

'*Protection against Cold Winds.*—For equal thicknesses, leatherand indiarubber take the first rank, wool the second, cotton and linen about equal.'

PROPOSITIONS.

1. There are two great divisions of food—the respiratory and the plastic.
2. The presence of nitrogen constitutes the essential difference.
3. The respiratory foods maintain our body heat: the plastic foods build up our tissues. (Speaking broadly.)
4. Gelatine is comparatively valueless as a food.
5. The combinations of food are most important: good combinations are found in our common dishes.
6. Spices are wholesome and desirable.
7. A certain bulk of food is instinctively craved after.
8. Sub-acid fruits are agreeable and wholesome.
9. Scurvy, on land or on sea, is curable by the juice of acid fruits, but not by the mere acid itself.
10. All force is derived from food, and especially from the respiratory foods.
11. The form of food consumed has an influence over the character of men and animals.
12. Nitrogen is the explosive agent which calls out manifestations of force.
13. 'Bantingism' is not free from risk.
14. In some countries animals are preserved by being made sacred.
    (Edible animals are so saved from extinction.)
15. Tinned meats are a valuable addition to our dietary.
16. Condensed milk is a great boon, to children especially.
17. The food of invalids should combine nutritive qualities with ready digestibility, and should admit of being easily taken.

18. Fluids are necessary for digestion; and also for the needs of the system.
19. Fluids admit of being easily chilled or heated: and 'iced' or 'hot drinks' are agreeable and useful, according to circumstances.
20. Clothes prevent the loss of heat, and are almost equivalents for food in cold climes.
21. Cotton is the material for use in hot climates: wool in cold ones.
22. Our bed-clothing is, and must be, thicker than our day clothing.
23. Dry leather is a very bad conductor of heat, and keeps our feet warm: but damp leather is a good conductor, and produces cold feet.[1]
24. Waterproof coverings, though possessing many objections, are frequently serviceable.

[1] See Appendix.

CHAPTER VI.

STIMULANTS AND TOBACCO.

THERE is nothing more marked in the history of man as a physical agent, than the widespread consumption of stimulants. Civilisations the most exclusive and isolated have each their means of acting on the nervous life. When the Spanish conquerors met the old Indian civilisations in Mexico and Peru, they found them possessing fluids of an exhilarating and stimulating character. The pulque of Mexico is a stimulant, made from the juice of the agave, while the Peruvian drank chica, a fermented drink made from maize, out of mighty golden goblets. Not only has alcohol, the stimulant above all others, and the vegetable principles, tea, coffee, and cocoa, been pressed into the service of man, but even a form of pepper, prepared by chewing, and a poisonous mushroom, have been resorted to in order to produce that action upon the nervous system which in its advanced stages is called intoxication.

'A peculiar problem, indeed, is presented to the psychologist in the remarkable circumstance, that wherever the human race is found, in the highest condition of civilisation as in the first dawnings of culture (with the exception perhaps of some few races almost more like animals than men), the custom ever exists of transporting themselves by various means into a higher

condition of mental activity, which in its excessive and evil phenomena is called drunkenness.' So writes the great German botanist Schleiden, who gave much thoughtful attention to this complex and difficult subject.

Whatever may be the feeling as to the why of this, there is no doubt as to the fact, and these means of acting upon the nervous life have been discovered wherever man has developed intellect enough to devise a process by which he can reach a stimulant. The lowest forms of stimulants unquestionably are those of the South Sea Islanders and the Kamtschatdales — the pepper and the mushroom. The first is chewed by squaws, and the saliva secreted freely under the stimulus of the pepper is spit into a large bowl, and this fluid is drunk by the warriors of the tribe. It is scarcely possible to conceive of a more disgusting method of arriving at the wished-for intoxication, and yet the plan of the Kamtschatdales is even more revolting. The principle of the fungus they use for the purpose of inducing intoxication is excreted by the urine, and this they drink again and again, keeping up the debauch by such means for several days. Verily man will sink low indeed to obtain the sensations of intoxication!

Our Norse ancestors regaled themselves on a poor ale—poor probably because they did not know how to brew a better one, or doubtless they would—and mead, a fermented drink made from honey; and on these they held grand drinking bouts, the forerunners, they held, of the eternal wassail in the halls of Walhalla. However much we may dislike it, there is no doubt but the heaven of our Norse ancestors was a paradise of intoxication. The Tartar tribes of the steppes of Asia prepare an intoxicating drink called koumiss from the

milk of their mares, and suck it from a tuft of hair dipped into the fluid.

In order to show how widespread is the consumption of stimulants, let us just enumerate the leading drinks of the world.

EUROPE.

Generally . .	Wine, spirits, and beer.		
Western Europe (and America)	Cider and perry, made from apples and pears.		
Russians and Poles	Vodki	„	potatoes.
Austrian Sclavs .	Slibowitz	„	plums.

ASIA.

Hindoos . .	Arrack	„	rice.
Chinese . .	Samshov	„	rice.
Japanese . .	Saki (beer), and Mirin (spirit), made from rice.		
Tartars . .	Koumiss	made from mares' milk.	
Mahrattas . .	Toddy	„	cocoanut.

AFRICA.

Abyssinia . .	Tallah	„	millet.
Negroes . .	Palm wine	„	the palm.

AMERICA.

Central America .	Rum	„	sugar-cane.
Mexico . .	Pulque	„	agave.
Peru . . .	Chica	„	maize.

The aborigines of Australasia do not seem to have been able to devise any form of stimulant of an alcoholic character. In addition to the drinks mentioned above, there are various forms of liqueurs, as curaçoa, maraschino, chartreuse, &c., in common use.

Wine is exclusively prepared from the juice of the grape, and contains along with alcohol various ethers which give to wines their bouquet, and further affect and modify the intoxicating effects of the alcohol. Some too are effervescent, and, other things being

equal, the sparkling wines are more exhilarating than the still wines. Most wines improve by age, and most notably port wine. Sherry is by comparison little benefited by age. But any wine, to benefit by keeping, must be a good-bodied wine to commence with. The subacid and acid wines are all refreshing beverages, but are liable to make gout manifest itself—if not actually to occasion it. Many of the commoner red wines possess an astringent property. Sherry is most readily tolerated by the dyspeptic. A suitable wine is usually very grateful to an invalid, especially during convalescence. The wines of Spain and Portugal are almost all more or less fortified with spirit for the British market.

Spirits are variously prepared from cane-sugar, grapes, barley, rye, and potatoes. They are all improved by age, and the fusel oil, which gives the maddening effect to new spirit and also the terrible after-headache and depression, becomes by time broken up into a more agreeable and less deleterious ether; so that the Highland toper will put his hand upon his jar of old whiskey, and with pardonable pride inform you that 'there is not a headache in a gallon of it!' There is no question but that the intoxication produced by pure alcohol, or good old spirit, is much quieter and more 'sensible-like' than the furious drunkenness which results from coarse or adulterated spirits. The terrible rows of squalid neighbourhoods are due as much to the poisons by which their drinks are adulterated, as to the habits and rudeness of the people themselves.

Spirits consist largely of alcohol, and are powerful agents as stimulants, whether used medicinally or as exhilarants. The more concentrated the spirit the worse its effects upon the viscera, and the drinker who takes

his spirits undiluted is far on his life's journey. The Scotch prefer the taste of the undiluted spirit, but they drink water after it.

Beer is a stimulant and a beverage, and varies in strength from a thin light table-beer, a most refreshing and innocent beverage, up to the A 1 of Burton brewers, a most potent fluid, well worthy of the Walhalla halls of which our ancestors dreamt.

Barley is the cereal from which beer is brewed, but other things are sometimes used, as raw sugar or maize, though the beer so produced is not so good. Hops are added not only as a flavouring agent but in order to preserve the beer in warm climates; hence the bitter East India pale ale, now so much in vogue. The different ales of England and Scotland are quite distinct from the ales of Bavaria and Vienna, and, as a rule, are not to be compared to the latter as a mere beverage.

Beer in any of its forms, as ale, bitter beer, porter, or stout, is rarely given medicinally as a stimulant, but it is often given during convalescence for its feeding properties. These properties are the combined result of the alcohol stimulating the digestive organs, the tonic action of the hop upon the mucous lining of the stomach, and the saccharine material contained in the fluid. One most important point must ever be attended to in the malt liquors given to the invalid, and that is, they must be 'in condition,' i.e. in a good condition for drinking. Flat, stale, dead malt liquors are useless as well as distasteful, and the beer of the invalid should be bright, and if possible sparkling, and the porter or stout 'up,' with a creamy foam. What the difference is, it is not easy to say, but there is a difference and a marked one.

Cider is a most pleasant and wholesome drink in

summer, better than beer in hot weather, and allied in many respects to wine. Perry is a delicious drink, not in such common use as cider.

Liqueurs are rarely used except as an addition to viands, but are powerful intoxicants. They are almost simply luxuries, and need detain us no further.

As alcohol has in its use and its abuse played a very important part in the history of man, and is also the subject of much discussion, not always characterised by either knowledge of the subject or temperateness on either side, it may be considered here at some length with all the dispassionateness the matter requires. There is no attempt being made here to stand well with both sides, teetotallers and their opponents; indeed, the position taken up will scarcely suit the partisans of either side, but the handling shall be at any rate unbiassed, and if possible impartial.

First of all, Is alcohol a food? It must at once be admitted that it is; it is useless to deny it. It contains no nitrogen, but it is a respiratory food. Lewes ('Physiology of Common Life,') says: 'We are forced to call alcohol food, and very efficient food too. If it be not food, then neither is sugar food, nor starch, nor any of those manifold substances employed by man which do not enter into the composition of his tissues.' Again, he quotes from a great authority (Moleschott): 'Alcohol is the savings bank of the tissues. He who eats little and drinks alcohol in moderation, retains as much in his blood and tissues as he who eats more and drinks no alcohol.' In Germany it is the rule to charge the water drinker so much more for his repast than is the tariff for the beer or wine drinker. It is well known that he will eat so much more. A good illustration of the soundness of this arrangement is shown by the

account of the Peace Congress in Frankfort, where the consumption of farinaceous dishes and puddings—respiratory foods, be it marked—was quite unusual and excessive. The men of peace were also teetotallers and drank no alcohol. The proprietor of the Hôtel de Russie observed that those who drank no wine ate more in proportion.

Though alcohol may be found in the breath and in the urine after its consumption, still it is largely burnt up in the body, and as a respiratory food furnishes both heat and force in its combustion, so saving the material of the body.

The beer drinker is rarely also a pudding eater, and when ladies at table hear a young gentleman say, 'I'm not a pudding man,' they know at once that he takes his respiratory food in another form. The same holds good to a great extent of the rejection of fat by the beer drinker.

But it is not as a food that alcohol is commonly consumed, it is as a stimulant. Now what is a stimulant? It is an agent which enables the system to use up more of its stored force than it could otherwise do; in other words it enables a person to borrow from himself. The system possesses the power of using up so much of its force and no more; a stimulant enables the individual to use up some of the reserve force, to borrow from himself. Now it is obvious that a loan is thus incurred which, however useful at the time, has sooner or later to be met. There is no evading the payment except by converting the temporary loan into a permanent debt. This makes the difference between the use and abuse of alcohol: if it can be used as a convenience for a time only, its injurious effects are not seen. But if the loan cannot be taken up, then comes

its conversion into a debt, a permanent lien on the body force. When the time of payment comes, and there are not funds in the body bank to meet it, or, to make the analogy more perfect, if the loan from the body bank is not repaid or met by the incomings, then there is permanent deficit. In the ordinary well-fed man such repayment is constantly going on, and it is as convenient to draw upon the system for the time being by a stimulant as it is commercially convenient to draw a bill. The stable firm or person meets the payment when due and goes on its way, drawing another bill and meeting it as occasion requires. But not so either the ill-fed man or the needy firm. They find it impossible to meet the bill except by drawing another, a wasteful, ruinous plan which inevitably ends in bankruptcy either financially or physiologically. It is the insidiousness with which the first may merge into the second form of consuming stimulants that forms one of the greatest dangers of stimulants, especially of alcohol. Not that it necessarily happens, but it too often does. Alcohol is, in England at least, so dear as to make it a most unsuitable article of consumption, and yet its use obtains among the poorest classes. Take a labourer, for instance, who has so much labour to perform ere his day's work is done, and that, too, in a limited time. He knows that a pint of beer will enable him to finish it, and he has it, and does his work. It has enabled him to call upon his reserve fund of force. True: but it has consumed a comparatively large portion of his wages to pay for it; it is borrowing at a high rate of interest, but needy borrowers usually have to pay dear! If he is a temperate man and goes home, has a good supper, and a long sleep, probably he is

none the worse for his stimulant. It has been a means to an end, and no more.

But if, on the other hand, that exhaustion of his ordinary force is due to his having made a loan the day before which he has not met as he ought to have done, it is a case of simple deficit, and he meets the necessity by borrowing a portion of the force which properly ought not to have been used till the next day. When the next day comes he has to repeat the loan: it has become a permanent debt unless a quiet Sabbath relieves him. The working-man may well be a stanch supporter of the Sabbath as a day of rest from toil. That it is too often misused and its advantages forfeited is but too true. The further effects of the abuse of alcohol and other stimulants in the production of physiological bankruptcy will be considered in the chapter on overwork.

What is the effect of alcohol upon digestion? In small doses it aids digestion; in large and concentrated doses it ruins it. A small dose of alcohol makes the lining of the stomach red and full of blood, and so the secretion is freer and digestion more perfect. Thus, a glass or so of wine, a little spirits and water, or beer, aid a feeble digestion, and the meal thus accompanied is digested when this would not otherwise be feasible. The alcohol represents so much food, too, as we saw above; but a draught of strong alcohol produces a vascularity so pronounced as to almost amount to an inflammatory condition, and the secretion is arrested and digestion rendered impracticable. The drunkard prefers soups and other similar forms of food which his enfeebled digestion can assimilate.

Alcohol, too, when taken undiluted, is absorbed, producing much slow inflammatory change in the liver

and other of the viscera. Gin-drinker's liver is a medical term in common use in the dead-house. The more remote effects are felt in the kidneys; and the kidneys of a hard drinker are rarely, if ever, found in their integrity.

Alcohol possesses a distinct effect upon the circulation. It increases the action of the heart, that is certain! It also acts upon the small blood-vessels, dilating them and allowing more blood to pass through them, as we have just seen is the case with the stomach. It dilates the vessels of the brain and permits more blood to pass through it. The effect of this increased blood-flow through the brain is to cause the brain to be more active. The thoughts flow rapidly, the halting speech loosens into eloquence; coldness of feeling gives way to affection, passion, or sentiment; despair becomes blended with hope, courage is reanimated; difficulties melt away, and the impracticable is almost already realised. These are the sensations which have impelled men in every clime to devise some means of exalting the nervous life; and a fearful price is paid for it. Soon the ready speech grows muffled, the thoughts confused, the impressions blurred; the higher feelings become submerged under the rising animal impulses; hope becomes a disfiguring conceit, courage merges into recklessness and boasting, exhilaration into boisterousness, and sentiment into maudlin. At last the human frame lies unconscious, powerless, all is oblivion; the awakening is, however, a grim reality. These later manifestations are not what is usually craved after; they are the unavoidable, or at least unsought consequences of the first stage. Only in extreme misery and despair does the soul crave for oblivion. The difference, however, betwixt the Red

man and the White man is shown in this matter of intoxication: the white man craves after the first stages, and if possible avoids the second; the Indian abbreviates the first stage with all possible celerity, and his desire is simply to be drunk.

In addition to its action on the vessels of the head alcohol affects other parts, notably the skin and the kidneys. The temperature has much to do in determining this action, and in cold weather spirits act markedly on the urinary organs. In summer, or in warm temperatures, the skin is chiefly acted upon.

This action upon the vessels of the skin has formed one of the greatest stumbling blocks to the explanation of the action of alcohol, and produced some of its apparently irreconcileable actions. For instance, we often feel the warmer for taking alcohol, and yet the alcohol-drinker perishes of cold in frozen regions when the teetotaller survives. How is this? It would appear to be explained in this manner:—Alcohol increases the heart's action and so drives the warm blood of the interior more quickly to the cold extremities, and we feel warmer. Yes: by dilating the vessels of the skin and so exposing the warm blood to the cold surrounding atmosphere; and man perishes of cold unless his stores of respiratory food or fuel are full, and clothes check the loss of body heat. In very cold climates even under the most favourable circumstances the loss of heat after taking alcohol is so great that its use is abandoned. When the unlucky whaler, the 'Diana' of Hull, came into Rona's Voe in 1866 famished and hungered, short of food, short of clothing, short of fuel; after enduring the accumulation of miseries of an Arctic winter spent under such terrible circumstances, my friend Charles E. Smith, her un-

daunted surgeon and acting captain, told me there were spirits lying untouched in her locker. The effects of taking alcohol under these circumstances in the temperature of an Arctic winter were such that the experiment was not repeated twice.

And yet after long exposure to cold on reaching shelter alcohol is acceptable enough, especially with hot water. With old people who get chilled in getting into bed, spirits and hot water, as we have seen in a previous chapter, taken just on getting into bed, are an excellent 'night-cap.' It is obvious from what has just been said above, that taking a dose of alcohol on going out into the cold is undesirable; as experience has long ago demonstrated to the satisfaction of all who have tried it.

The use of alcohol in hot climates is a fertile source of disease. This is well known to all, and the common drinks of hot climates are rather beverages than stimulants. The evil effects upon the viscera, especially the liver, are most markedly seen, and the tippling soldier when sent to the West Indies soon 'falls a victim to old habits and new rum.' The oxidation of the alcohol is probably much retarded in a hot climate, and this has much to do with the effects. Excessive action on the skin is also very depressing, and this perhaps is a factor in the production of the results. All people who consume stimulants at all know how far from exhilarating a dose of alcohol is on a warm 'soft' day. The action falls on the skin, which is bedewed with perspiration, and there is less blood than ever going through the brain; consequently a sense of depression and of lethargy is then experienced.

Alcohol is very injurious to all young and growing children, except in very small quantities given medi-

cinally upon emergencies. It is used to limit the growth of jockeys and of tiny pet dogs.

The alcoholic beverages of isolated civilisations are far inferior to those elaborated by the civilisations which centre towards the Dardanelles; where century after century man, in various climes and with diversified materials, has gone on elaborating and improving, inventing, blending, and finally subjecting his preparations to the grand alchemist hand of time. The spirits and fluids prepared from maize and rice are far inferior to those made from barley, and even rye. A maize drink I have not tasted wittingly, but arrack and saki are far from alluring beverages, nor can one wonder at the quick Japanese making western beverages one of the staples of their imports. The Peruvian cacique who visited the invading Pizarro in the island of Punà expressed his great satisfaction at the beverages of the Spaniard, and admitted their superiority over the chica of his native land. The inrush of wealth from the strides of commerce are multiplying the number and variety of our beverages; and a modern banquet on no special occasion presents a profusion of wines and liqueurs unknown to our immediate forefathers.

What opinion then can we hold about alcohol, with its almost bewildering inconsistencies? Let us try to come to a fair summary on the evidence before us as to the desirability or otherwise of the consumption of alcohol.

My relative, the late Inspector-General Sir John Hall, in his 'Medical History of the Crimea' says: 'My own opinion is that neither spirit, wine, nor malt liquor is necessary to health. The healthiest army I ever served with had not a single drop of any of them, and, although it was exposed to all the hardships of

Kaffir warfare at the Cape of Good Hope in wet and inclement weather, without tents or shelter of any kind, the sick list seldom exceeded one per cent.; and this continued not only throughout the whole of the active operations in the field during the campaign, but after the men were collected into standing camps at its termination, and this favourable state of things continued until the termination of the war.'

Not only in our own army, but in those of other nations, similar testimony has been furnished, viz. that alcohol is not absolutely necessary to man, and that most prolonged exposure and exertion have been the better undergone for its absence. There is no reason to doubt this: it is eminently probable when we consider the action of alcohol and how it enables a man to borrow from himself. The alcohol-drinking soldier on heavy continuous duty can scarcely go on long if he borrows to-day the force he ought to consume to-morrow. When to-morrow comes he must borrow as much, and probably a little more, as interest, and then the inevitable end is certain. Much better had he rest, having spent such force as he can expend without a stimulant, than by its use borrow to-day what there is no prospect of returning to-morrow. He is indeed an unthrifty individual who incurs a loan which must be inevitably returned against a certain date, when he possesses only a fixed daily income to which he lives close up. It is not difficult to see what will be the disastrous consequences when the settling day comes. A temporary relief would indeed be dearly purchased by a loan on such terms. It is not now difficult to see how abstinence from alcohol is decidedly desirable for the soldier on hard continuous duty. When in barracks he has enough of force to meet his daily wants without

a stimulant. The Russians do not allow any man who has recently indulged in spirits to march in cold climates in winter. They know too well that he has unpaid loans of force to meet, and will certainly break down.

So much for mere muscular exertion without alcohol.

Let us now look at the other side of the page. We find there a curious counter-statement, viz. the use of alcohol by all civilisations—the more civilised the greater the variety of their beverages. We see the comparative worthlessness of the people in sober countries—look at Spain and Turkey—and we find a distinct inferiority in the literature of the total abstainer; very exceptional instances to the contrary in no wise disturbing the rule. We find the progress of countries strangely in unison with their consumption of alcohol: compare Scotland with Ireland, and Prussia with Austria. We know numerous instances of high moral worth, unimpeachable integrity, and unimpaired health in men who have taken alcohol more or less from their youth upward. How does all this contrast with the hasty assumption often so freely launched that alcohol is a poison? Rash statements, arguments radically weak, urged with a pertinacity and intolerance in inverse proportion to their intrinsic weight, have done much to retard the cause of the abstainers. It is much to be deplored that the injudicious and indiscreet advocacy of many should so thwart the action of the thoughtful and really temperate 'temperance man.' They have shown incontestably that the abuse of alcohol is one of the most terrible curses with which the earth is smitten. But we may well pause ere rushing to the conviction that therefore it is a poison, and never useful or even harmless. This view cannot be sub-

stantiated; and the enthusiastic zeal which has forced experiences of the most varied kind into its service, enlisted every scientific fact or appearance of a fact which favoured their partisan view; which has its wordy lecturers in incessant vociferation, often injuring seriously the cause they espouse; which has banded together a distinguished body of men, with enormous funds, to make a crusade on alcohol: has brought out a counter-league as powerful and even richer to fight the battle *à l'outrance*. Further scientific researches are accumulating evidence which goes to suggest that alcohol is to be found in the body as a normal product of the hydrocarbons we swallow as food, and have demonstrated its presence in the urine of animals in a state of nature, as well as in that of an undoubted teetotaller; and to support the view that alcohol is a readily oxidisable form assumed by hydrocarbons in the body, and that a certain quantity of alcohol is consumed by each living creature every day of its existence. And so the battle rages.

Leaving the polemical side of the question, there is no doubt that alcohol in its various forms is a useful addition to the food of man, and that it may be indulged in for years without either doing injury to the consumer or the habit growing upon him. The business man finds his sherry or stout aid his noontide meal in its digestion, and enables him to do his afternoon duties better and more efficiently; if another finds he does not need it, or that it disagrees with him, by all means let him avoid it, as he would any other article of diet which is not to his mind or his taste. Surely the teetotaller should be permitted to please himself as much as the alcohol drinker.

Very frequently in emergencies the power to borrow

a little from the reserve force fund of the body is found highly convenient and in no way prejudicial, the sum borrowed being repaid by rest and food, and we all know how we do rest after excessive exertion: just as a man may find it expedient to overdraw his account at his banker's without harm—if he does not make an undue practice of it. So, frequently, alcohol as a stimulant is directly useful in the normal condition of man. What its value is as a medicine cannot be discussed here; one thing is certain, and that is that harm has frequently been done by the withholding of alcohol as well as by its administration.

Finally it does not follow that because a marching soldier is the worse of alcohol, in cold climates and hot ones, where it is worse than useless to him, that therefore under other totally different circumstances, alcohol is not useful and desirable: or that because the man exposed to intense cold is all the colder for his draught of alcohol, therefore a person getting into bed and covered with blankets will not be the warmer for his 'night-cap:' or that because one man utterly ruins himself by alcoholic excess, that therefore another man to whom alcohol is serviceable, should give it up to his own detriment. The whole subject is a complex problem not to be rashly solved, and the complete evidence is not yet before us.

While we all heartily agree, and are of one mind, as to the abuse of alcohol and its terrible consequences, we must still suspend our judgment and not pronounce hastily against its use.

There is one purpose for which alcohol is used, and that sadly too much, which makes one shudder to consider it; and that is its use as a moral anæsthetic. Permit me to explain this: an anæsthetic is an

agent which lessens or destroys the sensibility. Such is chloroform. Alcohol blunts the susceptibility of the mind; and that which seems intolerable, after a draught of alcohol becomes mitigated, and is again bearable. In aggravated cases the past is drowned in oblivion, in unconsciousness, which, while it lasts, is bliss; and many a poor soul, man and woman, has 'drowned their trouble in drink.' This is a most horrible thought; and the vacant, hollow, unreal mirth, or spirits, of those under the influence of alcohol taken for this purpose, is a hideous mockery. Each act of intoxication leaves the nervous system more unstrung, the determination less earnest, the power of endurance further lowered, and the prospect of ultimate recovery of self-control further away than ever. When then we see a person, after misfortune and ruin long bravely struggled against, beginning to take alcohol till its effects are obvious, we all know that that person is doomed. Doomed almost beyond the possibility of doubt! It tells at once that the resistance is no longer genuine, no longer contains the elements of possible success. Alcohol renders the irremediable condition tolerable while the person is under its influence. Sobriety brings with it the tortures of hell, and alcohol alone furnishes relief. The moral anæsthetic comes in, and first alleviates the suffering and then wraps the victim in oblivion. Life then consists of alternations of sober misery, drunken relief, and ultimately of unconsciousness, which is no longer a negative happiness but a state of active bliss. Alcohol used as a moral anæsthetic is ever dangerous; and though there is no question but that alcohol does give relief from the worry and bother of life, often more wearing than work itself, there is risk hidden in such

use of it, and danger grim and serious lurks behind the goblet and the wineglass.

This use of alcohol is terribly seductive to women, and the hopelessness with which we regard habits of intoxication in women is really founded on the motive for which they resort to it. The good old bustling matron who goes about her house actively, and finding her appetite not very good has little sips of alcohol to enable her to get through her duties, is in a secure position by comparison with the woman who flies to the sideboard because she is intensely miserable. The last may excite our compassion, when we know enough of her history to explain her habits, but she is a lost woman! Utterly lost, body and soul; unless, as too rarely happens, she is rescued. When we consider woman's susceptibility to mental pain we cannot feel surprised at this resort to the comparative ease afforded by alcohol, to the blessed relief furnished by unconsciousness. But drinking for this end is not confined to the female sex, and many a good man and true has been engulfed in this horrid maelstrom. Still, as a broad rule, man drinks to get more out of himself—either work, or what is called pleasure; while woman drinks, too often, to make existence endurable. From this terrible risk at least the other stimulants than alcohol in common use, as tea, coffee, and chocolate, are free. Whatever other evil consequences the abuse of them may entail, there lurks not in them this danger which alcohol possesses in common with those dangerous stimulant-narcotics, opium and haschish.

When alcohol is taken as a moral anæsthetic there is little hope of amendment; indeed, a stationary condition is almost out of the question, and the progress is steadily downward. The self-consciousness of abasement

is added to the former weight of misery or despair, and the situation becomes still more intolerable; the determination to make an effort no longer really exists, and the persons so circumstanced

> lie widowed
> Of the power which bows the will,

and are incapable any longer of making a serious effort, or of adhering to any hastily erected resolution. Their determinations of amendment are as fleeting as they are readily formed, and can scarcely be regarded as serious. They no longer possess the power of adhering to any resolve.

Such, however, is not always the cause of habits of intoxication in women; it sometimes is the consequence of a bloodless condition of the brain, or cerebral anæmia as it is termed. Here the bloodvessels of the head are contracted, the brain is but sparingly supplied with blood, and a sense of misery and depression is the consequence. This consequence of cerebral anæmia is seen most markedly in the melancholia which is the characteristic of insanity with a diminished blood supply to the brain; contrasting with the excitement and grandiose delusions which exist along with great cerebral vascularity. Alcohol dilates the blood-vessels of the brain, and relief is experienced. In these cases proper medicinal remedies, increasing the blood supply to the brain do away with the condition of anæmia, and with it the craving for alcohol. There is no relapse as long as ever they remain under the influence of the remedies.

Alcohol may be used with benefit at bedtime by those who undergo much mental activity, and whose brains are exhausted. Here some alcohol exercises a

distinctly soothing effect upon the brain, and procures a good sound night's rest, where without it there would be a restless, disturbed, uneasy, and unrefreshing slumber. There exists no objection to the use of alcohol under these circumstances, neither is there much probability of the habit growing; except in very rare cases, where there are probably other determining factors.

With this we must now close the section on alcohol, in the full knowledge that this is but a cursory and imperfect sketch. A fuller consideration is impossible here, but so far as this sketch goes, however, it may be fairly relied upon as in accordance with our most recent knowledge.

Opium.—Little need be said about opium here, as its consumption in alcohol-drinking countries is not great, and even in the Fens its consumption is now much decreased. As a stimulant it may be compared with alcohol; only its votaries when under its influence are quieter and less boisterous, and rather taken up with the contemplation of the mental visions so produced than engaged in manifesting their exhilaration in action. The use of opium disturbs and enfeebles the digestion and checks the action of the bowels, and the opium-taker is generally a lean, yellow, sallow personage.

Haschish.—Haschish, or bang, is the juice of the Indian hemp, and is a strong stimulant-narcotic. It is taken chiefly by Eastern Mussulmen, and produces, according to the dose, either a pleasant intoxication or a dangerous and furious madness.

Another list of stimulants which are non-intoxicant is furnished by the vegetable products, tea, coffee, cocoa, and matè; to which list may be added the extract of meat.

In all these there is a nitrogenised principle which possesses stimulant and exhilarating properties. This principle exists in all these different vegetable growths, and has determined their selection by man. Their adoption over the surface of the earth offers a close parallel to the wide-spread, independent discoveries of alcohol. Schleiden in speaking of them says : 'Thus have all these beverages become everywhere necessaries of life; everywhere is the origin of their use enveloped in mythical obscurity; everywhere has man, not led by rational considerations, by knowledge of their properties and action, or by comparison of them with already known nutritive substances, but as it were instinctively, added them to the number of his daily wants.' And Liebig, after reviewing the widespread consumption of these substances, and pointing out how they form part of the daily arrangements of the poorest labourers, comes to this conclusion, 'When we reflect upon these facts it is impossible to admit the assertion that the use of tea and coffee is a matter of mere habit.'

This vegetable principle (theine), is a decided stimulant, and gives to food a desired something which is not found in mere quantity or bulk. There is no doubt too but that the use of these vegetable principles enables the person to do with less bulk of food than they would otherwise require. There is something too in this; these vegetable principles contain nitrogen, and are chiefly consumed by peoples whose food is defective in that material. For instance, tea is found among the rice-eating Chinese, coffee among the date-eating Arabs, and cocoa among the maize-eating people of Mexico. It is quite true that the amount of nitrogen seems too small to make much difference when measured in the scales, but in nature's laboratory

it may be another thing. The fact however remains, that these vegetable principles are found in use amidst peoples whose food is almost wholly hydrocarbonaceous, and that the poor labourer whose dietary is defective in nitrogen attaches the most importance to his tea and coffee, and sets apart a considerable portion of his scanty wages for their purchase. One of the peculiar properties of these vegetable principles is their power of putting away sleep and keeping up a condition of wakefulness. For this purpose they have been much used. Coffee was first used by those who wished to keep themselves awake during the Mohammedan nights of prayer: and the legend associated with its origin is to the following effect. A holy man who spent his nights in prayer was much troubled with drowsiness, and in his anger at last cut off his offending eyelids and threw them on the ground. The coffee plant sprung up immediately therefrom, and the form of the amputated eyelids is perpetuated in the leaf of the coffee plant.

These vegetable principles are true stimulants in enabling a person to defy sleep, and really endowing him with the power to borrow from himself. In this respect there is no difference betwixt their action and that of alcohol. They are free however from those baneful effects which form the great seductive power of alcohol, and so lead to inebriety. Intoxication in the sense of drunkenness these principles do not produce; though intoxication, in the sense of certain abnormal physical conditions, they certainly will induce; especially tea. This is not perhaps so much due to the vegetable principle of tea (theine), as to the aromatic intoxicating oil found in tea; the elimination of which by evaporation is the reason why the Chinese keep their

tea some years ere using it. The excessive consumption of tea and coffee, especially with a poor dietary, leads to a condition of nervousness and irritability often quite pitiable, as well as to indigestion and marked impairment of the digestive organs, and to attacks of neuralgia. Indeed the evil consequences of the excessive use of tea are as marked in the out-patients of a hospital as are the consequences of alcoholic excess, and the habit of taking a cup or two of tea instead of more food, or in order to enable the individual to take so much more out of herself, is as common among women as the use of alcohol for similar ends is among men.

Allied in their action, their effects are alike disastrous in time. Still there are certain actions of alcohol from which these stimulants are free, and the use of tea and coffee instead of a ration of rum is quickly spreading in our services, especially during active duty in hot and cold climates.

Tea is light and easily carried, and is said on good authority to exercise a most excellent effect upon water of a questionable character. Such being the case, it should form part of the outfit of all travellers and emigrants.

Coffee is of Arab origin, and took the place of the kafta, a time-honoured beverage of similar properties. Its use among the working class is much greater in Germany than in England. It forms a very pleasant beverage, and is less objectionable in many ways than tea, not producing those disagreeable nervous symptoms which follow the excessive consumption of tea. A cup of strong coffee is the sequel to dinner in most countries, and both coffee and tea exercise an influence over the action of alcohol, retarding its effects, prolong-

ing the first stages and keeping off the second stages of intoxication.

Cocoa is a Mexican beverage, and was in use when Cortez first invaded the Aztec Empire. The vegetable principle is closely allied to, if not identical with those of tea and coffee, and is a mere variety of theine. Its use is much upon the increase. In consequence of the amount of vegetable fat in cocoa, it is a much more nutritious article of diet than tea or coffee, and may be profitably substituted for them by spare persons.

Matè is a product of the Brazilian holly, and is drunk by the South American with the same passion with which the Chinese consumes his tea. Its use dates back prior to the invasion of the Empire of the Incas by Pizarro, and a quantity of these leaves were consumed by the Peruvian aborigines on their marches over the long roads which traversed their empire, seeming to afford to them an increment of endurance and sustained power.

Such is the list of the generally known vegetable principles possessing stimulant properties which resemble to some extent in their action the effects of alcohol. One thing too is certain, viz. that the consumption of these stimulants is much increased by abstinence from alcohol; so much so indeed, that the abstainer is called a 'teetotaller,' a tea drinker solely. It has yet however to be seen how far tea is an unalloyed good, and a perfectly safe substitute for alcohol. It is painful to have to acknowledge that where the so-called temperance movement has spread, the use of other stimulants than alcohol has marched along with it step by step. In Maine and Massachusetts, the consumption of opium is terribly on the increase, and amidst the followers of Father Mathew the practice of drinking ether obtains,

until at fairs in the North of Ireland the crowds reek of ether. It would seem that the craving after something to intensify our existence and to act upon our nervous life is too deeply implanted in man to be wholly eradicable: a fact which the Temperance League would do well not to ignore.

Extract of meat comes under the head of stimulants rather than that of foods. When dissolved in water, it becomes a pleasant, refreshing beverage, often much relished by the invalid, indeed some prefer it to alcoholic beverages; it consists of the salts, and the flavouring matter of meat, but it contains neither albumen nor fibrine, in fact it contains nothing which can be converted into tissue, nor yet does it contain any respiratory food. The nitrogenised principles contained in it are too advanced in oxidation to be convertible into tissue, and are allied in composition and action with the vegetable principle, theine. When, however, extract of meat is used with boiled sago or arrowroot, pea-flour, &c. or bread crumbs, it renders the concoction very palatable, and with a small knob of butter, and some pepper and salt, the composition is pleasant and nutritious. But extract of meat is not a food itself, it is a stimulant.

When Columbus and his followers landed in Cuba in 1492 they were much astonished to see the natives smoking. Never hitherto had such a thing been seen by the eye of anyone belonging to the Eastern hemisphere. With a swiftness most remarkable, this practice of the New World spread over the different districts of the Old World. Why it should be so rapidly adopted, it is difficult to say, and though a thorough smoker is miserable without his tobacco, he would have some difficulty in explaining the reasons for his attachment.

The deprivation of tobacco too, is severely felt by those who are accustomed to its use; much more so than the want of alcohol by temperate drinkers. Tobacco has its enemies, who are chiefly found among the ranks of the enemies of alcohol. Why the enemies of the one should be the opponents to the other, it is not difficult to see, as these persons themselves either do not need or do not enjoy these neurotics. That there is harm in the abuse of tobacco we all admit, and dyspepsia, nervousness, muscular unsteadiness, and palpitation of the heart are the penalties to be paid for excessive indulgence.

In the Edinburgh Royal Infirmary, a peculiar term is used called 'smoker's heart.' This term is applied to an irregular and rapid action of the heart produced by inordinate use of tobacco. This condition is readily produced in many persons by excess in smoking, and even more certainly by the use of a stronger form of tobacco than that to which they are accustomed. It passes away with abstinence, and returns again with indulgence. But that in moderation tobacco is harmful, is a very questionable proposition.

So used it exercises no injurious effect, and neither lessens appetite nor encourages drinking. It possesses a certain soothing influence, and makes time pass agreeably. Thus the smoker in his chair puffing away calmly and thoughtfully, is a type of composure, and the short pipe at which the pedlar tugs seems to lighten his load and to shorten his journey; but how this sense of satisfaction comes about, we do not know. Tobacco is in itself a deadly poison, acting powerfully upon the heart, no very large dose of it is requisite to kill, quite an infinitesimal dose indeed, compared to what is more harmlessly consumed. This is

due to the fact that nicotine, the essential principle of tobacco, finds its way out of the blood by the kidneys very swiftly, and thus it is eliminated as quickly as it is absorbed. It is well known that an excessive consumption of tobacco will produce nausea and depressing sickness in those most habituated to its use, showing the poisonous nature of its principle. Still a man may be a smoker for sixty years, and yet never experience any such unpleasant consequences of his indulgence in the weed. Some men cannotsmoke, as others cannot take alcohol, and of course they need not further attempt its acquisition. But because this is the case with some, or that others have never learnt to smoke, and experienced no evil consequences from their ignorance of tobacco, therefore its use should be abandoned by all, is not a necessary conclusion. In Germany the practice of smoking is now so universally prevalent, that the mind recoils from the contemplation of the time when tobacco was not; and the question of the effect of tobacco upon Teutonic development is well worth the consideration of some one of that philosophic people. In their recent war with France, so much tobacco or so many cigars were requisitioned from the different towns as unfailingly as were provisions. This is quite an innovation, and marks the future when tobacco will be still more valued, and regarded not as a luxury but as a necessity of life. Our knowledge of tobacco and its action is meagre and unsatisfactory, and though a smoker, the writer has no more to say in the matter; for which he apologises to the reader who may be anxious for further information.

One caution however must be given in reference to tobacco, and that is, as to its consumption by the young and growing. There is no question about the delete-

rious action of tobacco under these circumstances, and the objection to its use by boys and youths who have not ceased growing, is correct and well founded. Even if it is a harmless luxury in moderation to grown men, such is not the case with growing youths. Like indulgence in alcohol, it arrests their growth, and not only that, but an enervated type of man is the consequence of too early indulgence in neurotics. In other instances no doubt the case is somewhat the reverse of this, and the use, or rather abuse of alcohol and tobacco, is the consequence of a precocious and early development; a development however which is not a very fine type of humanity. Tobacco, though a harmless associate for grown man, is a dangerous and seductive acquaintance for boys.

All neurotics, that is, agents which act upon the nervous system, are more or less dangerous in their effects upon their votaries, and the agents considered in this chapter have exercised a strange and weird influence upon humanity; while certain good effects can be admitted to be procurable by stimulants, a terrible amount of sin, crime, misery, and destitution have unquestionably accrued from their abuse. How far these means of acting upon the nervous life have been a blessing or a curse to humanity, when all is summed up, it is impossible to say; if not an unmixed evil, certainly they are not an unalloyed good.

PROPOSITIONS.

1. Stimulants are in use in almost every part of the globe.
2. Time improves all alcoholic drinks.
3. The fusel oil contained in new spirit is converted by time into agreeable ethers.

4. Malt liquors, for invalids, to be beneficial, must be 'in condition.'
5. Alcohol is a respiratory food.
6. Abstainers consume more food than the non-abstainer.
7. A stimulant enables the system to use some of its reserve force.
8. So by taking a stimulant a person really borrows from himself.
9. In small doses alcohol aids digestion: in large doses hinders it.
10. Alcohol in excess produces changes in the internal organs; as the 'gin-drinker's liver' for instance.
11. Alcohol affects the circulation; increasing the action of the heart, and dilating the terminal blood-vessels.
12. It increases the blood supply to the brain, producing those mental states which, when marked, form intoxication.
13. Alcohol acts upon the skin and kidneys; the temperature going far to direct the effect.
14. Its action on the skin causes such loss of heat, that the use of alcohol is abandoned in very cold latitudes.
15. Alcohol should not be taken immediately before going out into the cold.
16. In hot climates alcohol is depressing; and also produces much internal disease.
17. It is injurious to young and growing creatures.
18. Alcohol is not necessary to sustained muscular activity.
19. But it is not a poison under all circumstances, as maintained by some.
20. It is often a useful agent, especially for meeting an emergency.
21. The habit of drinking to procure mental ease is most destructive and most hopeless of reform.
22. Habits of intoxication are sometimes due to a physical condition; viz. a deficiency of blood in the brain.
23. When the brain is wearied, alcohol may be taken at bedtime with benefit.
24. Opium and haschish are stimulant narcotic poisons.

25. Tea, coffee, and cocoa are true stimulants, but not intoxicants.
26. As stimulants they are much used by abstainers from alcohol.
27. More objectionable stimulants are also used by abstainers.
28. Extract of meat is rather a stimulant than a food.
29. Tobacco in moderation is harmless, except to the young and growing.
30. In excess it is injurious, and affects the nervous system.
31. The essential principle of tobacco is excreted by the kidneys.
32. There is a form of functional disturbance of the heart caused by excessive use of tobacco.

CHAPTER VII.

THE EFFECTS OF INHERITANCE.

INHERITANCE, or the transmission of qualities by descent, exercises much influence over the system of man. This is seen as much in the mental qualities as in the bodily attributes. It forms the great aim of the breeder, and the stock from which an animal is descended gives it its chief attraction and its pecuniary value. The difference in price betwixt a cow of ordinary shorthorn breed and that of one who comes of the purest Booth blood, or other equally illustrious descent, tells of the importance attached to descent and inheritance. The same is the case with the horse, the dog, the sheep, and indeed with all animals which have been long domesticated by man. In his work on Hereditary Genius, Galton shows how inheritance and kinship bear on intellect. We are all familiar with the expressions 'they are a bright family,' or 'they are all dull,' which are in as common use as are the expressions 'they are a healthy family,' or the opposite, 'the family history is bad,' the latter being a point on which insurance companies are very sensitive. We all know too how some families are tall and stalwart, while others are small and wiry; some given to stoutness, while others are spare; some families are blonde, and others are dark; some clear-complexioned, some swarthy. The

nose of a family may be peculiar, as in the Napiers; or the complexion, as was that of the Stuarts. The mental characteristics are equally inherited, as seen in the intense egoism and hauteur of the Tudors; the wilful perversity of the Stuarts; the ambition of the Bonapartes; and the blind fanaticism of the Bourbons. Piety blended with fighting propensities is as characteristic of the House of Hohenzollern, which rules at Berlin; as are the under lip of the House of Hapsburg, inherited from the House of Burgundy through the mother of Charles V., and the light morals that somehow accompany it, which obtain in Vienna.

The most important matter here in connection with inheritance is that of the form of the constitution. The inherited constitution is called a diathesis; thus we have, for instance, a nervous diathesis. As compared to this, cachexia is an acquired condition, so we speak of a cancerous cachexia. Sometimes a condition may be either inherited or acquired, as gout for instance, and according to its origin it becomes either a gouty diathesis or a gouty cachexia. The chief classes into which inherited constitutions are divided are five: the gouty, the strumous, the nervous, the bilious, and the lymphatic: each possessing certain peculiarities, and endowing the owner with special liabilities towards certain diseases.

The importance of attention to these is manifested by the consequences of neglect, as seen in the gout which is so readily induced by good living in those hereditarily disposed to it; the equally easily-induced tubercle in the strumous; the actual insanity mixed up with the nervous diathesis; and in the easily disordered liver of the bilious. The diathesis too is not without influence upon the line to be selected for an occupation

in life. A brief account will now be given of each, so as to render the matter intelligible and to imprint it upon the reader's memory.

The gouty diathesis.—Persons of this diathesis are usually well made and often corpulent. The frame is well developed, the nutrition good, the muscles full and firm; the skin clear and the complexion ruddy, the teeth massive and regular and free from decay; the abdomen full and broad, and the gait erect. The hair is either fine and falls from the vertex early, or is thick and coarse, in which case it remains, but becomes grey or white. The respiration and circulation are good, the mental powers vigorous and enduring, the courage high; and the temper, if somewhat hasty, steady and even. From its combination of bodily and mental characteristics this type of constitution produces an enterprising and active individual, endowed with a capacity for much endurance and capable of much and sustained labour. The temper, though hasty, is sanguine, and men of this diathesis are not easily depressed. They form excellent pioneers and colonists. Their great danger is their tendency to live too well, and so to develop the inherited tendencies to disease. Gout, Bright's disease, diseases of the circulatory organs, affections of the joints, and recurring inflammations in advanced life, are dangers to which people of this diathesis are liable. But the tendency is to live to a good age, and persons of this diathesis do not commonly die in early life.

The strumous diathesis.—This is very different from the gouty form. These persons are defective in vital force; the circulation is weak; the skeleton is not so well developed or so well proportioned; the muscles are not so full and firm, the joints are large, the teeth

irregular or soon affected by decay; the hair is fine and thin, the eyebrows well marked, and either very straight or unusually arched; the lips full, as also are the alæ of the nose. The mind is quick, often bright and superficial; the person is piquant, but lacks the solid force of the gouty individual. There is great liability to precocity in children of this diathesis, and they are unusually apt to die in early life.

In its most aggravated form this diathesis furnishes scrofula, with its clumsily-formed figures and enlarged glands, which are so unseemly; but in its finer manifestations it gives us our most beautiful women. The large eye, with the white so pearly by contrast with the irides, the long eyelashes and marked eyebrows, the pink cheek, the full pouting lip, and the piquant mind: all form a combination by which man is readily entranced. The mental qualities are quick but not enduring, and many young persons of this diathesis have shown much intellectual vigour ere being carried off at an early age. Indeed, the mental activity which precedes or accompanies the early stage of consumption is often marked; but it is highly questionable how long this quickness would have been retained, even if the body had remained in its usual health. The physique is, however, never strong, and though the families are often large, they are not long-lived as a rule. Tubercle in its various forms constantly besets persons of this diathesis, and carries them off in large numbers, and all diseases are apt to terminate in tubercle.

Persons of this diathesis are unsuited for a life of self-denial and privation. They are not good colonists, but they fill many of the less trying positions of life very aptly. They make good officials, especially subordinates, and the requirements of commerce &c. find in

them excellent material for the staffs of clerks, cashiers, &c. Such duties fall in with both their physical and mental attributes. Mediocrity is their characteristic, and if they do not often rise above it, they may be trusted not to fall below it. But their forces are ordinarily all below par, though there are brilliant instances to the contrary.

The nervous diathesis.—These persons are usually small, but neatly made, active, unwearying creatures. There is something almost restless in their activity, which reminds one of the carnivora in their waking moments. Though slight they are well proportioned, and powerful beyond the promise of their muscles. They possess great brain-power and endurance, and the well-developed brain often tyrannises over the body and demands more from it than the frame is equal to. In business they are active and enterprising, persevering and industrious; in domestic life they make the enduring nurse, and always seem to be able to bear a hand to help the needy, and possess the willingness to do it too. The small, well-knit, active frame with its quick intelligence and often great mental grasp, marks a class well known to us all. Persons of this stamp form excellent heads of departments; they do their own work thoroughly, and see that others do theirs too; they are generally also the active partners of firms. They fill all positions well, and constitute the large proportion of our best light handicraftsmen. They are as a rule spare, and are small eaters, contrasting with the gouty class; and though they can get through their work easily without stimulants, and rarely feel any craving for them, they can usually take a considerable quantity of alcohol with impunity when so minded. They are quick and excitable, and they feel keenly. Such persons are most common among the Eastern

races, while the gouty diathesis rather is characteristic of the Teuton.

This diathesis and the gouty are not uncommonly blended.

Persons of this diathesis usually attain a good age, but do not commonly possess very robust health. They usually suffer more or less from overtaxing their powers, and illness often compels them to husband their resources. Affections of the nervous system are incurred in this class of persons from excessive action of it.

The bilious diathesis.—People of this diathesis are distinguished by their dark complexion. They are dark-haired beings with a skin at once wanting in transparency and of a dark hue tinted with yellow. They are rarely stout, but often tall and fairly made. At other times this diathesis is blended with the nervous. The bilious are often active and powerful both in mind and body, determined and tenacious; they are, however, gloomy and the opposite of mirthful. They are often of good physique; and not liable to early death, if they do not usually live to be very old. They are much troubled with disorders of the digestive organs and of the liver, they are dyspeptic and bilious, they require to be careful and sparing in their diet, and little excesses derange them. They are often very susceptible to external influences and feel the difference of locality very much. On low-lying, enervating districts they rarely feel well, and are much better in high-lying, bracing regions. Diseases of the organs of nutrition are common to this class of persons.

The bilious diathesis is commonly conjoined with one of the others. It unsuits the owner for hot climates as a rule.

The lymphatic diathesis.—Persons of this diathesis

are usually large-framed, but their muscles are soft and lax, and they are decidedly wanting in energy. They are large, easy, unenergetic creatures, and not disposed to fits of passion. As years roll on they are very liable to become stout, often oppressively so, or at other times to become spare; but the same listless character belongs to them whether they are stout or spare. They are generally credited with being goodnatured. In physique they are the antithesis of the nervous diathesis, as they are also in their mental attributes. This diathesis is unsuited for a life of exertion, and such people amidst the working classes are out of place, and always seem to be in some trouble, generally from lack of energy. This diathesis is decidedly inclined to passive hæmorrhage, and diseases in persons of this constitution have a tendency to take on a low and chronic type. In early life they are not unapt to become the subject of tubercle, and in after life are liable to latent gout and debility of the heart.

They are even more susceptible than the bilious to external influences and the effects of locality.

Such are the leading divisions of inherited constitutions; they are often found extremely well-marked, but are more frequently combined and blended, until it is not always easy to say what is the leading form of diathesis. It is a matter, however, not without importance in the consideration of health.

It happens of course frequently that two individuals of different diatheses marry, and then the diatheses are blended in their offspring, or one child takes after one parent and another after the other. It has been said that in physique children resemble their mother and in mind take after their father; but it is questionable if the reverse of this is not quite as often the case.

Another point is more curious and infinitely better established, and that is the effect exercised upon the succeeding offspring by the person to whom a woman first conceives. Thus it may happen that when a widow remarries, her first children resemble rather the first husband than their actual father. Even more awkward matters spring from this tendency to produce offspring resembling the first proletaire, and the peculiarities of an eldest child, which does not resemble either of its parents, often point to a history on the mother's part which is ever carefully concealed. Thus the late Sir James Simpson found in a family a dark brunette as the eldest child, while all the rest were blondes, like the father and mother. The explanation turned out to be this. The mother had made a *faux pas* with a black butler in early life; which had been concealed and was no doubt thought safely buried for ever, when behold the eldest child resembles rather the black servant of the dead past than its real parents. Murder is not the only thing which will out: and inheritance often reveals a hidden history. It is not in man alone that this effect of a first conception is seen. It holds good of animals, and a mare crossed by a quagga bore afterwards foals with stripes and bars to pure-bred fathers. No breeder would think of taking a half-bred foal out of a thoroughbred mare if he wished to have thoroughbred foals afterwards. He knows well that the hairy legs and other characteristics of the first father would be found in the subsequent offspring. The reverse is commonly practised; and the vigour and fire of the thoroughbred is seen in subsequent foals, the offspring of heavy sires. All breeders are particularly careful about any admixture in their strains, and especially as regards the first con-

ception. It is not known how far this species of inheritance bears on disease, or whether the second family of a widow would be affected by her first husband being consumptive.

A more intelligible but equally curious fact is known in relation to inheritance, and that is that a peculiarity may miss one generation and come out in the next; or that after a lapse of a generation or two a peculiarity belonging to an ancestor may crop out again in several instances. Thus a peculiar nose in a family portrait will crop out after a distinct interval, not only in the direct line of descent, but even in the neighbourhood around. A guilty secret may thus reveal itself after the active participators are laid in their grave. Much more likely is it to come out if the tendency lies hidden in both parents; and it is such a union which probably brings out the peculiar nose unseen for a couple of generations. The tendency for a hidden bias to come out when it exists in both parents is well known to breeders; and a greyhound owner who wishes to approach the form of old King Cob will take care to have a King Cob strain in both parents, when the double inheritance will probably come out strongly.

Not only will a family peculiarity thus manifest itself in succeeding generations, but what is a much more serious matter the acquired peculiarities may become an heirloom, and penury in a parent may become miserliness in his offspring, or habits of intoxication may lead to a naturally drunken child. The passion for intoxicating liquors is sometimes hereditary, and so several generations may pay the penalty for an acquired vice. It is indeed a grave matter, that what is acquired by the parent may be inherited in the child, and so a vice or a habit may be perpetuated. It has been ob-

served that natural children are often immoral; and such certainly falls in with my own observations. When conception occurs during intoxication it commonly happens that the offspring is an idiot. And so our vices revenge themselves upon us!

Habits of growing drunkenness in parents have the effect of inclining the children to grow up instinctive drunkards, and the first children born, ere the habits are confirmed, are free from the vice which holds the younger children fast in a disgraceful thraldom. In the greyhound the habit of 'lurching' is inherited by puppies born after the mother has acquired this habit, while her earlier offspring are comparatively free from the vice.

Conditions surrounding conception are not without influence upon the offspring, and after the well known siege of Magdeburg many children were either idiotic or insane. Esquirol, the great French physician, observed that children whose existence dated from the first French Revolution were nervous and irritable in mind, and liable to become insane from comparatively slight exciting causes. One of the most distinguished authorities on idiotcy lays it down as a rule that of idiots the largest proportion are firstborn children; the imperfection here representing the disturbance of the mother's nervous system in her first conception; the next largest list, but far below the first, consists of the youngest children, the idiotcy here marking degenerative changes in the father. Thus we see how too early marriage in a girl leads to defective development, and also marriage too long deferred in an aged father leads to degeneracy. What a satire these facts form upon schemes of dynasties and of families; the heiress's child and the old man's heir are often idiots.

The manner in which associations are formed and individuals linked to individuals by inheritance illustrates well the influence which can be exercised by one person over others. It behoves a man above all things to see that his children and their descendants are not to suffer from some sin or folly upon his part. Nor is it sufficient that such care be exercised after the determination to marry and to give hostages to fortune is formed. The life led before this is not without its influence; and long ere the idea of marriage has crossed the mental horizon, disease may have been incurred which will poison the springs of married comfort, and blast the health of the unoffending and as yet unborn offspring. The doom pronounced by outraged nature's laws is not to be averted, and the early excesses of the father may be branded on the physique of his child, years and years after the folly has been repented of and almost indeed forgotten. Not only is this true of actual, tangible, physical disease, but it is true of the mental peculiarities. The union of David with Bathsheba the wife of Uriah was commenced in sin and cemented by the shedding of innocent blood, and for centuries, down to the massacre of Athaliah, was this line steeped in blood and stained with adultery. Born in sin and conceived in iniquity, the brand was upon every one of the race as if it was accursed; and the original sin was handed down in a taint which descended as an inheritance.

Nor is there any reason to suppose that there is any modification in the laws which pressed so hard on the line of David, or any suspension of them which will permit of any breach of them at the present time with impunity. 'I will visit the sins of the fathers upon the children unto the third and fourth generation of those that hate me,' is as real now as it was when first

announced, and the grim and terrible truth conveyed in these words as marked now as ever. The results of the father's life, moral or other, are indeed felt by his descendants, and the effects weigh upon them in inherited tendencies and inclinations. How frequently does the eldest child in his recklessness and thoughtless self-indulgence tell of the life of his parents at the time of his genesis, and how stern must be this living rebuke to the parents for their forgetfulness of nature's laws; or an idiot member of a family lives a constant reminder of the debauch in which his existence commenced. At other times the notched and ill-formed teeth, or sunken nose and earthy complexion of his children, tell of vice long past, almost lost indeed in the lapse of time, in the thoughtless early days of the father's youth. Nor, indeed, need there be mere physical illness or disease in the results of inheritance, in order to affect the bodily health. What reader of 'Felix Holt' can forget the sickening sense of fear of discovery with which Mrs. Transome awaited the coming home of her younger son, and thought he might resemble his father; and when he came he did indeed resemble him, and she lived again in her fears through the passions of her youth. Years afterwards the early sin overtook and overwhelmed her. The dead past will not always bury its dead: and sin may long survive, be active and existent in its results, through the effects of inheritance.

The life led by the parents will exercise an effect upon the health of the children, and if the father lives fast the effects of his premature decay will be manifest in the constitution of his offspring; and, as we have seen, centre themselves upon a most important portion of the organism, the nervous system. In some families the duration of individual life is short, indeed it may

be the case with nations, as in Guatemala; in other families the duration of life in each person is remarkable. In a work on Centenarians, published in France, instances are given of unusually long life in different families; generation after generation is the term of one hundred years reached and even considerably exceeded. Nor is the long life of an individual without influence upon the life of his descendants, if we are to trust the rules of insurance companies; and these rules deserve our confidence. But the effects of inheritance are not a mere matter for speculation, nor simply curious and interesting. The matter is as practical and bears as strongly on the questions of health and longevity as anything can do. It is perfectly obvious in the first place that there are inherited constitutional conditions or diatheses, each endowing the possessor with a tendency to disease in a certain direction. From what we have just seen it is certain that peculiarities existing in both parents are very liable to come out in their offspring, consequently the children of parents of a certain diathesis will have that diathesis very marked; as for instance if there is gout in both parents the child will be doubly, nay quadruply apt to suffer from it; where there is a nervous diathesis in each parent the children will be very liable to suffer from affections of the nervous system; if tubercle lies hid in both parents the children will be eminently consumptive. Can the consideration of diathesis in parents be a matter of indifference or even of small moment to their descendants? Assuredly not: and the offspring of one union are as surely doomed to early death as are those of another likely to be healthy and long-lived. If such are the effects of inheritance, is man a free agent in the matter of

choice; is he at liberty to choose his helpmeet? Practically he is not, as our instinctive choice is usually of a different type to the chooser.

Still, however, such is not always the case, and then the question of free will steps in. Shall people sacrifice their own happiness, or what they suppose and believe to be their happiness, to the claims of their descendants; or in other words, shall a man's choice be subordinate to the health of his prospective child, and his preference yield before the possibility or even probability of a child wasted, worn, and pot-bellied, with its bowels matted together with tubercle; or under other circumstances fatuous and idiotic, an epileptic, or stricken with chorea? It is not so difficult to say what his choice ought to be, for surely a man is not justified in branding his children with disease or deformity. But it is equally easy to say what his choice probably will be. He will marry to please himself, and others must take the consequences. Yes: and the consequences come in time, as moderate powers of observation even will abundantly note; and very unfortunate they often are. But when the opportunity of choice has long been a matter of the past, all the parents can do is to endure their unavailing regret, and to hope that others will be warned by their example. And the thoughtful and sensible are warned thereby, and take thought, and may be counselled, but not so the thoughtless and indifferent; they reproduce their species in grand disregard of all laws; and their progeny suffer accordingly.[1]

The recklessness with which many young persons take upon themselves the responsibility of marriage

[1] For a judicial and clear summary on this matter the reader may consult *The Enigmas of Life*, by W. R. Greg. Trübner and Co. 1873.

with all its multitudinous consequences, is often very shocking; and their conduct is anything but a comfortable guarantee that their offspring will be of much advantage to the world into which they are to be ushered. But there is no control exercised on this matter except such as is exercised by good sense and prudence, and these are not invariable characteristics of humanity. Neither is the general knowledge on this subject such as to form much of a guide to a couple in doubt as to the wisdom of their union, or to be able to direct or counsel them wisely. It is true that as many errors are made through sheer ignorance as through indifference on this subject. But nature knows nothing of the distinction betwixt ignorance and indifference, and the consequences follow impartially without regard to the moral culpability or freedom from blameworthiness of the transgressors.

It is a much disputed question as to how far such practical considerations as the health or disease of their offspring should weigh with aspirants to matrimony, and how far sentiment alone should affect the question. But surely, while sentiment should be a leading factor, it need not necessarily be divorced from common sense, or be uncontrolled by the knowledge of the natural man. If the thoughtful and considerate can exercise reflection in such a matter, it is not unimportant that the subject should engage the attention of those who are neither. But if they remain supremely indifferent on the matter, and cannot, or will not, look at it in any other light than that of pure sentiment, should some extrinsic force be brought to bear upon them? It would form a piece of perfect tyranny in a paternal government to interfere in such a matter, and the task would be a most invidious one. On the other

hand, are we to sit with folded hands and quietly watch events the disastrous consequences of which are as certain as is the upshot of children's play in a straw-yard with a matchbox. There is only one direction in which unalloyed good in the matter can be looked for, and that is from more general knowledge on the subject. The thoughtless and the self-indulgent are of course the last to be reached by sense and reflection, but surely knowledge with its blessings will reach them in time; even if it is only after a long percolation and filtration through the minds of others first.

It is perfectly obvious that the children of one union will be doomed ere they are born, while if the parents married differently there would be a fair prospect of life before their progeny. The person of strumous diathesis may avert the fate which would lie before his children if he should marry a person of similar diathesis, by marrying a person free from all strumous taint; and the person of nervous diathesis may secure a fairly healthy progeny by marrying a woman whose family history is devoid of all trace of disease of the nervous system. It is obviously most undesirable that two persons should marry in whose veins lurks the tendency to insanity. Such a union would be simply wicked. Not that insanity is the hopeless matter which it was considered in days gone by, when ecclesiastics dealt with it as a perversity of the soul, and beat the poor madman with rods to make him 'cast out his devil,' and then when their treatment failed, chained him to a staple in a wall as contumacious; or even in later days, when the insane person has been regarded too much by his family as a plague-spot to be concealed, and by the asylum-keeper as a source of comfortable revenue which it was not desirable to put in jeopardy

by any attempt at cure, and so the family straitened themselves that their skeleton might be hid out of their sight. Insanity is not this incurable matter, this festering sore, and persisting indication of family mental unhealthiness, but a form of cerebral disturbance not uncommon in the talented and the able. It is often the penalty a family has to pay for the possession of brains, and the other members of the family marked by insanity are often strong-minded, intelligent, and able people. Still, after all, it is not desirable that members of such families should marry together; they should mate with those of a different diathesis. The bilious and the gouty had better intermarry than like marry like, and perpetuate the diathesis in an aggravated form.

Bearing on this question comes that of consanguinity, of the marriage of near blood-relations. This is a question with which the Church has concerned itself unduly; and which it has also rather regarded as a source of revenue than attempted to approach properly on its merits. It relates to those who are akin by ties of blood-relationship, and to those only; such matters as the marriage of a deceased wife's sister has no bearing on it whatever; neither has that of the marriage with an uncle's widow. These are the fringe of irrelevancies which surround the real question. The question at issue is this: what is the affinity which renders marriage undesirable? The line is ordinarily drawn at first cousins, and more distant relationships are regarded as permitting of union. Long lists have been from time to time prepared to show how disease has manifested itself in the progeny of those who are nearly related; how disease of the nervous system has simply blazed out under such circumstances, and how other

disease has shown itself with alarming activity or startling recurrence. But in all of it the question of diathesis has been omitted, chiefly because it is as yet a matter not understood or comprehended; although this is the question essentially. If the cousins are of similar diathesis the diseases of that diathesis will manifest themselves in the progeny; just as, in a lesser degree perhaps, it would in the offspring of two persons of similar diathesis who were not blood-relations. If the cousins are of different diatheses the progeny are unaffected. It is obvious, however, that recurrent intermarriages will tend strongly to bring out any lurking leanings, and the effects of a strain in the blood of both parents will come out strongly in their children; as we have seen before in reference to the breeding of animals. After all, the question is not one to be settled by any rule of thumb; and the peculiarities of each case must be taken into full consideration ere a decision be arrived at. Sometimes, doubtless, it is very undesirable that first cousins should marry; at other times there may exist no reasonable objection. In the case of double first cousins, that is, where they are first cousins through both parents—where brothers have married sisters, or a brother and sister married sister and brother, the objections are more than doubled and the prospect of disease in the progeny becomes intensified.

The tendency of mankind is not, as a rule, to intermarriage, and amidst savage tribes it is common to seek a wife from another tribe. In countries where the aristocracy are not permitted to marry out of their order degeneracy has been the rule; and the hidalgos of Spain show how undesirable such restriction is; while history furnishes us with numerous well-marked instances of the energy given to a race by a mésalliance.

An infusion of new blood is now a common expression illustrating the prevalence of the belief in the advantages to be derived therefrom. It is well known that new blood from the country is requisite, absolutely necessary, to maintain the existence of burgher or town-bred families, and that immigration is as essential to the continuation of their existence as it is to many colonists. Mule races are often most enterprising, as seen in the mulatto races of Spanish America, and often half-breeds unite the best qualities of both parents. But mule races, human and other, are very infertile, and soon die out without free and numerous accessions from the union of the primitive races.

A very singular fact may be here mentioned in reference to the union of different races, and that is this. There is some evidence pointing to the conclusion that the women of the red races of America and of the aborigines of Australia having once borne a child to a white man are ever after infertile with a native. Such rule in no way bears upon the most fecund of all women, the negress.

Ere closing the chapter on inheritance and its effects it will not be out of place to consider for a moment what is called the 'potency of the individual,' that is, the effect exercised over a family by one individual of strong character and marked physique. Such men are the founders of families and of dynasties. They have had progenitors like other people, but they stamp their individual peculiarities on their descendants, and convert their personal attributes into inherited and inheritable characteristics. Such was the modification of the Plantagenet line by the Welsh squire, Owen Tudor, and in the temperament of the choleric

Welshman lay the seeds of the imperious egoism of Henry VIII. and Elizabeth.

It may be that such a marked influence is but rarely exercised; still there is the liability for every parent to modify, to some extent at least, the character of his family, and such being the case, it behoves him to so conduct himself that he shall not be the cause of its deterioration.

PROPOSITIONS.

1. The transmission of qualities, mental or bodily, forms family characteristics.
2. This transmission of qualities by descent enables breeders to form new varieties of animals.
3. The inherited form of constitution is called a 'diathesis;' an acquired constitutional condition is a 'cachexia.'
4. The gouty diathesis gives massive and powerful individuals.
5. The strumous diathesis is weak in physique, in mind quick but often superficial.
6. The nervous diathesis furnishes small, neatly proportioned people, with active minds.
7. The bilious diathesis gives a tinge to the skin and a liability to liver disturbance; but persons of this diathesis are often of powerful physique and much mental power.
8. The lymphatic diathesis gives large, unenergetic individuals.

   (This is the exact opposite of the nervous diathesis.)
9. When persons of different diatheses marry, the children may inherit either diathesis, or 'a blend' may result.
10. The first conception often influences the succeeding ones; and the children of a widow's second marriage may resemble the dead first husband.
11. This holds good of animals, and is well known to breeders.
12. A family characteristic may leap over a generation, and then reappear; this is 'atavism.'

13. What is acquired by the parent may be inherited in the child.
14. Idiots are often the first-born, and here the idiotcy results from disturbance in the mother during her first pregnancy. Or it may show itself in the youngest, from degeneration in the father.
15. Diseases may be inherited. (See Prop. 13.)
16. Longevity and its opposite run in families.
17. The instinctive preference for a person of different diathesis has good effects.
18. The question of the consequences of marriage upon the children ought always to be entertained.
19. Marriage betwixt persons nearly related is not necessarily undesirable; but if of similar diathesis is better avoided.
20. An infusion of new blood into an old family is often most beneficial.
21. Town-bred families would die out in a few generations if not recruited by new blood from the country.
22. The women of some tribes having once had a child to a white man, are ever afterwards sterile with a native. (?)
23. Some men stamp their individuality not only upon their children, but upon their descendants for generations.

For a passage from *Junius* illustrating the effects of inheritance, see Appendix.

CHAPTER VIII.

THE ELECTION OF A PURSUIT IN LIFE.

This is a matter which bears both on health and life. By its own intrinsic healthiness or unhealthiness, by the taste or distaste for it, by its suitableness to the natural inclinations and its harmony with the aspirations ; the pursuit in life exercises an influence over the health and the duration of the existence of the individual. Nor is it either strange or incomprehensible that such should be the case; rather it would be against our expectations if it should not exercise such effect. The very idea of a mode of life which is repugnant and distasteful, when it has to be the occupation of years, is enough to depress the natural spirits and to leave the individual joyless and dispirited at the prospect. But when the line of occupation is such as falls in with the temperament and aspirations, then the natural enthusiasm is thrown into it, and not only is success more probable, but the effects of such occupation are felt upon the spirits and the health. How can we fancy any success or satisfaction in the natural aspirant after adventure and travel when his life's occupation is to read long and mouldy papers and processes, or to fill ledger after ledger and make entry after entry. Or again, what charm has a life of danger and excitement for one whose hopes are centred in a life of religious

exercise and devotion. The custom of permitting a boy to choose his path in life is a well-founded one, and the small modicum of success which awaits the selection of a life in accordance with parental ambition or design instead of the natural wishes of the individual, testifies to the wisdom of permitting such choice. So small is the share of success, indeed, where the disinclination to the occupation is persistent, that the interests of the individual and all connected with him are rather towards adopting the natural choice than attempting to force on him a distasteful one. There is little prospect of success or happiness where the labour is repugnant to the labourer, and equally little of health when the occupation is uncongenial.

Education, by enlarging the choice of the individual, has its influence, direct and practical, over the future health and prospects. By its means those whose physique is unsuited to manual labour can find an occupation which will enable them to live in moderately good health and to reach the allotted span of man's existence. For those who are not of good physique education has indeed in many respects been a blessing. To others again, it furnishes the means for carrying out the ambitious career which is craved after. Its absence restricts the choice and compels the individual either to select a handicraft or to adopt the arduous life of unskilled labour, with its hardships, its subordinate position, and scanty wages. It is not customary to look at education from this point of view, but nevertheless its importance must be patent to all.

The first point then to be settled is that of whether the occupation shall necessitate what we ordinarily term education, that is, a certain amount of knowledge conveyed by instruction, or it shall not. Where the educa-

tion is awanting, then the choice is easily made, it is the choice of necessity. Whether in many instances there would be better health in a light handicraft or in the ordinary clerkship for which no great amount of education is necessary, it is not easy to determine. The conditions and requirements of the one leave a better balance out of which food and the other requisites of life can be purchased; but the pursuits of the other may be much more congenial. In the same way the question may be raised as to how far domestic service with its light cares, its regular duties, and its ample food, may not be in many respects a much better occupation for girls than those half-paid, trying occupations which permit however of the young girl dressing herself as she pleases and aspiring to the title of Miss. It is a question of solid comfort versus sentiment; and sentiment often gains the victory. It is no question for discussion here as to the relative merits of such a life as is open to a girl of the working and lower middle classes, but only as to the question of health. There is not much to be said on the question, and the circumstances of each individual case must and really alone can settle the question. If the genteel occupation is preferred, it is desirable that the person making the selection should first ascertain whether the occupation will furnish a sufficient income for the absolute maintenance of the chooser. It is to be feared that occupations other than domestic service, and teaching, are too frequently utterly insufficient to provide the requisite sustenance and the clothes; and that too frequently in order to procure the latter certain other means of adding to a straitened income must be resorted to. That there is too much truth in this statement there is every fear to believe; not only so, but that such is the

fact in all parts of the globe. It is absolutely necessary to allude to such an unpleasant subject here, as many girls make their choice in ignorance of the probable consequences of it. Whether a girl can maintain herself single-handed decently and decorously is not so much the question as, is it practically possible for many of those essaying the life to be successful? The answer must be in the negative, however distasteful and opposed to what we might wish to think. How far women will be successful in the higher walks of life it is as yet premature to attempt to determine, but the essay will ere long be made on a large scale, for the aspiring women are persevering and possess support of an influential character.[1] Little can be said as to the selection of a pursuit in life by women; a selection which is almost always forced upon them by some mischance in Anglo-Saxon countries where provision is usually made for them.

It is rather with the selection of a pursuit in life by man that we are engaged with here. When the child has had a sufficiency of time to make a choice and to have some reasons for the choice, be they good or bad, it is customary to permit him to choose his future occupation. Of course it is obvious that the line he seeks must be within his reach; that is the first restriction. Then comes the question of how far is he certain of his adaptability, and how far is he likely by natural bent and inclination to be suitable to the chosen line and successful. The minds of parents and guardians are

[1] For further information as to certain elementary matters in regard to woman's adaptability to a life of self-maintenance by the exercise of her intellectual powers, the reader may turn with advantage to the papers on *Sex in Education*, in the *Contemporary Review* of April and May of this year, 1874.

much exercised with this latter question, and properly so. To permit the child to attempt a career for which he is obviously unsuited is a weak and mistaken kindness, as failure means loss of time, with all the trouble and disadvantage of a second start. Under these circumstances it has been no uncommon thing to consult a phrenologist. This individual, who professes by observation and examination of the head to be able to read the natural bent and capacities of the child presented to him, though often no doubt wonderfully shrewd in his forecast and successful in his interpretation, has failed, and unquestionably failed, to make good his claim on human credulity; and consequently parents and others are thrown back on the ordinary channels of information. Schoolmasters can frequently forecast whether a boy is likely to make an able or an industrious man, but beyond this their lore does not extend; and the selection of a pursuit in life is one of the most difficult as well as grave choices to be made during our whole earthly existence. Nor is it easy to lay down rules which will be useful in this dilemma. The first suggestion is that the child be made fully aware not only of the grave importance of his choice, but also of the necessity of abiding by it. It is hard to throw upon a child the choice of the occupation of his after life, but since we have lost faith in astrologers and horoscopes, and even phrenologists have had their day, we must take refuge under more prosaic guidance; there is nothing else for it. Next should come the question of the disposition of the child. If he is of quiet and methodical habits, business and commerce will offer fitting careers. If of strong physique and enterprising character, the services, and still more the colonies, give him a field for the display of his qualities. But the

question of bodily as well as mental fitness must not be overlooked, and must aid in guiding the selection. If the child were of studious habits and of slender frame the Church of old claimed him as her own, but how far the Church offers much scope now for such combinations it is hard to say. Of old, too, the strong-willed lad, whose stubborn temper, high courage, and robust physique fitted him for the warrior or the pioneer, and suited him for the career of Cortez and of Clive, had such a career before him, but what modern life has to offer him as an existence and a substitute it is not easy to see. High courage, natural intelligence, and good thews and sinews, have not such a field before them now as they once had.

Much, too, depends upon making the most of the natural bent and inclinations, not only for the boy's success in life, but for its secondary effects upon his health. Thus many children show a great natural aptitude for the acquisition of different languages, a talent quite lacking in others. As the rule is, or ought to be, that every individual should have the opportunity given him for making the most of himself and his powers, such a child should be permitted to follow out his bent and make the most of his strong points. This is the great secret of success. But unfortunately the strong points do not always manifest themselves sufficiently early in life, but when they do come out their indications should always be followed. It is obviously to the advantage of the state as well as of the individual that every man should be made the most of, and developed to the utmost of which he is capable; and that end will not be achieved by neglecting his natural inclinations. Yet it is no uncommon thing to see parents systematically ignoring a lad's natural aptitudes and inclinations,

and forcing him into the line which they for their own ends wish him to adopt. It is no matter for surprise that in such case the attempt is essentially wanting in the very elements of success, and if persevered in ends in the utter ruin of the individual, and the entire waste of him in a world where he might have been very useful.

Boys forced into uncongenial pursuits generally make up for their distasteful occupation by an equivalent of self-indulgence, and this bears directly both on their moral and physical health. It is almost criminal on the part of parents to compel a child to follow an occupation which is repugnant to him, as well as a source of peril to the boy: to say nothing of the prospects of success with its consequences offered by cultivating the natural bent.

In other cases again a boy shows a marked aptitude for mathematics, a power which may be usefully cultivated. Very commonly however, marked power of this kind is regarded as an interesting phenomenon to be talked about instead of to be acted upon. Yet such power will be of great service if the child is placed where it can be made the most of. It is a wicked waste of talent, a most valuable product, to neglect these evidences of a natural bias; as grievous a waste indeed as the neglect of any other natural product of a country; for surely of all the products of a country brains must be the highest and most important, and if it is the highest natural product its cultivation must be most momentous. To look at the thing from a mere commercial aspect, it is most important to see for what purpose the material is most fitted, and so to adapt it. Who would make ropes of wool, or fine cloth of hemp? And yet such is the way we too commonly treat a far finer fabric, namely brain-tissue. It is as un-

economical to use fine brains for a coarse or common purpose as it is to use fine material for coarse purposes in manufacturing. But too frequently the material is taken for the purposes in hand not from its suitableness but from the fact that it is the only material at hand; that in fact the choice is entailed by poverty. Still whatever the excuse, the principle is wrong.

On the other hand we often find in families the most affluent and respectable one member who differs widely from the rest. Usually it is a boy, and commonly the eldest. He is utterly unamenable to the considerations which ordinarily guide our actions, partly from perversity and partly from sheer intellectual incapacity. From school to school he rolls, the despair of parents, and the *bête noire* of schoolmasters. Knowledge will not adhere to him: but he is proficient in all of which it is desirable he should be ignorant. He is idle, inveterately so, except where activity is undesirable. He is untruthful, vicious, and abandoned to low society of both sexes. The grief of his parents, the sorrow of his brothers and sisters, do not affect him in the least, he is simply supremely indifferent to them and their wishes, except so far as he can utilise them for the advancement of his own selfish ends. Sooner or later the instinct of self-preservation compels his family to extrude him from among them altogether, to expel him as herds of animals drive out injured individuals. After this his career is commonly a chequered one. He may find his way into a regiment and be capable of being drilled into an average private, especially if he sees no way of escape except by desertion, which he dislikes, for his selfishness keeps him very wide awake as to what affects himself within the lines he adopts. Or he

may emigrate and find in the rough life of a border civilisation an occupation congenial to his tastes and adapted to his powers. His platform of thought is lower than that of ordinary mortals, and it is a distinct mistake to attempt to induce or coerce him into adopting the thoughts, the aspirations of others. He is not so fashioned; but he may fulfil the duties of a lower function not altogether amiss, and perhaps after all he but seeks his proper sphere intuitively in his own extraordinary and unique fashion. Commonly it is said that he is morally insane. Certain it is his mental processes are not controlled by the moral feelings as are those of others. Maudsley, in his well-known work on the 'Physiology and Pathology of Mind,' from which I have made several unacknowledged quotations, sums up thus. 'Those who suffer from moral insanity are often very troublesome to deal with satisfactorily, but it will be worth while always to remember that one unequal to the responsibilities and duties of the social position in which he was born may not on that account be unequal to the relations of a much lower social stratum. It is not because a person insists upon degrading or ruining himself that it is justifiable to deprive him of his liberty by treating him as a lunatic. Very little more can be done for those who from childhood have manifested a moral and intellectual imbecility than to place them where they will be properly controlled, kindly treated, and well taken care of; they should certainly not be subjected to the discipline of a stern schoolmaster who expects by severe measures to implant better feelings and to awaken a brighter intelligence in them. God has not given them understanding, and man cannot do it.' The material which goes to form the web of their life is only adapted to coarse and

common uses, and it is a fruitless waste of time and labour to attempt to fashion it into a finer fabric.

Manual dexterity again is a matter of no slight moment, and the skilled hand is the willing servant of the brain teeming with devices. Look at the long and flexible hand and fingers of the born draughtsman, and especially the limber thumb, and compare this hand with the thick or stumpy hand which can never execute with any satisfaction the designs of the brain, or transfer them into decent visible forms; and the conviction at once forces itself upon one that there is here a power whose existence should be utilised and not neglected. The child is father to the man; and the busy knife and creative power of the schoolboy often foreshadow a brilliant career as a constructive engineer, or indicate some great mechanical feat in the distant future. The power to plan some boyish escapade has often been the first indication of a capacity and possession of resources which in after days has saved or subverted empires.

Acuteness and perfection of the natural senses are capable of being utilised in the struggle for existence. Taste even is in commercial request, and in the selection of wines and spirits is a matter of the greatest moment. Real natural good taste is a rare and most valuable commercial commodity, and of all things the most difficult to imitate; though numbers aspire to it whose taste is not to be depended upon and whose selection is mere guesswork. In the choice of tea, cinnamon, and other vegetable products the taste is most important; though it is a sense we are little apt to associate with a choice in life.

Even the skin of the hand has its uses and its commercial value; and for the very finest polish of lacquer and papier-maché goods the skin of the human hand is

requisite for the finishing touches. Would it not then be a stupid waste to put that hand to hard domestic uses, where it has no advantages, and, if anything, is at a disadvantage; when it might be much more profitably engaged in a work for which it is naturally adapted? The question is not one of mere economy; it is vitally related to the health and happiness of the individual, and so bears upon the life.

It is not only the question of seeing what are the natural capacities and how to make the most of them, but also the matter of what should be avoided where the senses are weak or easily exhausted with which we are engaged here. Thus for instance, a person who is naturally somewhat deaf or hard of hearing should not be selected where the sense of hearing has to be chiefly exercised; nor a man with indistinct vision for the post of watching signals. The matter of sight is every day becoming more and more prominent, and examinations to test the vision are now being regularly instituted in certain branches of service. It is of importance then, that a boy should know what is the condition of his sight, and also its power. If it is defective it is important that all that can be done should be attempted in order to remedy, if possible, the natural defects. Attention to this may much widen the choice of an occupation; and neglect of it cripple the future existence. Occupations, too, which try the eyes are obviously unsuited to those of weak eyesight, and are to be avoided for their ruinous effect upon the visual organs. A constant strain upon weak eyes is the most efficient mode of wearing them out. Fine needlework at night is the ruin of many a girl's eyesight, and similar strain by artificial light has the same effects on men's eyes. And it is a most important matter for those who have

their living to earn that the eyesight be impaired as little as possible.

There is a general adoption of spectacles and eye-glasses among young people now-a-days, and it is often a subject of discussion how far it is affectation, or real necessity. It seems a strange affectation to simulate a defective sense, but there can be no doubt as to the fact in a number of cases. In others the defect is real, and the glasses are requisite, and their use takes its origin in the superior knowledge of oculists. But these explanations are not quite satisfactory, and it is a moot point whether defective vision is on the increase or not.

Another form of defective vision is that of colour-blindness or Daltonism, where the power to distinguish betwixt certain colours is defective or entirely amissing. Dalton, a famous man of science in Manchester and a Quaker, was once met on a Sunday morning going to meeting in a pair of flaming crimson stockings which he had mistaken for his ordinary blue ones, and put on accordingly. The colours green and red are those which are most commonly mistaken for each other in consequence of the lack of power to distinguish them. The now common use of coloured signals, especially by coloured lights at night, has made the question of colour-blindness of much more importance than it has hitherto been; and for railway officials, and especially for engine-drivers, freedom from colour-blindness is a most important and essential requisite. The fate of a train-load of passengers, to say nothing of individual safety, may rest upon the perfection of the vision of the driver, and the question is one of importance to us all.

So we see that not only are the peculiarities and diatheses of individuals important, but that the perfec-

tion or imperfection of the special senses is of moment in the selection of a pursuit in life, and in its after effects upon health and existence.

Forms of occupation exercise in themselves much influence over the health of those who enter them, irrespective of diathesis or physique. Thus the comparative duration of life betwixt a country clergyman and a Sheffield needle-grinder is so widely different, that a very delicate man would in all human probability as a country clergyman outlive the very healthiest man who becomes a needle-grinder. There never was an old needle-grinder. Many occupations exercise a most deleterious effect upon the health of the individual, and none more so than those which lead to disease of the respiratory organs. Foremost among these are the dry grinding occupations in which the grinder constantly respires the fine dust of the grindstone, and of the steel article being ground. Fork-grinding is very bad, but needle-grinding is worse. Larger articles are not quite so destructive. The fine dust leads to inflammation of the respiratory organs; it aggravates the disturbance it sets up, and irritates the diseased lungs till recovery is simply impossible. In the same way the mason suffers, and the finer the stone and the work the worse the effect. The freestone of Edinburgh is notoriously bad for its effects in producing mason's asthma. A change of occupation even to coarse mason's work is often absolutely necessary to the preservation of life and the continuation of existence. In other cases the entire abandonment of the work for a time is desirable, and a term of service as a soldier or a policeman is indicated.

The inhalation of dust in the pottery district is also productive of pulmonary disease and early death; as in a minor degree is the inhalation of the dust of various

cereals by bakers and millers. In woollen manufactures the inhalation of dust is a common source of disease; and the same is the case with the dust of coal-mines, and the pearl dust in button-making. In every case where the lungs are diseased or there is a strong family tendency to lung disease, the above-mentioned occupations should be studiously avoided. The mechanical irritation of the dust borne in the air is a source of much suffering to the consumptive; and the absence of it in the air of the country, and still more of the ocean, has much to do with the well-known benefits which the consumptive derives from such changes of air.

Many very deleterious occupations owe their harmfulness to chemical poisons. For instance the pewterer, the plumber, and the painter suffer much from the absorption into the system of the lead amidst which they work. Scrupulous cleanliness has done much to relieve them from these consequences, still lead-poisoning is a common form of disease.

The manufacture of matches is also very injurious, producing disease of the jaws, especially the lower. This is effected by the fumes of phosphorus, and it is said that if the teeth are sound no ill effects are experienced, but if there is a hole in the tooth, the fumes pass readily through it and affect the jaws. Here it is obvious that those who possess bad teeth should avoid this method of getting a livelihood, and also that every speck of decay in a tooth should attract attention, and the affected tooth should be stopped. Systematic and regular inspection of the teeth should be the rule in every match manufactory, great and small.

Looking-glass makers are very apt to suffer from mercurial poisoning, the result of the quicksilver they use to cover the backs of glasses; and brassfounders

suffer from the absorption of copper, either by fumes or by the skin. Arsenic is a poison which affects those working at certain occupations, and by its fumes is a common source of disease amidst those engaged in the smelting of copper. As a fine dust it is very deleterious to those who are engaged in the manufacture of wall-papers and artificial flowers; and even to dressmakers when making up dresses where arsenic has formed a portion of the pigment or colouring matter. Chemical works where the fumes of hydrochloric acid, or sulphurous acid, are given off, and gas-works where compounds of hydrogen and sulphur are common, are both injurious to the health of those who work in them, or even live in their neighbourhood.

Much has been done, however, in these different deleterious trades to neutralise these ill effects. Well ventilated workshops and mines, fans, magnets, and respirators have done much to check the diseases induced by mechanical irritants in the air; and the processes where deleterious fumes are generated have been revised, and the fumes either altogether removed or very much reduced.

At other times disease is generated by an excess of what is normal in the atmosphere, as carbonic acid gas for instance. In other cases the inhalation of highly heated and too dry air is injurious, as in the cases of flat-pressers and others.

In addition to the above-mentioned injurious occupations may be added the following from Dr. Greenhow's Report to the Privy Council:—

'B. 1. Habitual exposure during the hours of labour to a hot and exceedingly moist atmosphere, exemplified in the cases of slip-makers in potteries, and spinners of flax.

'2. Working in ill-ventilated and over-heated factory rooms, as in many manufactories of textile fabrics, in some of the decorators' rooms of potteries, in warehouses, and likewise in many establishments where young females are congregated together at work.[1]

'3. Exposure to vicissitudes of temperature, exemplified in the cases of the operatives in several kinds of factories and workshops.

'4. A stooping or otherwise constrained posture while at work, exemplified in lace-makers, throwers of earthenware,[2] certain classes of weavers, file-cutters, and silk-piecers.

'5. Working continuously many hours daily at a sedentary occupation, such as that of the glove-makers of Yeovil, decorators of earthenware, and welters and finishers of hosiery.

'6. Working in ill-ventilated and overcrowded rooms, as in the straw-plat and lace schools of Berkhampstead, Lancaster, and Newport Pagnell, the winding rooms of Leek, and the weaving shops of Hinckley and Leicester.

'7. Residing in dwellings so constructed that the bed-rooms are badly ventilated, and the cubical space per head is inadequate to the preservation of health, such as are to be found in Berkhampstead and Saffron Walden.'

There is much room for fear the last section might be extended over a much wider area than that assigned to them by Dr. Greenhow; indeed it extends over the greater portion of the earth that I have travelled over, and is as true of the half-buried hut of the Sclovacken

[1] This last is a very common cause of disease.—J. M. F.

[2] Shoemakers may be added to this list.—J. M. F.

in Hungary as it is of the densely packed houses of our poor neighbourhoods in towns.

In addition to the numerous deleterious occupations mentioned above, the effects of low shops may be alluded to. The old-fashioned shop was often exceedingly low, and the ceiling was not very high above the head. Many persons suffer from constant headache and lassitude in those shops who are at once relieved by removal to the high shop now in vogue.

Another form of disease induced by occupation is that of a certain form of disease of the heart and great vessels produced by strain. A knowledge of this form of disease is not yet general, but its existence is unquestionable. It is a slow inflammatory disease of the valves of the heart at the base of the aorta, the great artery into which the heart opens. It is commonly found in strikers, the men who wield the large hammers in foundries and iron-ship building yards, in colliers, in bargees, and in boatmen.

It is found to a less extent in athletes; but if their efforts were continuous and persistent as are those of an occupation they would suffer more. The cause of this inflammatory action is strain, and it is occasioned by general muscular efforts; consequently it is common among those who use their arms, for which purpose the rest of the body is steadied by 'setting' the various muscles. In consequence of the efforts required, strong and muscular men only fill these posts, and the efforts made are often severe and trying. In time disease is engendered, and the pursuit aggravates it and intensifies it, and this form of heart-disease usually carries off the sufferer after no long time; change of occupation gives the only chance. 'We may be enabled to aid the working man in whom these changes are being esta-

blished to avoid further damage by changing his form of labour for some other less trying occupation. For if this form of labour cannot be abolished, and thus the changes engendered thereby be obviated, some good at least can be achieved by substituting some other form of labour, some other method of obtaining a livelihood, for this which has already induced changes in healthy organs, and can, if continued, but aggravate the morbid processes which it has inaugurated.'

Such are the commoner forms of disease entailed by special forms of labour, and very serious matters they are for the consideration of those engaged in them, or about to engage in them. Still there are more general disorders associated with the various occupations in which man must engage in the great struggle for existence; thus all sedentary occupations are apt to be followed or accompanied by various troubles, chiefly of the abdominal viscera, the consequences of quietude. Exercise is here necessary, in order to promote the action of the liver and intestines, and to call the skin into play. For the clerk confined indoors, and breathing an atmosphere which has been again and again utilised ere it comes to him, exercise in the fresh air, if possible, is absolutely necessary to health. It is scarcely sufficient to merely walk in and out from his residence to his office, though that is a practice which can scarcely be too highly commended; he must have more active exercise, at least in summer, and that is furnished to him by the cricket-field and the river. Cricket is an excellent game, calling into exercise the muscles, the powers of observation, and the trained co-ordination of eye and hand which is so desirable an acquisition. The quiet boating on the river in the evening is an agreeable exercise as well as a recreation, and does not entail

that straining exertion which belongs to boat-racing, the consequences of which are often so injurious to its devotees. In winter, football and other games are desirable and healthful diversions.

All these exercises, the more in the open air the better, are useful and wholesome for those who follow sedentary occupations, and help to furnish that union of muscular exercise and intellectual labour which is so desirable for the maintenance of health.

On the other hand, in monotonous occupations entailing no demand upon the intellectual powers there is a great tendency to mental disease. No fact is better established than this; and the proportion of insanity amidst agricultural labourers is much higher than it is amidst the members of energetic professions and occupations. Disuse of an organ is almost more fatal to its functional activity than its excessive use. Certain it is that a fearful price is paid for those divisions of labour which, while commercially successful, entail a terrible tendency to insanity in those actually engaged in such monotonous occupations. The sense of ennui and of depression entailed by such wearisome labour incites the men when work is over to plunge into dissipation and alcoholic excitement. In female operatives so engaged recreation of even a more questionable character is common and usual, and much of their immorality is strictly due to their uninteresting and monotonous pursuits. Amidst the young of both sexes fiction, the wilder and more unreal the better, is greedily devoured. It is the natural reaction after their routine labour, and the greater the contrast betwixt the lives of their ideal characters and their own existence the more palatable the fiction. Sober-minded readers accustomed to the perusal of serious works and higher

class fiction wonder whither goes the tremendous fiction of which the 'London Journal' has come to be regarded as the type, and who reads it. It has, however, a most extensive sale, and is doubtless acceptable to its purchasers, else the purveyors would not furnish such highly-seasoned *bonne-bouches*. To those engaged in monotonous pursuits it is palatable, and is a form of intoxication. The wild fancies engendered by such fiction do little to steady the excitable and unstable brain, and such stimulant literature, though perhaps unavoidable, is far from a healthy exercise. Betwixt the effects of their occupation and the relief sought after the hours of labour are over combined, the worker at routine and monotonous labour is specially apt to become insane, and that insanity is usually accompanied by exalted ideas. Much of our insanity, that is, of the forms now on the increase, is at once a reflection and a satire upon our ordinary pursuits and aspirations. From the contemplation of grandiose constructions of the imagination, it is an easy step to the belief in their actual existence; and for the ill-trained and unsteady mind it is easy to bridge over the gap which exists betwixt the contemplation of unbounded wealth and its actual possession. Such are the forms of insanity which seem almost a part of our increasing wealth and commerce—part of the tax we have to pay for our progress.[1]

Thus we see that mental exercise is as necessary to the health of those engaged in physical labour of a monotonous character and making no call upon the

[1] 'They are the waste thrown up by the silent but strong current of progress; they are the weak crushed out by the strong in the mortal struggle for development; they are examples of decaying reason thrown off by vigorous mental growth, the energy of which they testify.'

mental powers, as is actual physical exercise to those who are engaged in sedentary pursuits.

In addition to what has been said before about emigration it must be considered now in relation to the selection of a pursuit in life. Colonisation is an old and well-established process in densely crowded countries, but it is only of comparatively recent years—indeed, since the discoveries of America and Australia, that it has assumed extensive proportions. At first only those of hardy courage and iron frames ventured to risk the trials of a new country with its dangers and privations; but now those of every form of physique, of mental and bodily build, venture on trying their fortunes in new countries. Not all of them are successful, nor are all those who essay the trial such persons as to render success probable. Many qualities are requisite to ensure a fair share of success. First of all there are yet many hardships to be endured, and there ought to be the bodily vigour and strength to contend with them or endure them; no matter how buoyant the spirits and courageous the mind, if the physique is unequal to the trial, the end is a breakdown or practical failure. On the other hand a courageous disposition, not readily depressed nor disheartened, is absolutely necessary in order to secure that determined perseverance without which the physique, no matter how good, is useless and of no avail.

The Saxon, 'the man of to-morrow,' as Knox calls him, is a colonist *par excellence*, and though like all isolated Teutons he is apt to become a boor, he is the man who, axe on shoulder and rifle in hand, declares himself getting 'crowded' if he sees another smoke than that raised by himself, or hears the crack of another man's rifle; and prepares forthwith for another

excursion away from the civilisation which follows at his heels. How different are the colonies of the Latin races which, wherever scattered, always consist of numerous individuals, and whose movements are always in concert; contrasting so forcibly with the isolated individual action of the Saxon.

The intending emigrant should if possible be of a healthy stock, long-lived, and free from disease; his personal habits should be such that they fit him for hardship and toil; above all things he should be temperate; he should possess a good and powerful physique; he should know not only his own pursuit, but be acquainted with many other things, and be able to turn his hand to anything; he should be hopeful and courageous, and withal he should be persevering and unwearied. With such qualifications the intending emigrant will probably be successful, without them it will probably be better for him to remain at home and take his chance amidst an old civilisation.

But whether he elects to try his fortune amidst new scenes or to remain and throw in his lot with those who stay at home, there is no doubt about one thing, and that is, that now-a-days the favourite pursuits are those which will land their followers most quickly and surely in wealth. This is the pursuit of the present, and 'the practical religion of the age, testified everywhere by faith and works, is simply money-getting.' For its acquisition health, strength, and life itself are risked as readily as they were by the gold-seeking Spanish conquerors of America; nor are the risks run now by any means slight, if they are not so tangible. The success of the successful is apparent, but not so the failure of the unsuccessful—the dark waters of life quickly close over them, and they are seen and heard

of no more. But the price of success is much greater than is usually reckoned, and a harvest of ill-health, broken constitutions, and shortened lives accompanies, apparently inseparable from it, the success which manifests itself in increased revenues, flourishing duties, and increased toleration of taxation, or, as it is euphemistically expressed, 'the increase in material wealth.' The two following chapters will take into consideration the physical and psychical results of this race after riches.

NOTE.—Ere closing this chapter a word upon sewing-machines, and their influence upon the health of those who labour with them, is not out of place. There are peculiar results which follow from the use of the treadle sewing-machine, especially the double-treadle machine, which are known to those who work with them; and these phenomena are such as to cause a hand-machine to be more desirable in private families, in spite of the obvious advantages of the treadle-machine as regards power and speed. For those who must labour for a living the latter may be absolutely necessary in order to earn sufficient upon which to live; and they must take the consequences, as so many have had to do in the struggle for existence: but in families of young girls where there is no call for such high pressure, the hand machine is certainly to be preferred, and ought assuredly to be adopted.

PROPOSITIONS.

1. The pursuit in life exercises an influence over the health of the individual.
2. Boys are properly permitted to make their choice.
3. Education enlarges the choice very materially.

4. For girls, at present, the choice is but limited.
5. The choice of a pursuit in life is very important, and it should always be in harmony with the natural bent and powers.
6. The best choice is that by which the most can be made of the boy and his abilities.
7. Acuteness of a natural sense is often a valuable gift.
8. A defect in the senses, as in eyesight, limits the choice of occupations.
9. Colour-blindness is a grave defect; especially as colours are often used as signals.
10. Some occupations are very destructive to life, and most so those where much fine dust is respired.
11. This dust irritates the lungs into disease, and aggravates the disease when it is established.
12. Chemical fumes are also very deleterious.

(People with bad teeth are not suited to match manufacturing.)

13. Too dry or too moist an atmosphere is injurious.
14. The persistent maintenance of one position leads to disease.
15. Some forms of labour induce a special form of heart disease
16. Physical exercise is essential to health in those engaged in sedentary occupations.
17. Mental derangement is very common in monotonous forms of labour.
18. Those engaged in monotonous occupations are specially liable to seek exciting diversion after work hours.
19. Much of the now prevalent insanity is a mockery of our pursuits and aspirations.
20. For emigration, a good physique and a courageous disposition are as essential as a knowledge of several handicrafts.
21. Success in life is often purchased with a price of which broken health is frequently a part.
22. Hand-sewing machines are best suited to private families.

CHAPTER IX.

OVERWORK, AND PHYSIOLOGICAL BANKRUPTCY.

THE reader in perusing the foregoing chapters will have noticed many allusions to the consequences of excessive toil or systematic overwork—a matter so important, especially at the rate at which we now live, and with the prospect of even an accelerated pace in the future; that the devotion of a special chapter to its consideration seems desirable. The more so that much of the overwork of the day is the direct consequence of ignorance of its effects and results. No more striking instance of the effects of overwork, of the utter exhaustion of the brain produced by excessive toil, can be adduced than that of Hugh Miller, the stalwart mason who worked his way to the editorship of the 'Witness,' and was one of the leading minds in a country remarkable for its intellect, viz. Scotland. Excessive toil so affected that undaunted mind, the fit companion of his stalwart frame, that at last the mind reeled; and the revolver, provided against imaginary dangers, was at last used to put its owner past all earthly trials and burdens. A shock passed through the community at large when it became known that Hugh Miller, the type of self-made men, the grand lay figure of that remarkable ecclesiastical movement, the establishment of the Free Church of Scotland, one of the most note-

worthy men of his day, and a man of high religious feeling, was a suicide. But when the history of his life became more known, and the portentous toil he had undergone became apparent, the feeling merged into that of keen regret at the untoward consequences of systematic and sustained overwork. Some such marked instance of the consequential results of undue labour was absolutely necessary in order to attract the attention of a busy world. But these lessons, however sharp at the time, are too readily forgotten; and the attention of the public had again slumbered or been distracted, when one of her Majesty's judges died by his own hand, worn out and exhausted by excessive labour combined with physical ill-health.

These are well-marked instances where the burden of this world has been found no longer tolerable, and relief has been sought by that horrible method, self-destruction. But for one who perishes by his own hand, hundreds succumb without any necessity for resort to self-sought relief. Again and again do we read and hear of men brought down in their prime by diseases at first regarded as trivial, and the life gone ere it was well realised that it was endangered. Men of good physique, and constitutions apparently unimpaired, sink in the day of trial because their resistive power is reduced, and diminished by a long course of excessive and severe labour. There is no longer the power to resist and withstand disease which normally exists; because the reserve power which would have enabled them to make a successful stand has been already spent and utilised, and the body bank of force has been too much drawn upon already to have a practically sufficient reserve left in it; in plain English, the person is 'physiologically bankrupt.'

How much stimulants of all kinds, inebriating and others, are responsible for such a condition of matters we will shortly see.

Ere proceeding, however, to the consideration of overwork in the adult and mature, we will again glance at it in the growing, a matter alluded to in a former chapter (p. 47–49). We have seen there the distinction betwixt exercise and toil in the young. We will now enter into the matter at somewhat more length. All observers must have noticed that in our busy manufacturing districts there is a marked tendency in the working population to be short; stunted is the more correct term. Not only so; but there are a large number of persons who depart still further from the norm, and are more or less deformed. The proportion of such persons is out of all comparison greater than it is in purely agricultural districts. Those modifications of the human frame are the results of early toil.

In manufacturing and mining districts children at an early age become profitable, and are accordingly compelled to labour. Frequently the toil undergone by children is extreme and prolonged; as is still seen in brickfields and other occupations not yet brought under the action of the Half-time Act. But labour among children is a practice as old as man's necessities. It is almost impossible to conceive a time when the busy restlessness of childhood has not been utilised by man. In the most primitive condition the little hands of children must have aided their mothers to gather the harvest of fruits, nuts, and acorns, in the primeval forests. In agriculture children have been engaged, apparently without detriment to their health, time out of mind, to weed the crops, to scare the birds, to drive the team; and to perform all and sundry such light

tasks as were compatible with their strength and powers.

Nor has agriculture at all times shown itself very considerate towards its youthful toilers; in haytime and in harvest the peasant's child feels the sensations occasioned by prolonged labour, and has a foretaste of what must be his experience through life. In some parts of England, notably in the eastern parts, this child labour has grown into an odious institution called the 'agricultural gang.' The explanation of this is that children were collected under a gang-master, often marched long distances at an early hour to commence a long day of toil, and then, worn, wearied, and exhausted, marched home to sleep and to rest their aching limbs. There was doubtless much in this, both physical and moral, which was very undesirable; but the frames of the adult were not stunted by it, nor was deformity induced. The boys grew up into well formed, good sized men; the girls became somewhat overgrown and coarse. There was no arrest of development here. Whatever drawbacks there were to the system have now been rectified by recent legislation. But when children are condemned to long hours of toil in the factory and the mine, the effects upon the physique are marked and unmistakeable. A close observer of humanity informs me that the physique of the factory hands is much better now than it was before the passing of the Factory Act and the limitation of the hours of labour for children under a given age. Inspectors have also been appointed who examine the children that are intended for factory labour, and the unsuitable ones are rejected. The little half-timer now rests his muscles half the day, and learns to exercise his intellect during the other half, to the

manifest improvement of his physique. Still the mill population of Yorkshire and Lancashire form a strong contrast to the bulky agricultural population around them; not only that, but they compare almost equally unfavourably with the population reared amidst the agricultural gangs.

It is obvious that this difference does not lie in the mere toil endured, as much of the factory work is light and untaxing, except from its demand upon the attention. Neither is the difference one of food; for the factory hand, in spite of his well-known improvidence and the short rations of Thursday and Friday, is better fed than the agricultural labourer. The difference lies in the air respired. The air breathed by the field hand is pure and laden with oxygen in an active form; the air of the pit and the factory is impure and rebreathed again and again, until its active oxygen is exhausted and consumed. Probably there is little difference in their sleeping rooms; but in the day the field hand is storing up oxygen, while any such action is impossible in the mill and the mine. And the storing up oxygen, and its utility in thoroughly removing waste tissue and so permitting of the growth of new tissue in its place, are important matters in relation to health and growth; more important than is generally credited.

When toil is combined with indoor occupation, or, to put it more correctly, is divorced from pure air and unlimited supplies of oxygen, then imperfect development and disease are engendered. So much for the effects of labour upon the young and growing: and the more perfect ventilation of factories and mines is as necessary a matter for the preservation of the health of the juvenile labourers as the institution of medical inspectors and the restrictions of the Half-time Act. There is every

reason to believe that toil, if not too excessive, is not in itself injurious to the young and growing; if it is performed under the favourable circumstances of pure air and a sufficiency of food. If these latter are denied or the supply imperfect, then the effect of toil, as overwork, is readily apparent in its action upon the physique, and in the arrest of development. But in saying this it is not meant that such labour, in having no injurious effect upon the bodily development, is equally free from effect upon the mental growth. There is room for fear that the mind is commonly stunted, arrested in its higher development; and has a tendency to coarse and too often brutal amusements.

The death rate amidst overworked populations and the effects of continuous toil upon those taxed beyond their powers, have been most strikingly illustrated on a large scale by the high mortality and degeneracy amidst the survivors of the Indians of Mexico and South America under the grinding tyranny of Spain. The severe labour imposed upon them, and enforced by odious cruelties, produced such marked effects upon the population that a sufficiency of labour for the working of the mines was soon no longer procurable. The failure of the Indian led to the employment of the negro; and the exhaustion of one race led to the enslavement of another. The superior physique of the negro better suited him for arduous toil; at the same time the cost of each individual negro was such as to act as a fairly efficient check to that excessive overwork which led to early exhaustion and death. Contrary to what may appear at first sight, the negro does not furnish the best evidence of the effect of continuous overwork. The costliness of the negro has been his protection. The effects of unstinted, unsparing toil are best seen in the subordination of conquered nations, where at first the

labour supply is practically unlimited and costless. Labour enforced and unremunerated was the doom of the defeated and the lot of the vanquished; and a hard lot it often was. Under such circumstances the diminution and disappearance of the enslaved people were never far distant; unless the interests of the conquerors were enlisted on the side of their preservation. The interests of his owner were always in favour of the preservation of the negro; and under the Anglo-Saxon the negro was well cared for and treated comparatively kindly. The evidence for this is that while servile insurrections, accompanied by horrible cruelties, were far from uncommon in French and Spanish colonies, where the negro was under the dominion of the Latin races, the negro has never risen against his Anglo-Saxon master even during the American Civil War. Nevertheless all slave-owners are not equally considerate and thoughtful; and the difference was sufficiently marked to point out how the excessive toil enforced by one master was accompanied by a high death rate compared with that of the better managed and more prudently conducted plantations of others.

But the disease and death which have been the consequence of enforced toil does not in the present day equal the like consequences of the voluntary effort of spontaneous toil in the pursuit of wealth. The shores of Sierra Leone, of the Mexican Gulf, are not more thickly strewn with the bones of the white man than are the outskirts of our towns, especially those devoted to manufacture and to commerce. The high mortality of one is not really more marked than the other; in each case the deaths are due to the same originating cause. The one dies from a climate to which he is unsuited, and the other dies of disease which might have

been avoided or recovered from but for the weakening effects of sustained over-exertion. Man has the power of using up so much of his force every day; but in health his daily income meets his wants, and he has a reserve store of strength in the body bank; in the same way that a prudent firm always has a sum lying at its bankers'. This sum may be constantly drawn upon and added to; but its bulk is never too seriously diminished. Consequently, if there is any sudden demand upon the firm by failure of a correspondent, or defalcation of a cashier, this demand is met by the reserve in the bank and the firm goes on; and by diminishing its expenditure in time retrieves its position and trades again with unimpaired vigour.

Now exactly the same thing goes on in the human system. Man ordinarily has also his reserve fund of strength in the body bank; he draws from it and adds to it, and the gross sum may fluctuate a little but not materially. Under these circumstances a person may catch a contagious disease, or have an inflammation of a viscus, but his reserve fund of strength in the body bank enables him to meet the demand successfully or not, according to the amount of the demand and his amount of capital or vital force. If the reserve fund is sufficient he weathers the storm, and is merely reduced in proportion to the demand upon him. During convalescence the expenditure of force is as limited as possible, and so the reserve fund accumulates again; and perfect recovery means the restoration of the reserve fund unimpaired. If, however, the recovery is imperfect, or from its nature impossible, then the individual remains an invalid; that is, his force capital is impaired. Exactly in the same way, if a firm is not quite equal to the demand upon it, it may maintain its

existence in a crippled condition; it has got a shake and remains an invalid. The parallel betwixt the two conditions is sufficiently close; and the comparison illustrates what is meant by a physiological reserve fund. Now it is very obvious that a firm may trade beyond its capital without any other than the best intentions. So a man may overwork his strength from the best motives; but in either case the stability of the firm or of the individual is somewhat imperilled. Slight disturbing causes are more readily felt and their effects are more serious; there is an increased sensibility to external impressions, to extrinsic forces; and a slight rise in the bank rate in the one case, or a small increased demand upon the individual in the other, occasions grave disturbance; greater disturbing causes occasioning very serious consequences.

Again is there a parallel betwixt the physiological reserve fund of the body and capital; and that is, that both can be severally drawn upon, the one by bills, the other by stimulants. By a bill a person anticipates his income and utilises a portion of his capital otherwise beyond his reach; by a stimulant a man brings into action a portion of his reserve fund of energy otherwise equally beyond his reach. In each case the person is enabled to get at his capital and to call it into use. But it is obvious that if he does not repay these loans from himself he will sooner or later be a bankrupt. If the funds are not there to meet the bill when it becomes due another bill must be drawn to meet it; and that bill in time matures and must be met. Now there is a lien on every bill called discount, a percentage to come off it, ere it is converted into cash. If the bill-drawing is out of proportion to the real capital, this discount becomes a distinct cost, an important item, and in time eats deeply into the capital; there is a

distinct loss in anticipating your income by drawing upon your capital, and when that drain is sufficient or long enough continued, total bankruptcy results. But more commonly the final catastrophe is the result of some extrinsic disturbing action which the unstable and undermined firm is unequal to withstanding. In the same way a man can draw upon his force-reserves; and in place of the bill he has recourse to a stimulant. This enables him to draw upon his capital, to use to-day what he ought not to consume till to-morrow; to get at his reserve and utilise it. But this loan from himself must be repaid; and if there is not such incomings as will furnish the means to meet the bill, it must be met by another bill, another loan from himself, a temporary accommodation. This process, however, will not go on for ever, neither is it illimitable; and the cost of so getting at the capital tells in time. So man's powers fail: but as in the financial parallel, the final catastrophe is usually precipitated by some external force, some sudden disease or illness. This soon unveils the real condition; and the fictitious appearance of health on the one hand and of prosperity on the other is soon exposed. The secret decay of health and the hidden penury are alike laid bare by a sudden demand, and the ruin of health or fortune follows. Such is the common end of men and firms who trade beyond their means and use up their capital. Sometimes a different result is achieved. The individual breaks down and a long period of rest is entailed; that is, his expenditure of strength is reduced to its practical minimum and he lives upon his income and saves up, until once more he has accumulated a reserve fund and can go on again. So in business a firm finds itself in difficulties. The expenditure is at once reduced, and the resources carefully husbanded until a real capital is once more accu-

mulated, and then the firm goes on as before. Long intervals of rest and care are requisite to the restoration of a healthy condition, in either the individual or the firm.

These comparisons will, it is hoped, help to illustrate what is meant by physiological bankruptcy.

It is really a most important matter; out of all proportion to the attention paid to it. It is not enough that a man who is living too fast should call in his medical attendant and inform him that he is not up to the mark: what must he do? You must rest and leave your business; is the answer. But this is impossible, is the reply; and it either is so or the patient chooses to think so—it is a distinction without a difference. The work cannot be interfered with. The patient wishes really to know how he can be enabled to carry on: that is the point! He is informed that he is overworking himself, and if he cannot rest, must meet the demand upon him by a glass or two of sherry and a chop at lunch. This meets the emergency; and betwixt the stimulant and the extra food the patient goads himself still further. But all this does not make him really stronger or more equal to the demand; he is only enabled thereby to borrow some more of his capital, and thus a system of borrowing is established. He is just like the trader who finds himself in difficulties, and after consulting his solicitor goes in for a bill. It gets him over his immediate difficulties, but it does not make him any richer. Quite the reverse indeed, as he usually finds in time. The bill matures and has to be met, and sooner or later becomes almost a dead weight upon his capital; the repeated discounts have eaten up the loan and converted it into a permanent debt. In either case as a rule—for though the chop supplies so much food convertible into force and the money raised by

the bill is useful, the stimulant and the discount have drawbacks—the impoverished individual must go on borrowing away from himself until he is ruined. There is no help for it, and no retreat except a thorough change and reorganisation: a reduction of the business until there is once more a practically sufficient capital to work it, or a reduction in the demands upon the system, alone afford a chance of escape from the impending crash.

Again and again do we hear both of men having to reduce their establishments for a time till better days; and of others who are ordered away from all business for a time until they once more recruit their strength: and at the pace we live now-a-days such will become ever more common and frequent. The one is living beyond his true financial income, beyond what he can fairly draw out of the firm; and the other is living beyond his physiological income, beyond what he can draw without detriment from his body capital. The means of repair in both cases is to reduce the expenditure, and in time all comes right. But where, instead of this, bill-drawing and stimulants are resorted to, bankruptcy is the inevitable result. It is quite true that in both instances the individual believes, and firmly too, that he can really afford to do as he does, and often quite rightly so; but a disturbance of the money market or the fluctuations of commerce, by lowering his profits in the one case; and an extra demand upon the system in the other, either by an illness, or by indigestion &c., limiting the amount of physiological income: reveal the fact that he is less rich in money or strength than he had contemplated; and consequently a reduction of expenditure in either case is imperative.

The parallel would be much more practically efficient

and useful, if a man could only tell what his physiological capital actually is as well as he can realise his exact financial position. Financially he may readily comprehend that what one man can afford is much more than what another can, and what is no strain to one may be simply impossible to another. But it is not so easy for him to estimate his physical resources and the extent of his capacities. What seems easy enough to another may not be feasible to him, but in ignorance he attempts it, and so ruins himself. Neither is it very possible to tell a man what his physiological capital is. The best approach to a calculation of it is that of estimating how far his consumption of stimulants is a necessity or not; a man may take them because he likes them, and not because they are required; the amount he takes is not the measure of his needs. But when they have become a necessity, and half a tumblerful of brandy has to be swallowed ere the last pile of letters, which completes the day's work, can be got through; then there is little doubt but that the consumption of stimulants is actual, veritable bill-drawing. When alcohol is requisite to start the day with, the affair has become serious; alcohol may long be ruled as a servant, but when it gets the upper hand the case is very grave. More especially is the gravity extreme when a free consumption of alcohol merges into a condition where the alcoholic consumption becomes very apparent. For it is through stimulants chiefly that a man is enabled to accomplish his physiological ruin. It requires strenuous unaided efforts for a man to reach his reserve capital without the aid of stimulants; though it is possible to do so, and a perfect and genuine abstainer may and can die physiologically bankrupt. But alcohol will enable him to do it much more quickly

and effectually ; and tea will, if taken to excess, produce grievous evidences of systematic exhaustion. Neuralgia, sleeplessness, palpitation of the heart, and muscular tremors follow the excessive use of tea as well as of alcohol ; and all stimulants, by virtue of their nature as stimulants, have certain injurious effects. A stimulant, no matter what its character, enables a man to get at his physiological reserve fund—if it did not, it would not be a stimulant—and so will enable him to expend himself. It does not matter whether he takes the stimulant to enable him to do more work, to take more out of himself ; or whether he takes it to intensify his consciousness of existence (the ordinary motive for the consumption of stimulants), the effects are the same ; and a man may drink 'through himself' for the pleasure of doing so, the satisfaction derived from drinking, as well as from his exigencies. The motive matters nothing ; as often said before, nature's laws know nothing of excuses or extenuating circumstances, and physiological bankruptcy follows as surely in the one case as the other. The young squire drinks himself to death, and exhibits much perseverance in doing so ; the merchant kills himself at a comparatively early age by overwork, which stimulants have made feasible ; the handicraftsman drops off young from decay wrought by the hand of alcohol and accelerated by too much toil ; in each there is a case of physiological bankruptcy.

Living fast is an expression in common use, and it is grimly true. A man can live through a life which would with care have served him half as long again, and die worn out at 60, when he might have lived to 90 ; but his physiological capital is spent long ere its time, has been anticipated in fact, and he ceases to exist—his account is closed. The accelerated pace at which we

now live is telling upon us all; and though the average duration of life is increasing, the difference lies chiefly in the increasing length of life afforded now to delicate children, who a generation ago would have perished in infancy, but who now can be reared to puberty, or even beyond it. We all, at least all who are actively engaged, are living too fast; and we cannot live both fast and long.

The reader will perhaps exclaim that all this is very well, but how is the condition of matters to be remedied? Certainly not by the prevalent fashion of tacking a second day of amusement to the first day of work; not by having an appetiser or two of gin and bitters after business hours, until the cravings of hunger are produced or simulated; and then a hasty dinner with more stimulants and a final cup of coffee to maintain the action of the alcohol in its first stage, and ward off the second, until the individual feels that he can go to the theatre and enjoy himself: or in simple truth until he has borrowed enough from himself to give him the sensations of buoyancy and relieved the sense of weariness. That plan will not effect the desired end; neither is it to be accomplished by spending the evening at billiards, and drinking whiskey and seltzer water, and smoking unlimited cigars, until nobody knows when or how far into the small hours. In either case there is a large consumption of stimulants, comparatively large, that is, for each individual; for though one man may drink only half as much as another, he may be taking quite as much out of himself—what may be a small quantity for one may be excess for another. In each case there is a late retirement to rest, an insufficient sleep; for sleep, and plenty of it, is the grand restorative; and then next day the individual does not feel up to the

mark, and a stimulant is necessary to commence the day's work with, then 'the steam must be kept up' during the day, and after that there is the evening again.

The only plan by which the loan contracted by having to have recourse to a stimulant can be comfortably repaid, is by a simple meal after business hours, a quiet evening, if necessary a light supper; and an early adjournment to rest, with a long sleep. Then, and then only, can the loan be properly repaid; and the necessity for a stimulant next day be avoided. The quiet evening which is so intolerable, is the only effectual measure; but, perhaps, after the perusal of the above, the quiet evening may not appear such an unmitigated nuisance.

Stimulants however are not absolutely essential to the production of physiological bankruptcy, especially in persons of a nervous diathesis. They seem able to call upon themselves sufficiently without needing to have recourse to stimulants, and commonly stimulants afford them no satisfaction; in their case the activity of the nervous system seems to require no aid from stimulants: it is sufficient to exhaust the system efficiently without them. Persons of such a diathesis can permanently exhaust themselves without having recourse to stimulants; and such are those who, though abstainers, overwork themselves, and become physiologically bankrupt ere their time. Persons of other diatheses may be able to perform a similar feat, but it is much more difficult of accomplishment with them. There is no doubt but that much of the disease of the nervous system to which persons of nervous diathesis are liable, is simply the result of continuous overwork, until disease is engendered.

Overwork is indeed one of the most serious outcomes of the pace at which we live, and of the struggles which we make, first to secure a living, and then to accumulate a fortune. At no period of time was there such a high-pressure existence as now prevails; though there is every fear that it is growing, and will continue to increase until man learns better than he has hitherto done, the lesson that his powers are neither unbounded nor inexhaustible. Physiological bankruptcy is an expression which has something strange and unfamiliar about it as yet, but it will not long be so; increased acquaintance with it will lead to our being much more familiar with the expression itself. Bankruptcy is the term which conveys the most vivid impression to the mind both of what has occurred and how it has been brought about; and the reader will ere now have fully recognised how man's reserve fund or capital of force can be dissipated, in precisely the same manner as his financial capital may be expended. It is not only, too, that life may have to be continued in straitened circumstances, or as a confirmed invalid; there is an ever present danger of some sudden demand which will break up the individual. The inability to meet any demand is the danger to existence *par excellence*; in the one case it kills, in the other it produces financial extinction.

These are indeed serious matters for reflection for all who are engaged in the keen struggle now necessitated in those, and their name is legion, who aspire to earn either fame or wealth in 'this madly striving age.'

A plain account of the perils before them is requisite in order that they may be enabled to realise their true position. The earnest perusal of this chapter—and there is no exaggeration in the foregoing sketch—may

excite in some the attention it is so necessary to secure for this subject; and the comparison of what is written here with what they see around them, will I trust convince the reader of its intrinsic truthfulness.

Of course the reader must not expect to see it all at once; the eye can only see what it has learned to see, the Italian painters say, and with much truth; but every observation will demonstrate the matter more and more clearly. And it is of the greatest importance that familiarity with that process here termed physiological bankruptcy should not be confined to such of the profession as are more or less engaged in physiological research; but should obtain amongst the generally well-informed—whether professional or lay readers. It is not perhaps possible to make the matter as clear to the reader as the writer could wish; and a matter not much handled previously is not so easy to elucidate as one with which there already exists previous familiarity. Nevertheless it is confidently hoped that the parallel drawn betwixt matters physiological and matters financial will help to clear up the existing difficulties.

PROPOSITIONS.

1. Overwork is very destructive to the body, and when it is mental, not uncommonly overbalances the intellect.
2. Overworked persons are apt to die from comparatively trivial disease; because their resistive power or vital force is low.
3. Toil in the young and growing arrests the growth, and often leads to deformity.
4. Agricultural labour does not entail the same injurious consequences upon children as are induced by labour in the factory or the mine.

5. The difference of the supply of oxygen is the probable cause of this.
6. The Factory Act has done much good.
7. The effects of overwork are demonstrated on a large scale by the high mortality and degeneracy of enslaved nations.
8. Man has a reserve of force: like the balance of a prudent firm at its bankers'.[1]
9. If this is too far drawn upon, a sudden demand becomes a very serious matter. (See Prop. 6 and 8, Chap. VI.)
10. Unfortunately a man cannot estimate his physiological capital so exactly as he can his financial reserve.
11. Stimulants, though a great means, are not absolutely essential to attain physiological bankruptcy.
12. 'Living fast' means living beyond the physiological income, and induces early exhaustion of the force capital.
13. Loans of force may be repaid by economy—by quietude and sleep.

[1] See Appendix.

CHAPTER X.

MENTAL STRAIN—OVERWORK AND TENSION.

In discussing the relations of mental labour to the bodily health, it is desirable to divide the subject into two sections; the one embracing the consideration of the effects of such mental toil as is not undesirable in itself, but which has become excessive and too much for the natural powers; the other including rather the effects of tension—of suspense and anxiety. There is a wide difference betwixt these two psychical conditions, though they agree in the one matter of being alike destructive to health and to life.

The form of mental overwork with which we are most familiar—that is, popularly familiar—is that form of which so much used to be heard, viz. 'excessive study.' This was the outcome of the fact that most vigorous and ambitious minds had been trained for centuries, dating from the dark ages, to look to intellectual study, to mental toil, for the results they craved after. Consequently many youths, commonly more ambitious than naturally gifted, bent their powers to their work with all the energy of a determined will. They possessed a vague consciousness that in exercise of the intellect they would find the surest means of strengthening the natural powers, of increasing their grasp and cultivating their endurance. In that they were right;

clearly right! The athlete learns that while he can develop his powers by steady continuous training, he can also train downwards and not upwards; or towards less perfect efficiency instead of more thorough completeness. The terms ordinarily used to designate these two different and indeed antagonistic movements, are to 'train off,' and to 'train on.' As long as the voluntary toil is not excessive and within the capacity of the powers, the athlete improves or 'trains on.' When from excessive or too prolonged efforts he deteriorates and becomes less and less equal to the feats he aspires to; he 'trains off.' So it is with the mental powers. The ambitious student, pursuing a path leading in a right direction truly, yet capable of misleading, adopts a similar training. He knows that that which at first is difficult, indeed apparently impossible of achievement, becomes possible by steady persistent effort, by which in time he will acquire the power to perform the desired feat. Time and patience will endow him with the coveted capacity. Consequently he struggles on, either acquiring the desired power, or ultimately feeling that it is beyond his reach, and that the efforts he has made are telling upon him; that his powers are growing steadily feebler instead of enlarging; that in fact he is 'training off,' and his studies have to be abandoned.

He has learnt the painful lesson that what is possible to and within the reach of some is beyond him, in spite of all his efforts; that there are indeed limits to capacities. But while this is the lesson conveyed to one, another finds that his mind is becoming developed by sustained labour, its grasp is quicker and wider, and that its endurance and capacity to labour longer hours are becoming more pronounced. He begins to feel

greater confidence in his own powers, is more self-reliant, and indeed is more capable.

While this held good of the scholar at one time, it is more true now of men engaged in commerce. We have now learnt that when a young man breaks down in the ordinary scholastic training, there is some lack of capacity or physical infirmity which interferes with his attainment to certain goals, whose distance, and the amount of effort, of labour, or brain power required to reach them are pretty well known.

In the general competition of commerce—not the mere struggle for existence but the rivalry of the eager pursuit of wealth—we now see the most marked instances of the baneful effects of mental toil, pursued more intently and continued longer than the capacity of the individual is really equal to. Indeed it would seem that there is a widespread desire among business men to find their utmost limit of endurance, their stranding point, indeed. It is obvious enough that this only can be learned when the point of actual breakdown is reached; that in fact the limits can only be distinguished by exceeding them.

This is rendered all the more sure in consequence of the indomitable perseverance of the Anglo-Saxon character, and its deep-rooted aversion to being beaten. One of the most pitiable and illustrative instances of this elementary passion in our race was furnished by the little fellow at Rossall Hall School, who followed his comrades in a paper chase until his powers failed; but with determination unabated, he told them to go on, and he would follow. The days were short, and the early evening had closed in when the roll-call revealed his absence. A search at once was made in the darkness of early night, and at last the game little fellow

was found dead; perished with cold and exposure combined, but nevertheless within the boundary of the playground, and almost within reach of relief and aid. This case but points the national character; and, piteous as it is, is equalled every day in the emulation of commercial rivalry.

The determination to go on, to make up for lack of power by persistence in effort, to persevere until the wished-for success is achieved, is a ruling passion and an habitual practice of our times. That to it we owe much of our commercial and financial prosperity we know well; but the path is strewn with the prostrate figures of those who have striven and failed. The lists of the killed and wounded ever mark the severity of the battle; and the similar lists of the contending struggle for wealth tell of the severity of the fight and of the price of success.

The business man who sees his family growing around him, the wants of little folks growing into the needs of childhood, with the prospect of further demands as time goes on, bends himself more determinedly to his labours: he works harder and longer hours. Steadily and courageously he follows out his plan, and finds the stores of material wealth he seeks so diligently are increasing and accumulating. His boys can go to school and then be started in life; and his daughters can be portioned more suitably to his aspirations. Such are the visions which cheer him on to more strenuous efforts; such the allurement which leads him to ultimately overtax his powers. His motives are pure and unselfish; if the execution of his plans be somewhat lacking in the element of judgment, of correct estimate of his capacities.

Sooner or later he finds that his day's work has be-

come an effort—a toil rather than a delight; the last hour has become a strain only maintained by determination. A sense of exhaustion and fatigue envelopes his closure of the day's work; the last columns of figures have presented difficulties hitherto unknown, and the last pile of letters has seemed more trying than of yore. Anything new, of an unwonted character, making special demands upon the higher faculties, becomes arduous and distasteful; revealing the fact that the higher powers are first commencing to give way, to announce their inability; while the more routine matters which have almost become automatic or even habitual, can still be effectively discharged. But in time even these lower processes are affected; and the last half-hour at the office is a distinct trial, and is followed by a sense of exhaustion.

There is a certain amount of irritability combined with the sense of exhaustion—that irritability which is ever found along with the exhaustion of nerve matter. This irritation, sometimes almost amounting to excitement, marks the commencement of nervous exhaustion and failure. While work seems to become more irksome, the usual sources of pleasure no longer afford their wonted solace and satisfaction. There is a heightened susceptibility to any little trivial annoyance; domestic matters are felt more keenly; the dinner is not so satisfactory; the children are noisy. The more the necessity for rest, and the more distinct the craving for comfort and quiet, the less seems forthcoming. There is an emotional sensitiveness which reveals the irritability of the exhausted nerve centres. The newspaper is stupid and uninteresting; the piano wants tuning; servants are deteriorating; children are less obedient; and wives less sympathising than of yore.

The mind is as sensitive as is the skin after a blister: the slightest touch produces pain.

There is impairment of the intellectual powers other than mere lessened power of endurance. One of the most marked of these is the gradual loss of memory of names, of individuals, and of places. Such memory is easy to young minds who can remember abstract matters, standing alone and unconnected with anything to suggest them; though perhaps in the matter of dates there is general imperfection. The failure of this mnemonic mechanism, called memory, is often the first indication of the impending degeneracy. It shows by its impairment the decay which is inevitable and not too far distant. A name, though familiar, cannot be recalled: it is 'at the tongue's end,' but it eludes the search; and its escape produces a distinct irritability, the blended product of consciousness and apprehension of failing power, so detestable and repugnant. The occasional failure in the mnemonic mechanism becomes more frequent, and ultimately habitual. 'My memory for names is growing very bad' is the usual acknowledgment of the mind, partially and but dimly conscious of the significance involved in the fact.

There is often at the same time occasional brief but distinct intermissions of memory, solutions of continuity, little blank spaces or gaps, which an able city man in talking to me likened to 'a leaf amissing in a book.' The missing leaf turns up again and again, until the omission is ultimately appreciated, recognised, and its place registered. But other missing leaves occur and can be noted, until at last several pages are awanting together. Here we find the explanation of that curious oversight, that neglected factor, whose omission has totally altered the character of the matter entered upon,

has converted almost certain failure into a seemingly unquestionable success. It is the missing leaf which is the leak in the otherwise stately and well-found vessel —the one forgotten signal which ruins the train otherwise well conducted. It is these blanks, scattered irregularly through the volume of the memory, which invalidate the most cautiously laid schemes of the veteran speculator, and convert what was once a career of almost unchequered success into growing failure—into the bankruptcy and ruin which engulf many of our most flourishing merchants.

To this deterioration of the memory, this intermittent loss of power, must be added the general impairment of the mental faculties which characterises waning power, or insidiously advancing dotage. There no longer exists that vivid consciousness which would otherwise detect the blank space—the missing leaf—and either supply its place or allow for its loss. There is no longer that clear and distinct recognition of individuality which belongs to youth and to powers still in all their integrity. The individual seems rather a shadowy onlooker at the drama in which he is one of the principal actors: he seems rather as if taking an observer's interest in the matter than that of a principal whose interests are intimately bound up with the struggle which he is merely curiously scanning. There is a blunting, a blurring of the consciousness—the first stages of that obliterating process which will ultimately erase and blot out the existence of the individual, and leave the mind a confused mass—a chaotic compound of mental detritus—of the disintegration of ideas and impressions.

There is a general failure of the powers of endurance, of the higher mental processes, and of the

memory, together with a less distinct personality, which, combined, constitute the condition known as 'exhaustion of the brain power.' It is thus described by a leading American physician, Da Costa:

'Its manifestions are a slight deterioration of memory and an inability to read or write, save for a very short period, although the power of thought and of judgment is in no way perverted. Nor is the power of attention more than enfeebled: the sick man is fully capable of giving heed to any subject, but he soon tires of it, and is obliged from very fatigue to desist. He passes sleepless nights, is subject to ringing in the ears, cannot bear much exercise, is troubled with irregular action of the heart, and with a frequent desire to urinate; but he does not lose flesh, and his digestion is uninjured.'

The reader will notice that this extract concludes with an account of the commoner physical bodily troubles associated with this condition of impaired brain power. By design all allusion to these changes has been omitted hitherto from the consideration of the effects of mental overwork. They, however, must occupy our attention ere we proceed with the description of the further downward progress, when we shall find bodily and mental troubles inextricably intertwined and inseparably associated with each other. This we know, that an imperfect blood supply to the brain will limit the power of the cerebral cells on which the manifestation of thought depends. Imperfect digestion will lead to such physical change—indeed, the importance of an impaired nutrition to the grey matter of the brain, in its effect upon the nature of the thoughts and the emotions, is such that we shall discuss it at some length further on. As hilarity, mirth, joy-

ousness, and indifference to actual cares characterise the condition of intoxication, when the brain cells have been flooded with blood from the action of alcohol; so gloomy presentiments and dark misgivings are pathognomonic of a condition of comparative brain-bloodlessness. Under these circumstances of cerebral anæmia all things look grim and are tinged with sadness; and the emotional condition so instituted forms as it were dark-coloured spectacles, through which the intelligence must look; and which communicate their own shade of colour to every object.

Sleeplessness too is a very important matter; the exhausted brain shows its irritability, the firstborn offspring of debility, in an incapacity to sleep. Either sleep is not caught for hours, or, if caught, is broken, fitful, and disturbed. The dreams, which are but more vivid glimpses of the waking cares, are painful and depressing; and the sleep which is vouchsafed is unrefreshing and fraught with no energy-endowing properties. It is during sleep that the nutrition of the brain is conducted. Rest and repair are contemporaneous. Consequently the exhausted brain is neither sufficiently rested nor nourished. How then can it recover its lost tone and be restored to its pristine integrity.

Not only are the actions more commonly associated with the brain affected by this depraved condition, but other processes, less directly associated with the action of the brain, are involved. There is muscular lassitude and disinclination to, as well as incapacity for exertion. The heart feels the effects; and its irregular action testifies to its implication in the general condition. There is an abnormal sensitiveness to the natural calls, which is harassing and worrying. This is another instance of the association of a perverted and exalted sensibility

with waning power. By this time the individual has reached that point that the impairment of the general health can no longer be overlooked. The physician is consulted; and whatever may be the requirements of individual cases, cessation from toil, from all labour, is a *sine quâ non*. The efforts which are inducing such marked 'training off' must be abandoned forthwith, and an entirely new arrangement entered into. An arrangement which will not make heavy, indeed accumulating, demands on waning powers; but will permit of some recuperative and restorative action being instituted. The restitution of integrity must be aimed at; and if possible the downward process must be arrested, and an upward direction given to it. As in recovery from bodily exhaustion, the daily expenditure of force must be brought within the daily production of energy, and the amount so spared must go to the restoration of the exhausted force-fund. Much will depend on the native powers of the individual, the reactionary forces of the constitution, the mental diathesis of the individual; and much upon the duration of the malady. Where the condition has been reached by long-continued, reiterated, and persistent demands upon the powers, a longer period of mental convalescence is indispensable to recovery; where a sudden sharp strain has reduced the powers, a quicker return to the norm may be possible.

If this period of rest from all labour in some quiet health-resort be of sufficient length and be properly utilised, a perfect restoration to health may be accomplished. But more commonly the consciousness of returning energy is accompanied by a return of the old aspirations and aims, and an early resumption of labour is determined upon. The warnings of the physician

are disregarded; and hope whispers its flattering tale to ears once more willing to listen to its syren strains. Labour is resumed with much of the pristine energy, both of aim and endurance. The restorative process has once more permitted of all the old enterprise. All, did I say: yes, all! in those cases where thorough repair has been established: cases just frequent enough to point what may be done, but not numerous enough to cause a general conviction: and not numerous enough because the conditions which alone permit of such result are not supplied. More frequently—sadly more frequently—the resumption of labour reveals the partial recovery, the uncompleted convalescence. Shorter hours of labour; forms of labour not involving the higher processes, the first to go and the last to be repaired; longer periods of rest at shorter recurring intervals; all are required in order to permit of the labour machine continuing its toil.

There is lessened capacity for labour, a lessened energy, mental and bodily: lesser exciting causes of ill-health are sufficient to produce illness; a slighter mental strain will call out the indications of exhaustion.

The individual is a crippled being: a process of involution is contracting his powers and narrowing his capacity; his bodily forces are sympathising or suffering with his mental decay, and he is 'not the man he was.' No reader will feel any difficulty in supplying from his experience numerous instances illustrating the truthfulness of the foregoing sketch and in supplementing many little minor details omitted here, but more or less commonly found along with this general condition, whose features vary little. Very frequently this condition of mental degeneration, of failing intellectual powers, is found along with the physical conditions

described in the chapter immediately preceding this, and designated 'physiological bankruptcy.' Early, complete decay of the powers, mental and bodily, or fatal intercurrent disease, are the ordinary termination of such cases.

At other times we find a perverted and abnormal mental condition existing, and entailing effects upon the bodily powers. Here it is not an excess of mental labour—uninjurious in itself in moderation—which is inducing baneful results, but a state of tension, a combination of suspense and anxiety, which is wearing down the powers, mental and physical, of the individual. It is a condition only too common in the present age, the frequent outcome, indeed, of those methods of attaining riches which are designated 'speculation.' Large sums are invested in the purchase of some article whose value is fluctuating, it may be undergoing depreciation, or some state of matters may entail a scarcity of it, and a proportionate rise in its price. These fluctuations form a temptation to invest or speculate in this material product or stock. A sum perhaps equal to the whole fortune of the individual is so invested, and the fortunes of the family are staked on a turn of the market, or an alteration in the tide of affairs. Scores of individuals were so circumstanced during the American Civil War, when the 'Trent' misunderstanding threatened to involve us in war with the United States, or rather the Northern half of them. Such a condition affected the funds, so sensitive to every breath of air which ripples the surface of the political waters, and the fortunes of many depended upon peace or war. The suspense, the mental tension of such speculators, was intense. There is a price attached to success! Another person invests largely

in coffee, or any other staple product of common consumption whose price varies slightly from time to time. In order to make the venture of any value as a source of profit an immense sum must be staked, entailing a proportionate amount of mental tension. Perhaps there follows a still further fall ere the upward movement is inaugurated. The anxiety becomes pronounced. Certain loss will result from any immediate realisation, and so the investor must hold on, and with sphinx-like composure of countenance, that obliteration of all outward sign of inward conflict so characteristic of the Teuton race, he abides his time, and waits until all hope must be abandoned, or till the wheel of fortune has brought him the anticipated gains. I am informed that one city gentleman carries with him, stamped indelibly upon him, the impress of the circumstances by which he gained 300,000*l.* He won at last, certainly; but the tension has left its mark, which he will carry to his grave.

Or at other times a politician or statesman has to select a line of answer to a despatch which may involve his country in war, may cost thousands of lives and millions of treasure. His responsibility weighs heavily upon him, as it is but right it should do! He lives through a period of unrest and of terrible tension until relief is afforded by the issue of events.

In all these different cases, and a large variety might be adduced, the essential feature is the mental tension, the anxiety often blended with remorse and tinted with despair. Every time that the speculator's children make some request for a trifling outlay, mental rigors pass over him like the initial shiverings of fever; he feels how easily it may eventuate that even these little gratifications will become impossible; that those

little creatures he cherishes may become destitute and beggared by his actions; and no amount of confidence in his calculations or in the rectitude of his intentions will prevent the chill which then gathers round his heart. His wife alludes to some long-cherished plan, often talked over and agreed upon with many a pleasant thought of the delight to be derived therefrom, and spasms of agony pass through him as the prospect fades out into disaster and ruin. As he drives away to business, and a turn in the avenue gives him a perfect view of his elegant, happy home, now hanging in the balance and resting upon events over which he can exercise no control, his remorseful contrition becomes complete. Gloomy presentiments crowd upon the foreground of his consciousness, and if momentarily dispossessed, merely retire into the background or gather together on his mental horizon, ready to return and assume their prominence on the slightest opportunity. His thoughts are saturated with sadness, and even hope no longer confers its wonted buoyancy upon the mental images. His sleep is disturbed or wholly lost; the unrested brain is still less equal to bearing with composure the tax imposed upon it. His mind no longer preserves its wonted tone, it becomes depressed and melancholic. Every new flash of painful thought, of acute realisation of the moral aspect of his actions, adds to and aggravates the pre-existing condition. 'Everything which has existed with any completeness in consciousness is preserved, after its disappearance therefrom, in the mind or brain, and may reappear in consciousness at some future time. That which persists, or is retained, has been differently described as a residuum, or relic, or trace, or vestige, or again as a potential, or latent, or dormant idea, and

it is on the existence of such residua that memory depends.' The residua of previous gloomy thoughts and ideas are brought out from their static condition as every new flash of mental pain puts the mnemonic mechanism into action, and joins the ends of the strands of memory. The mental condition is one of great tension and misery, and the memory of it survives in these residua, long after the pressure of the immediate period of anxiety has glided away into the records of the past. The period is survived but its impress is not obliterated, and when in the future some new venture evokes the old ideas, these residua again become connected with the consciousness; they quit their static condition, and once more are acting forces. Every time the psychological experiment is essayed the condition is intensified from the accumulated residua.

What is the practical good of this piece of psychological dissection, the reader may naturally ask? What the advantage to be derived from this demonstration of mental pathology? If it is but to render more vivid what he may possibly already be acquainted with or even be familiar with, he can but read it as a patient would read a faithful account of his disease; neither comfort nor useful knowledge can come out of that! True: but very often diseases, mental as well as bodily, are the direct result of ignorance; and a knowledge of the inevitable consequences which will and must of necessity follow—as surely follow indeed, as will the snatching of a jewel out of flames be accompanied by scorching—if a certain course be pursued, may affect to some extent the decision arrived at. A calculation of the mental strain which must eventuate, guided by what has been said in the earlier section of this chapter as to failing mental powers affecting the accuracy of

the calculations, may decide a doubtful and hesitating mental condition; either in the individual himself or in those engaged with him. A much more practical outcome of the consideration of mental strain will be furnished by a review of how far such mental conditions are affected by inherited peculiarities or by acquired physical states. It is obvious that no human power can relieve speculation from its inherent and unavoidable consequential anxiety!

The inherited diathesis of an individual has much to do with the amount of moral sensitiveness which will accompany his actions: his capacity to feel, indeed, depends much upon the development of his sentient organs; we do not all feel psychical pain equally alike, any more than we all experience equal amounts of suffering from equivalent amounts of injury inflicted. The more sensitive the individual, the more his reception of sensations has been cultivated, the more susceptible he is. The naturally refined and cultured mind is structurally unsuited for the grinding wear and tear of commercial anxiety. Silken sails would be very unsuitable for a steady nor'easter and still more an Indian monsoon, where the stronger, tougher hemp is found infinitely preferable. A mind at once powerful and coarse of fibre has a great advantage, as regards sheer endurance, over another mind of finer fabric. Here the fineness of the fibre is a simple unmitigated disadvantage. The fine quality of the material may add much to the power of perception and appreciation of enjoyment in life; but it is nothing else than a drawback as regards its power of enduring tension. The self-made man is usually a man of strong and rude fibre: otherwise he would never have been what he is. Polish means loss of substance, put

it as we may! The mind which is best naturally fitted for the requirements of modern commerce must possess power, and not be remarkable for sensitiveness: *i.e.* for success, and its own comfort.

Ere a man goes into speculation, then, he should first ask himself how far he is naturally fitted for it: how far the material of his mind is suited for such a career; how far, in fact, he possesses in himself the elements of success. He that goeth to war with his neighbour must first count the cost, we are told on excellent authority.

The sensitive and cultured man should obviously shun such a career: he is no more suited for it than he is for the life of an American backwoodsman. He is, briefly, best out it!

The mind which is naturally fitted for the higher forms of study, or is æsthetic and susceptible to the finer emotions, is thus structurally unfitted for the career of a speculator. The mental configuration which is best adapted to such a life is one which is at once enduring and not too sensitive. Unnecessary stress may seem to be laid here upon the importance of the nature of the material which goes to form the web of the life: but such stress is indeed indicated. The mind which is so formed as to sustain, cheerfully and without excessive friction, the steady work of lifelong intellectual pursuits, or even of ordinary commerce, which can be fairly estimated and gauged beforehand; is almost thereby, by virtue of its very material, unsuited for the tremendous tension, the strain often sudden and severe, of protracted suspense, in extensive and complex speculation. The brain tissue which may be eminently suited to the one form of mental toil is unequal to the endurance required for the other. Not however that any temperament, any physique, corporeal or mental,

can endure with impunity the trials and tests just described. All suffer, more or less; it is only a question of comparison. The tax so imposed upon every mind by these financial experiments is severe and destructive. An eminent alienist physician [1] recently expressed the difference in effect upon the nervous centres of steady work and that involving anxiety, in such happy phrase that it must be quoted verbatim, it would only lose by transposition.

'Again,' he says, 'let me impress this truth upon you, that it is not pure brain work, but brain excitement or brain distress, that eventuates in brain degeneration and disease. Calm, vigorous, severe mental labour may be far pursued without risk or detriment; but, whenever an element of feverish anxiety, wearing responsibility, or vexing chagrin is introduced, then come danger and damage.' The two forms of mental toil are well contrasted here, and with this forcible and telling sentence to illustrate the effects of mental worry upon the brain, no matter what the original substance of that brain may be; we may now proceed to consider how far physical conditions may conduce to the development and aggravation of mental distress.

This is a most important matter indeed: it is the essentially practical part of the question, without which this chapter would possess but little real value—be of little actual service to the reader, if it so happen that the reader is personally interested in the subject matter. To commence with, it must be distinctly understood that our mental condition is most extensively influenced by corporeal states. Certain conditions of the nervous centres modify their workings and mould their products,

[1] Dr. Crichton Browne, of the Wakefield Asylum.

thought amongst the rest. When the nutrition of the brain, and especially those tiny microscopic cells upon whose activity thought, or at any rate the manifestations of thought, depends, is modified or interfered with by any physical condition, a distinct effect is produced, viz. a condition of mental pain, otherwise unhappiness and depression, is induced. The brain feels as pain intensified sensations from other parts, but it is insensitive to pain itself. The condition which produces neuralgia in the peripheral nerves is mental pain in the cells of the brain itself. When they are well fed and unexhausted they endow the individual with a sense of well-being, of comfort, and of energy; when ill-fed and exhausted, this condition expresses itself in a feeling of discomfort, of wretchedness, and apprehension. The thoughts are steeped in misery during such periods, and the affairs of life assume a different hue and complexion according as these physical conditions vary. When the brain is well supplied by a powerful circulation, and a rich blood supply from a good digestion furnishes it with an abundance of pabulum, the cares of life are borne with cheerfulness and sustained with equanimity. But when the physical condition becomes affected, a total and complete change may be, and commonly is induced. The change is as great as is that betwixt a bright sunny May morning with a cheering breeze, and the sultry, oppressive electrical condition which ushers in the violence of a black darkening thunderstorm. Things look very differently in the light of bright morning to what they appear during the dark gloom of the impending thundercloud. But after all, the *things* are the same, however much in appearance they may seem altered. Let us apply our simile to the subject matter in hand. A business man has, for instance,

made a handsome fortune by a business which holds out much future promise, when a new railroad and terminal station comes and occupies the ground on which his business premises stood. The change is followed by a change of residence, and interrupted business, and a falling off of profits, or even a distinct loss is sustained. But these unfortunate results of the change necessitated are met by perseverance, by redoubled attention, and assiduous personal supervision of the business. An improvement is soon inaugurated, and profitable returns are again flowing in, and the aspect of matters is much more promising than it has been for some time past. Yet what is the actual condition of the proprietor's mind? he is troubled, unhappy, apprehensive, and wretched. Never at any time was he so desponding; even when matters were at the worst he was never so utterly destitute of hope, so given over to despair as he is now, when matters have once more taken a favourable turn. The natural expectation would be that he should be elated, sanguine, and buoyant: the exact reverse is the fact. The anxiety, the worry, the sustained tension and physical over-exertion have produced a condition of exhaustion in his overtaxed cerebral centres. Hurried meals, leading to imperfect digestion; disturbed sleep, and imperfect rest and nutrition of the brain cells; impaired physical health and cerebral exhaustion, have produced their effects. The actual condition of affairs is unaltered; but the impression on the mind of the individual is widely different.

Other physical conditions exercise a potent influence over our feelings, and through them even upon our more purely intellectual processes, profoundly modifying our view of matters, themselves unchanged and unaffected.

'Without any change whatsoever having taken

place in his external relations, the presence of bile in his blood may drive anyone to regard his surroundings and his future in the gloomiest light imaginable; he may know that a few hours ago things looked very differently, and may believe that in a few hours more they will again have a different aspect, yet for the time being he is the victim of a humour which he cannot withstand. Philosophy is of no avail to him, for philosophy cannot remove that condition of nervous element which the impure blood has engendered, and which is the occasion of his gloomy feelings and painful conceptions.' Thus we see that a condition of matters themselves far from desperate, may assume a most hopeless character in consequence of some biliary disturbance induced in the individual.

At other times a disturbance of the balance betwixt the waste of the tissues and the power to eliminate such waste products is followed by distinct mental attitudes; in which things appear widely remote from their ordinary aspect. This condition is much more common than is ordinarily credited by the general public, or even by the bulk of the profession. The psychical disturbances so produced are distinct irritability and unreasonableness, which is aggravated by a consciousness that there is an element of unreason present; a tendency to be perturbed by slight exciting causes, the mental disturbance being out of all proportion to the excitant; a loss of mental grasp; a marked inclination to think in interminable circles, especially during the sleepless hours of the early morning; and finally a mental *pose* of depression and forebodingness, which sometimes amounts to absolute melancholia. 'All writers on gout are agreed that a suppressed gout may produce severe mental disorder, and that the sudden

disappearance of a gouty swelling is sometimes followed by an outbreak of insanity. Lord Chatham, who was so great a martyr to that disease, had an attack of distressing melancholy lasting for nearly two years, from which he only recovered after an attack of the usual gouty paroxysm.' In my own personal experience the psychical symptoms of gout have appeared to be more constantly and frequently present than any of the physical outcomes or manifestations of that condition. The convincing proof of the association existing betwixt morbid mental states and an excess of renal salts in the blood is furnished by the fact that the treatment suitable to gout restores the mind to its wonted condition.

At other times profound modifications of the mental processes are induced by abdominal and visceral disturbances. The famous Dutch physician, Schroeder van der Kolk, had hallucinations and temporary mental disturbances from a load in his colon. He likewise quotes cases of a similar nature. A clergyman was melancholic for two years, and suddenly recovered, his reason unimpaired, after a copious evacuation of hardened fæces; a lady suffered from severe melancholia whenever her womb became displaced, and recovery immediately followed its replacement. Mental torpor and depression are the not uncommon consequences of constipation of the bowels. This may proceed to suicide, which not unfrequently takes its origin in vague, shadowy, ill-defined apprehensions of approaching evil, the consequences of morbid corporeal conditions.

There is a good illustration of the relation existing betwixt psychical and physical conditions furnished by the story of an Englishman calling upon Voltaire at

Ferney. The Englishman's spleen and Voltaire's sense of ennui being in harmony at the time, it was decided that they should commit suicide together the following morning. Punctually the resolute and unwavering Englishman turned up with the means of self-destruction, but Voltaire was in another mood.

'*Pardonnez-moi, Monsieur, mais mon lavement a très bien opéré ce matin et cela a changé toutes idées-là,*' was the answer which came from a brain in quite another attitude from the one so recently preceding it.

It is no longer possible to evade the fact of our mental conditions being amenable to, and indeed being based upon, our physical conditions. *Mens sana in corpore sano*, is an old and well established proverb. The consideration of how far our thoughts are subject to, and under the control of our physical conditions, may give in the eyes of many readers a practical value to this paper, as furnishing to them information which may tend to make apparently intolerable states of mind intelligible and consequently bearable. A condition of intense wretchedness even is mitigated when we understand how such state has been arrived at, on what it causally depends.

Not only, however, is the varying physical condition a matter of much importance in those who will venture on the troubled waters of speculation and commercial ventures—but the habitual *pose* or attitude of the mind and of the emotions is of much importance. By means of the residua, which we have seen, early on in this chapter, remain after every idea, every emotion, that imprint which we call up or communicate with in the act of memory, a passing mental attitude may be intensified, prolonged, and aggravated. Thus to those who have endured much sorrow or misery, all things

seem mournful; everything is dyed with darkness and gloom. They no longer possess the power to dismiss these distempered phantoms by an effort of the will, and substitute for them the cheerful images which can be evoked by determination in normal conditions; the morbid thoughts have attained a supremacy over the will. Consequently the giving way to these sorrowful mental states, commonly called 'brooding over' misfortunes or troubles, is not only practically useless but is positively pernicious; such brooding only crystallises passing gloomy conditions into permanent enduring melancholy.

We do not all of us possess to an equal extent the power to put away mournful images and replace them by other and happier figures; neither is our power so to do at all times alike. At one time it is easy to remove the triste picture and to substitute a more cheerful one; at another time it is well-nigh impossible. Much, almost everything, depends upon the physical condition inherited or acquired. Nevertheless, for his own mental comfort every man should strive with all his might to maintain the supremacy of the will over his ideational and emotional conditions. He must resist with what power and energy he possesses the demon force which is striving to enslave him, if he wish to remain a free man. The more energetic and sustained the resistance, the greater the self-confidence inspired and the weaker the assaults become. It is a fight to the death whether the individual shall triumph over or succumb to the assaults of a mortal enemy. Even if victorious he must hold his ground against persistent and vigorous rebellions and insurrections. Whenever bodily disease shall have enervated the mental powers or palsied their energies, these subjected morbid ideas

will rise in active revolt, reinvigorated and inspired by the hope of success. One single feeble defence, or cowardly surrender of a position, is almost an everlasting loss; it can never be recovered but by an heroic determination, and too commonly remains a vantage ground from which the enemy can pursue its assaults more vigorously and effectively. A clear comprehension of this matter will give confidence and inspire hope into everyone who has fought the battles of these emotional civil wars. 'A painful idea will, as every one's experience must have taught him, return again and again into consciousness, notwithstanding every effort of the will to get rid of it, just as a movement may take place in spite of the will. The command which a man has over his thoughts is very different at different times, and one person may be able to dismiss a troublesome reflection when another cannot do so.' This last section of the quotation involves that difference in the mental configuration and material of which we spoke anon, and which we saw was so marked in different individuals.

But there is one physical condition which, steadily exerted, will influence any mind, no matter how buoyant or how courageous, and that is sleeplessness. Under its influence the most powerful minds can be reduced to a condition of emotional mobility; which it is often quite painful to witness. It deprives the brain of that rest and nutrition which sleep furnishes, and consequently lowers or reduces the higher mental processes. It is itself the consequence of brain distress, of an adynamic irritability which interferes with that actively quiescent condition of the brain cells which leads to sleep. It supplies what may be lacking in the already existing condition of perturbation, and renders the destructive action on the brain centres certain and un-

avoidable. Long hours of sleep, of rest and nutrition, might enable the suffering, ill-fed cerebral centres, worn out and harassed, exhausted by the evolution of painful, imperfect thought—for painful thought is but imperfect, unfinished thought—to recover their normal condition, to be renewed in something like their pristine integrity. So conscious is every one of the destructive action of sleeplessness, so vividly are the ill effects of the condition apparent to the individual himself, so distinct the distress resulting therefrom, that there is no abnormal condition for which artificial means of relief are sought so much, so quickly, and instinctively, as the condition of sleeplessness. Various are the measures resorted to, either under the supervision of a medical man or upon individual responsibility. The first are without question alcohol and opium. The first origin of man's acquaintance with these stimulant narcotics is shrouded in the dim vista of a long bygone past. We have been familiar with their effects for generations, indeed for many centuries. We have learnt much about their qualities; their drawbacks, as well as their advantages. Time has taught us what the dangers are that encompass their habitual use. We know something about different sides of the question in their case. Consequently, when a man resorts to opium and to alcohol as hypnotics he knows that there is danger attached to such use, that there is a risk incurred of the occasional use of these agents becoming perpetuated as a habit; that he must not play with fire, in fact.

And here I am deliberately departing from a rule which is elsewhere strictly adhered to, namely, to withhold any mention of the remedial measures to be employed or resorted to in various morbid conditions. As a rule it is desirable and proper; but it would be repre-

hensible to a degree, and even criminally culpable, having alluded to sleeplessness as a morbid condition, not to say something definite about the means resorted to by people at large for the relief of this condition. Knowing, as the generality of people do, that the habitual resort to alcohol and opium as hypnotics is fraught with baneful consequences; the general public hailed with satisfaction the announcement that new remedies had been discovered which procure sleep without ill effects.

No wonder that the enthusiasm of the medical profession was emulated by the laity, by the sleepless public, and the agents unhesitatingly received as precious boons. Precious, because they could be abused without ill effect! If this had been so, the earth might well have rejoiced at the discovery of unalloyed good, and that too in the questionable region of remedial agents. The search after the philosopher's stone never excited a more mistaken, ill-placed confidence. It is a pitiable spectacle, a painful uncovering of the weakness of our boasted rationalistic spirit, this unlimited confidence in the untried, the almost unknown. Chloral hydrate is the now fashionable hypnotic, the means by which balmy sleep, tired nature's sweet restorer, is wooed. But the brief flourish of trumpets which announced its discovery has given way to a well established and justly founded outcry against its abuse, and the evils which attach to its employment. More dangerous than opium, more baneful than alcohol, an utterly destructive agent, except in certain active sleepless conditions where it should be given by medical men alone, chloral hydrate is working much irremediable mischief in our midst. I am sorry to have to record the opinion I am just about to express, the more so that it is in the pages of a work intended to come before the lay public, but it

must be done even if it lead to some odium. It is but too common for some practitioners to advise a patient to do what they can discern he wishes to do. It is also a sad fact that any new line of treatment, any novel means of playing tricks with people under the misnomer of therapeutics, will meet with a ready adoption by those who either wish to be *au fait* with fashionable and new remedies; or are disinclined to give the necessary thought, individual thought, to each case and its special indications for treatment. Consequently the rash, ill-founded, and, as it is being rapidly found, ill-starred confidence in chloral, is now being generally deplored by the observant members of the profession. Shortly after bromide of potassium was ushered into notoriety, a plentiful crop of cases appeared in the medical journals telling of the consequences of its abuse, either when continued too long after being medicinally prescribed, or self-administered. The evil consequences of the habitual use, or rather abuse, of chloral hydrate are becoming much more vividly apparent. Its destructive action on the nerve centres, its production of a permanent condition of brain-bloodlessness, and consequent imperfect function of the brain cells, is being widely recognised; and it is now established beyond all question of doubt that the adoption of chloral hydrate as an hypnotic in lieu of opium is the adoption of a greater evil than the one it has replaced. That chloral, though it may be and is eminently useful as an hypnotic in certain cases, in habitual or occasional use is a destructive poison, carrying with it most baneful consequences, is generally admitted: and its widespread use as a soporific is fraught with mischievous results. The highest authorities, English and American, are now decrying its use, especially in cases

of sleeplessness associated with depression or 'low spirits,' with mental worry, and with brain-distress. Those, who unfortunately have been induced to make resort to chloral a practice, had need to watch themselves carefully, and note quickly any changes they may feel; and eschew the poison as speedily as may be on the first appearance of any morbid effects.

If it be no longer possible for an overworked or anxious business man to procure sleep otherwise than by using some medicinal agent, rather let him take opium and alcohol, whom we know; than agents of whose bad qualities we are still ignorant, or at any rate with which we are only commencing to be familiar.

A confidence which is founded on the want of acquaintance with the matter, conclusions reached through our ignorance and not through our knowledge, can scarcely recommend themselves to our sober judgment. If some soporific agent be indispensable let it be opium, which disturbs the stomach and locks up the bowels, and let it be combined with some palatable aperient—or better still, alcohol, taken in a full dose last thing at bedtime. So taken, alcohol is but trivially injurious. Again, if an hypnotic is absolutely necessary, alcohol, properly taken, secures the maximum of good with the minimum of evil.

There are, however, truly physiological means of securing sleep, which should ever be steadily tried ere forming the hypothesis that sleep is unattainable without hypnotics. These are a good long walk, which will tire the muscles, a light and easily digestible supper, chiefly of farinaceous material, with or without, but better with some malt liquor of fair body, and in good sound condition. Then bed may be essayed with a better chance of success than after the ordinary evening: if

sleep hangs off, some alcohol in a concentrated form may be taken just on getting into bed; and if the weather is cold the alcohol may be rendered more efficient by giving it in hot water. If the person be elderly the bed may even be warmed with advantage. It is not, I humbly conceive, a matter of indifference what form of hypnotic be taken. Sleep after simple depressant narcotics, as chloral and bromide of potassium, is commonly disturbed; the unpleasant phantasms which haunt the waking state still presenting themselves in broken dreams. The after effects, too, are to aggravate the unhappy, because anæmic state of the nerve centres. Narcotics which exercise a preliminary stimulant action are infinitely preferable. The heightened vascularity of the brain, their first effect, breaks the thread of gloomy thought and supplies a series of pleasant images in place of the triste figures which occupy the mental foreground; with these happier ideas predominant, the second stage, sleep, comes on, and the rest is unbroken, or comparatively so, and refreshing. Whatever may be the sins of alcohol, and they are both numerous and heavy; it must be acknowledged that it has often evolved the first flash of hopefulness which has kindled into life a renewed vigour and a renovated ardour, and roused once more into active consciousness and new energy the hopes and aims, which had been temporarily overthrown and trailed in the dust. But if the reader assumes the responsibility of prescribing it for himself, he does it at his own peril. If he may have found a way indicated here, he cannot say, with Chapter VI. before his eyes, that the pitfalls and dangers which beset that path have not been clearly placed before him—or that in being guided he is being misled.

As said before, nothing can remove the mental

tension inseparably associated with some pursuits, but something may be done to see that the evil effects of such tension be as little disastrous as possible. And for this end each person so engaged must pay particular attention to his physical health; must try to distinguish betwixt unavoidable anxiety, and that cleverly simulating spurious form which is the result of the effects of certain physical ailments upon his nervous centres; when in doubt, he must call to his aid skilled professional assistance; and also, if he be a wise man, he will estimate carefully before he enter into any scheme how far he is naturally fitted to bear the burden he proposes to lay upon himself.

With an apology to the reader for the length to which this chapter has unavoidably attained—unavoidably, that is, with anything like an intelligibly useful sketch of the important subject matter, the discussion of one of the most interesting topics of the future must cease. The full importance of physiological bankruptcy, of physical exhaustion, and of mental overwork and tension, or cerebral exhaustion, will be better comprehended when a few more years shall have taught us all more clearly the lessons which it has been attempted here to inculcate, and familiarised the public mind with the effects, corporeal and other, of the mental strain which is the direct outcome of the rate at which we now live; a pace contrasting markedly with the steady jog-trot of bygone times.

PROPOSITIONS.

1. Mental strain may arise from overwork; or from conditions of sustained tension.
2. The mental powers may be improved by persevering labour; but if this be excessive, deterioration results.
3. This is very distinctly shown in the present race after riches.
4. The irksomeness of the last half-hour of the daily toil often reveals the incipient failure of the powers.
5. Irritability, a morbid sensitiveness, is commonly a part of the initiatory process.
6. Inability to remember names, either of men or places, is one of the early indications of failing mental power.
7. There are mental blanks, like missing leaves in a volume, occasioned by decay of the powers; and these increase as the case proceeds.
8. The consciousness of individuality is frequently impaired.
9. Certain physical ailments are common results of mental strain.
10. Rest permits of repair, and of more or less perfect recovery.
11. Sustained mental tension is fraught with serious results in most cases.
12. Much depends upon physical conditions, of which the form of inherited constitution is one of the most important.
13. Abundance of brain power, without too much sensitiveness, forms the best combination for enduring strain.
14. Brain worry is infinitely more destructive than simple brain labour.
15. Corporeal conditions influence very materially the mental products of the brain.
16. Mental pain, or misery, is the outcry of ill-fed cerebral centres; a sense of joyousness combined with energy marks their well-being.
17. Liver disturbance often leads to melancholy and mental gloom.

18. Suppressed gout commonly produces a painful mental condition.
19. Visceral and intestinal ailments frequently affect the mind.
20. The habit of brooding over troubles is useless and pernicious.
21. Morbid thoughts often battle with the will for supremacy.
22. Loss of sleep breaks down the mental powers.
23. Chloral hydrate is a much more objectionable narcotic than either opium or alcohol.
24. There are physiological means of producing sleep.
25. These means, combined with a dose of alcohol, give the maximum of good with the minimum of ill effect in conditions of sleeplessness.

CHAPTER XI.

HYGIENE.

This is a matter the importance of which is now only being comprehended, and a sufficient knowledge of it scarcely exists in the best informed authorities, to say nothing of the general public. Some more or less defined ideas exist, chiefly amidst those who are actually interested in the matter, or who have officially been brought in contact with the investigations of various places made by the Privy Council authorities. When the recent Health Act was being discussed, it was urged 'that the country was being given over to the sanitary fanatics,' a step which, if it can be thus denominated, is justified by the success attending modern knowledge and efforts; and the notorious association betwixt the desolating plagues of past times and the insanitary arrangements of our ancestors. Some enthusiasm surely is indispensable to the successful overcoming of the vis inertiæ of general ignorance and indifference.

For the more convenient handling of this most weighty subject this chapter will be divided into different sections.

Section I.—The House we Live in.

This will deal with the house in which we have to live, and the various points to be attended to in its construction, and in the selection of a site. To take

the latter first, it should be so situated that there is an outfall for the waste water and sewage; and it should also be exposed fairly to the sun. The necessity for the first is obvious; a word about the latter may not be out of place. The effects of cutting off the light are seen in the blanched condition of vegetables deprived of light, or even more still in the debilitated appearance of those parts of a plant which are removed from the light. What is more to the point is the effect of sunlight upon the human frame. This has been most illustratively seen in the effects upon the health of residents in different portions of the same barracks. The largest proportion of ill-health was always found in those sections which were furthest removed from light and sunshine. The companies were changed back and forwards, but the illness always stuck to the dark and shaded barracks. The effect of the glancing sunlight is well seen in the convalescent, who seems positively to absorb strength and spirit by being bathed in the invigorating light.

The next matter of importance in the selection of a site is with regard to the nature of the soil. This is important from several points of view. Firstly, it has been abundantly demonstrated that 'dampness of soil is an important cause of phthisis to the population living on the soil,' and the improvement produced by draining the subsoil in lessening the amount of consumption is marked. Where the soil is too damp this must be met as far as possible by careful drainage of the house and curtilage. On sand or gravel a house stands dry and warm, provided this subsoil drainage be efficient. On clay soils it is more difficult to avoid dampness. Another point to be attended to is that of the actual warmth of different soils. Some absorb

heat much more readily than others, and are drier and consequently warmer to the feet. Soils give off their heat much more rapidly than they absorb it, and so cool at night very markedly. Sand with some lime forms the soil which absorbs heat most perfectly, then sand alone, and lastly clay—the heavier the colder. Thus in cold countries clay soils induce catarrhs, rheumatism, phthisis, &c., and sandy soils are much to be preferred. In hot countries sands are too warm for health and comfort, unless covered with grass.

Of all the horrible insanitary arrangements devised for the direct induction of disease and ill-health the most diabolical are rubbish foundations. 'Rubbish shot here' is the herald of disease and death. It is a flagrant violation of all sanitation. The rubbish consists in every case, more or less, of decaying organic matter, animal and vegetable. This decomposes, and in doing so either evolves directly active poisons, or forms a capital nidus for their settling down. The houses are notoriously unhealthy, for when they are built upon rubbish the engendering of disease is converted from a probability into a certainty. Not only is it most unwise to actually bring poison-bearing rubbish to form foundations for houses, but every old drain, cesspool, and pit should be carefully cleared away. In the midst of stately piles of buildings certain houses have been known to be infested with typhoid fever as it were smitten with pestilence, where old unremoved cesspools remaining and poisoning the inmates have been discovered, and their removal has been followed by the cessation of the local plague. It is of vital importance that the foundation of the house be free from poisonous material.

Having seen that the site is not infected with the

material for a future host of doctors' and undertakers' bills, it is important to attend to the removal of the refuse and waste from the house, and to protect it from damp. Drains should not, if possible, traverse a house, and when this is unavoidable, glazed earthenware pipes, laid in concrete or cement, carefully sealed up at the joints, and then covered by cement, should be used; and protected at the walls by relieving arches, to secure them from the effect of settlement. Ventilation of them should be provided at their entrance and exit, and access pipes should admit of ready entrance to them. They should also be periodically flushed, so as to secure them against accumulations in their interior.

To protect the house against damp it is necessary that a damp-proof course be laid over the whole of the foundation. This should consist of hard-glazed earthenware tiles, or slate laid in cement. In addition to this a dry area around the main wall is highly desirable. This is furnished by having an outer wall around the main wall, leaving a space betwixt them. Having so secured the foundation; the outer walls may be protected against the damp produced by driving rain either by covering them with slate, or a waterproof composition. Much of the damp-absorbing power of walls depends upon the nature of the materials used in their erection, and soft porous materials are most objectionable. The same may be said of floors; which should always be of wood, if possible, and well ventilated underneath. In many places flags are used instead, but they are much colder, and absorb damp more easily. But the most abominable of all floors is that made of bricks. The housewife notices that after washing them they quickly dry, and perhaps rejoices in her heart thereat. If so it is an ill-placed contentment,

for the bricks absorb the water and remain cold and damp; causing much ill-health and disease.

The walls of the houses should be substantial, and stout enough to protect the dweller against external damp; in which respect houses now being built in towns and suburbs are lamentably defective. The roof should be well united, and the rain should be collected into sufficient and well-jointed spouting, and carefully carried off either into cisterns or drains. If the former they should be efficiently drained, so as to secure the removal of the surplus water. Defective spouts and the saturation of walls with rain-water are efficient factors in the production of disease; and a damp house is inimical to health.

The spouting should converge to one or more down-pipes which run from the roof into the drains. These down-pipes serve also another useful purpose. They serve to ventilate the drains and carry the sewer gas away from the house, and out into the air; so relieving the house from the danger of sewer-gas escaping from the water-closets &c., and poisoning the house. The want of proper ventilation of the sewers, and the escape of the sewer gas, was the cause of the attack of typhoid fever from which the Prince of Wales recently suffered.

Section II.—The Air Supply.

The next point to consider about the house is its air supply. This is a point of no secondary importance. A free supply of air is necessary to the wants of the system, and that air must possess several requisites; it must be pure and free from hurtful constituents, and be furnished in good quantity.

Air is a mechanical composition of nitrogen and

oxygen, the oxygen being about 21 per cent. by volume, and in addition to this 3 parts per thousand of carbonic acid gas. Water in the form of vapour, and traces of ammonia, may almost be regarded as normal constituents of the atmosphere. The oxygen is the essential element, the nitrogen being merely a diluent. Oxygen in an active condition is termed ozone. The consumption of this ozone by the respiration of animated creatures and the combustion of fires and flames, renders the air of towns much less invigorating than that of the open country or the ocean. Rebreathed air in close ill-ventilated rooms leads to a sense of lethargy and depression, not unfrequently combined with headache, as consequences of the imperfect removal of the carbonic acid &c., and the absence of active oxygen. 'The quantity of oxygen is sensibly diminished in the air of towns.' The amount of carbonic acid varies under different circumstances, but not very markedly in the open air, where it never reaches 1 per cent.

Air to be pure must contain a normal proportion of its constituents; it ceases to be so when some are present in excess or are deficient. It becomes impure by the addition of foreign matters, either solid and merely suspended in the air, or gaseous and diffused through it. The suspended matters borne by the air by which we are chiefly disturbed are the products of imperfect combustion, or smuts. They are the nuisance of every large town, especially in dark, dull weather. They blow in through the finest crevices, and settle everywhere. In certain states of the weather, the products of imperfect combustion form fogs, which are smoke clouds. The presence of these smuts in a condition of the finest subdivision is then readily demonstrated by the expectoration; the expectorated mucus is dark and

inky from the particles arrested and detained by the mucous linings of the air tubes, and drawn in by the respiration. Through the fog the noonday sun appears as through a piece of smoked glass; it is really seen through a smoke-laden atmosphere. But in addition there are vegetable seeds, spores, and germs; low forms of animal life, as bacteria and vibriones; products of animal life, as pus-cells and epithelia, especially in the air of hospital wards; particles of fabrics, cotton and wool; and at times mineral matter, as sand, forming in certain regions sand clouds, the deadly simoom which the Arabs dread. Contagious particles, though too minute to be recognisable by the most powerful microscope, or detected by the subtlest analysis, are borne in the air, and their presence demonstrated by their effects. The odour of plants is due to minute particles of solid matter which are wafted off the plant, and bear the characteristics of each. The rose has its odour, and so have the violet and the woodbine, they are distinct and recognisable; but they have never been seen by the microscope, any more than has scarlatinal poison; no chemistry can determine their composition, which is as unknown as that of the poison of typhoid fever.

Malarial or marsh poison cannot with certainty be referred to the class of suspended agents, possibly it belongs to the gaseous division. Organic matter has been found in the dew of malarial districts. But there exists no doubt as to the existence of malarial poison, and much is known about it, though its presence has never been demonstrated by any other means than its results. Probably fever-poisons are not gaseous but solid. We will refer to them again in their own section.

The gaseous impurities of air arise variously from

the body itself, from the earth, and from manufactories. The carbonic acid which is given off by respiration is a common cause of air-contamination. Its excess in the body is always accompanied by a deficiency of oxygen, and the effects of each are with difficulty separated. In 'the black-hole of Calcutta' and the well-known case of the 'Londonderry,' these two were combined, and the mortality in each case was fearful; in the first 123 died out of a total of 146, in the latter out of a total of 150 no less than 70 perished. The amount of oxygen may be reduced from 23 per cent. to 20, in close ill-ventilated places; and such diminution is not only deleterious and dangerous if carried too far, but if only existing to a lesser degree, it is baneful and injurious to the health; causing great loss of vital force and leaving the person predisposed to disease.

Emanations from the earth of an injurious character generally take their origin in decaying organic matter, and form zymotic poisons, to be considered hereafter; but sometimes gases are exhaled, as the choke damp of mines, sulphuretted hydrogen, and carbonic acid, as seen in the Poison Valley of Java (Guevo Upas), and the Grotto del Cane of Naples. Earth itself is a good disinfectant, and organic matter efficiently buried rarely causes any troublesome consequences.

Air is extensively contaminated by manufactories and chemical works, and in more limited areas by fumes in certain trades, as we have seen before.

The question of fever-poisons will be discussed at length anon.

Section III.—Ventilation.

In this division will be considered the question of the amount of air required; and then the subject of ventilation; closing with the means of ventilation so intimately associated with the warming of buildings.

The amount of air which each person requires is that amount which shall not allow of an accumulation of carbonic acid beyond a certain point. This gas exists normally in the air, but below 4 parts per thousand; an atmosphere containing 1 per cent. is odious and instinctively avoided. In an atmosphere where 1,200 cubic feet of fresh air was furnished to each person per hour, the proportion of carbonic acid rose to ·855 per 1,000 volumes; with a supply of 1,700 feet of air each man per hour it reached ·759 per 1,000 volumes; where only 765 cubic feet per hour each was furnished, the carbonic acid attained to 1·2 per cent.; this last was obviously very unwholesome. Probably 1,200 cubic feet of air per hour is the least which is compatible with health. But this calculation excludes carefully any lights or fires, which consume the oxygen of a room very rapidly, and load it with carbonic acid; the effects of which will be considered shortly. The sick require more air than the healthy, and in hospitals even 3,500 cubic feet per hour per head has not been proved sufficient to prevent the peculiar offensive odour.

Now it is obvious that the mere cubic space afforded to each person will not in itself meet the question. The rate at which the air is renewed is a most important factor. If there is 200 cubic feet of space for each person, it is obvious that the air must be renewed 10 times per hour in order to afford each person 2,000

cubic feet of air in that time. If the space for each person is 400 feet, the air need only be renewed 5 times per hour. The rate with which air passes into and through a room involves the question of draughts. In order to keep a small room efficiently ventilated, the movement of air must be so rapid as to cause a draught, and draughts are common exciting causes of illness. Large rooms are better than small ones, because the air has not to be so frequently renewed, and draughts are thus avoided; the number of persons being alike in each case. When the rate of change of air in a room exceeds 3 or 4 times per hour it becomes disagreeable, and warmed air is requisite.

Natural ventilation.—This is achieved by the readiness with which gases diffuse themselves through the atmosphere by winds, and the circulation of air currents. Currents are largely produced by changes of temperature: as seen in the sea breeze of the morning and the land breeze at night, the air coming off the heated land in the evening, and returning again when the land has been cooled by night. Artificial currents exist betwixt the heated room and the cold air outside; the hot air escaping out, and the cold air coming in. The rushing of the heated air up the chimney causes a draught to the fire, and consequently ventilation of the room. It is obvious that there must be a draught where the external air enters a room and crosses it to the fireplace, and persons in that air-current are very apt to catch cold. Currents are also produced by having points of entrance and exit, as open windows, especially when these face each other. This is called 'cross-ventilation,' and is largely employed where practicable, as in large wards and single houses. When the configuration of the room will not permit of

this, the air-currents pass from the windows to the door or fireplace, or from the door to the fireplace directly. The efficient ventilation of a room is so commonly productive of cold draughts, that various contrivances have been devised to obviate these unpleasant consequences. Ventilators have been put in the roof or ceiling, from the known tendency of heated air to escape upwards, and form the usual and common means of securing a change of the air in apartments. These ventilators often form shafts passing through the upper storeys and emerging at the roof. These ventilators are good when they are efficient; but it is not always easy to know when the ventilation through them is active.

The plan of having a strip of paper, or rag, so hung as to be visible, and by its fluttering telling of an air-current, and by its motionless condition informing us when the air-current is arrested, is one which might be more generally adopted. The incoming current of air is and should be always directed upward towards the ceiling, so that the cold draught may not strike the inmates. There are many plans in vogue for the production of this end. One is to have either a glass louvre inserted instead of the top centre pane, or to have the pane cut into strips, which may be separated or approximated by a cord. Another plan is to have the panes doubled, the incoming air being warmed in the space betwixt the panes, the course of the current being also thereby broken. A third plan is to have a wire screen at the top of the window, which takes the place of the window when it is drawn down. But no plan will ever be so effective with single windows as are those where the windows are double. This is a luxury to which English people are averse, and yet the

double windows deaden sound, as well as permit of an ample space where the air can be warmed and its current broken betwixt the windows. A pane can be divided into slips in the outer window at the bottom, and a louvre put in instead of a pane at the top of the inner window, and then the rate of entrance can be thoroughly regulated, and a perfect ventilation be established without draughts of cold air. The effect of double windows is well seen in foreign hospitals, and for the sake of this improved ventilation and the deadening of sound they should be introduced into banks, business houses, and hospitals—the last especially—as well as into private houses; and their introduction would be conducive to health and comfort.

An excellent plan of ventilation is to have the interspace betwixt the ceiling of one floor and the flooring of the story above, itself well ventilated; and to allow the air carried out of a room by a ventilator in the ceiling to pass into this interspace, and from thence out into the open air. At other times the ventilator can be carried through a shaft to the roof, and then the shaft can be surmounted by a cowl. The cowl at the top of air-flues and chimneys is a plan for utilising the aspirating power of the wind. A proper cowl rotates and turns its back to the wind and the rain, and, in order that it may do so, it should be well balanced and rotate easily.

Artificial ventilation and warming.—It is almost impossible to consider the two subjects separately, as fire is used for both purposes—indeed, cannot very easily be used for one without involving the other. The combustion of the fire draws a current of air towards it in addition to the action of the shaft or chimney, and by their combined action a good change of air is main-

tained. The open fire of England indeed is much more efficient as a ventilating than as a warming agent, and is almost the reverse of the stove of the Continent, with its heat-giving surface of glazed tile. The chimney acts as a ventilating shaft, even when the fire is not burning, though the ventilation is not unobjectionable when the air-current comes down the chimney.

In an ordinary fireplace the waste of heat is enormous, and the statement that the actual waste of coals is greatest in private houses is well founded. No less than seven-eighths of the heat passes up the chimney; and even with reflecting backs &c., the waste is excessive. At the same time such a fireplace and chimney will ventilate a room capable of holding from three to six persons, as the quantity of air passing up it is equal to from 6,000 to 20,000 cubic feet per hour. If the room is small and the fire brisk, the passage of the air through the room is keenly felt; and you are roasted on the side turned to the fire while the other is chilled by the cold air which rushes in behind. Large rooms, with an equal amount of fire, are much more comfortable than small ones; provided that the large rooms are not unnecessarily airy and draughty. With the ordinary fireplace then the room is rather ventilated than warmed; and when the room is too well closed against the entrance of the cold air by chinks in the doorways and windows, the chimney has down draughts, and the cold air rushes down as well as the heated air mounts. The diffusion will take place somehow. As a rule the cold air rushes in under the door; and every one knows rooms where you are comfortably warm everywhere except the feet. They are stone-cold from the cold draught betwixt the space beneath the door and the fire.

Many have been the inventions to render fires more

useful as warming agents. That of Captain Douglas Galton is the best, and contains an air chamber at the back, through which the air enters the room, and is at the same time so heated as to no longer cause a cold draught. Another is a cottage grate of fire clay, also with an air chamber: Mr. Penfold's plan. Less complicated plans of causing the back of the grate to lean forward and so throw back the heat into the room, have been more or less adopted. The desirable fireplace, of simple construction yet effective, has still to be discovered. Several forms of stove have been invented to economise fuel, or to utilise the heat produced. Two favourite forms have the air introduced beneath the stove and then given off, warm flanges of metal heating the air as it passes off. A dish of water gives to the heated air the requisite and desirable moisture. One of these is the Goldsworthy-Gurney stove, and the other is Musgrave's slow combustion stove, where the combustion is very slow.

A gas stove has been invented called the Calorigen stove. This also warms the air ere giving it off into the room, moisture being furnished by a water dish. It is also economical. But all stoves are objectionable, while heating the air they give it an unwholesome dryness.

Another method of utilising flame as a ventilator is to have the gas-lights so arranged in the ceiling as to form the 'sunburner,' and by adding a shaft to this burner the already respired and vitiated air is drawn towards the shaft and passes away out. This forms an efficient ventilator.

But gas is an objectionable heating agent; and the arrangements must be very perfect to admit of its being used without actual detriment. The products of gas consumption are very disagreeable as well as deleterious,

as every one knows who has been where gas is largely burnt either as gaslight, or in the 'clinker made-up grates,' which when red hot somewhat resemble an ordinary fire. The air is heavy, unpleasant, and laden with the products of combustion; unless the ventilation be very perfect. Indeed for steady continuous work, literary or other, and for study, the Queen's reading-lamp is far preferable to gas; both from its steadier light and its comparative freedom from this causation of combustion-products.

Another plan of producing warmth and ventilation is that of combined hot water pipes and air shafts. The plan of warming a room with hot water pipes has long been in vogue, and in many instances it is an excellent and efficient plan; and it has also been proposed to have around the water pipes air shafts, so that the air might be heated by the contact with the hot water pipe. This air shaft along the hot water pipe would surround the room, and by many minute perforations admit of the warmed air entering the chamber. Then, by means of propulsion, the air could be forced into the room at a fixed rate; and by a modification of the machinery its rate of entrance could be checked when desirable. Propulsion of air into rooms dates back to 1734, and the idea of warming it ere its introduction into the room has existed since 1713.

Extraction of air by a fan is used in collieries to maintain a practically sufficient ventilation. A fan worked by steam will extract no less than 45,000 cubic feet of air per minute, and so cause an equal quantity of fresh air to rush in to take its place; so that no less than 225 men could be supplied with fresh air at the rate of 2,000 cubic feet per hour, by one of these fans. This extraction of air is used for buildings in other

countries, and is said to be more efficient and less costly than the plan of propulsion. In St. George's Hall, Liverpool, the plan of propulsion is followed out, and the air is washed by a jet of water, and then passed into the rooms being warmed in winter, and cooled in summer! When the difference betwixt the dry and moist thermometer bulb is more than 5°, the air is moistened by a steam jet. Whenever hot pipes are used to warm rooms it must not be forgotten that there is no longer the air current established and maintained by an open flame; and special means must be taken to maintain the ventilation. The tendency to exclude fresh air from rooms is only too deep-rooted, and the more effectually most of the chinks in a room are closed the more active will be the draught from the unclosed chinks. If all the chinks are closed the atmosphere of the room will become very vitiated; and all the consequences of bad ventilation will be artificially secured.

Section IV.—The Water Supply.

We will now proceed to examine the question of water supply: a question not less important than those hitherto discussed. Water, which consists of a chemical combination of hydrogen and oxygen, is essential to the life of every living thing, animal and vegetable. The circulation of water, bearing certain matters with it, is as important to the life and growth of vegetables as it is to animals; and both alike die if deprived of it. Its supply to crowded populations in towns has been ever most important; and magnificent systems of water supply characterised many extinct civilisations, as well as forming one of the most important subjects which engage our attention at the present. The aqueducts

of ancient Rome and Peru put in the shade the punier efforts of more recent times. The dark ages were dark indeed, and the darkness was most marked in matters sanitary; and we are but slowly re-recognising the importance of our water supply.

The amount of water required by each individual per diem varies from seventy to a hundred ounces: one third of which is contained in our articles of food. From half a gallon to a gallon daily is further required for cooking purposes.

A varying quantity is consumed by different individuals for the purposes of ablution; more especially among those who have their cold tub every morning. Another quantity is consumed for the water-closet. The calculation made for towns is usually that of thirty gallons per head; ten for personal and domestic purposes; ten for municipal purposes; and ten for trade and manufacturing purposes. If the water supply exceed this it is almost profuse; if it fall much below it, it is insufficient.

The supply of water for towns depends much upon the natural surroundings; at Gibraltar the water is so bad that rain-water is collected. London derives its water supply from rivers; and Glasgow from Loch Katrine. There is much difference in the water derived from various sources; and it requires different treatment accordingly to make it wholesome. Rain-water requires to be stored in cisterns, covered in and protected from heat and cold. Being fairly pure and soft, it should not be stored in leaden cisterns. The waste water pipe of cisterns should never pass from the cistern to the drain, or sewer, unbroken; as, if the communication is unsevered, at some point or other sewer gas is apt to find its way into the cistern. Rain-water

is preferable for ablution, but it is not palatable as a beverage.

River water is more or less pure, according to the soil and watershed from which it is derived. If from peat it is dark and unpalatable; if from mountains it is usually clear and fairly pure. It becomes muddy after heavy rains, especially in arable districts; and more in spring and autumn, when the surface is disturbed by the plough. The water which falls as rain and percolates through the earth, becomes highly charged with carbonic acid, which makes it fresh and sparkling. Where it runs over lime or chalk it becomes extremely hard by taking up carbonate of lime. This hardness is removed by boiling, the lime salts encrusting the kettle or pan; and in persons liable to vesical calculus and gravel, such boiling is very desirable. Exposure to air also relieves hardness, and the horse has doubtless good reasons of his own for preferring the water of the fawn-coloured horsepond to the sparkling crystal water of the spring, or brook.

Lake water is usually very pure from the position of lakes; and from the exposure to the air the water is soft. When the washings of certain districts pass into it, it may be highly charged with organic matter, especially when it comes from mossy moorland or peat bogs.

In mountainous districts of the older geological formations the water is commonly very pure.

From wherever water is collected, it is usually conducted into large waterworks, and there exposed to the air in settling ponds, where any impurities of a solid character may fall; after which it is filtered through filtering beds, and then distributed through pipes to the different divisions of towns. According to the

original water, and the care with which it is manipulated, is the purity of the product. The softer and purer it is, the more deleteriously does water act upon lead, either in pipes or cisterns.

Water varies in purity according to its source and the geological formations from which it is derived.

From granitic and metamorphic rocks it is good and pure. From soft sandstone it varies much; and may be very impure. From sand it varies much, as also does water from gravel. From chalk it is good but hard, and improves by boiling. From clay it is usually surface water and impure. From surface and subsoil it is often objectionable. From marshes it is highly charged with organic matter. Accordingly as these different waters meet, will be the river water which forms the sum total.

Water is also derived from springs and wells; and varies according to the position of the springs and wells, and the geological formations with which they are connected.

Artesian wells are wells sunk to a great depth; that of Grenelle in Paris is 1,800 feet deep, and that of Kissingen in Bavaria is 1,878 feet in depth. The water from these wells varies much in quality, and in some districts the quantity is affected by drought. As a source of water supply for large towns they are now abandoned, being found insufficient; but they are well suited to the needs of brewers, and the ales of Burton owe much of their superiority to the water found there.

Water is also procured by distillation, and by this means the purest water is produced. It is not palatable though bright to the eye, but is water requisite for chemical and medical purposes. On a large scale fresh

water is now distilled from sea water for the use of ships and troops, especially where the coast water is very bad. The water from the condensing apparatus of engines is very pure and soft; capital for ablution, but not a pleasant beverage.

There are various methods adopted for the purification of water. The chief are distillation, boiling, subsidence, and filtration.

Distillation means the conversion of water into steam, and then its recondensation by cooling, the impurities being left behind. It is efficient; and as we have just seen, useful for some purposes.

Boiling is requisite to destroy minute organisms and germs; and it destroys those dangerous and active poisons on which many of our fevers depend. It also precipitates lime, for which purpose it is much used.

Subsidence permits of the settling down of impurities, and is often useful. By the exposure to air water is much softened, and the settling-bed serves two ends.

Filtration is far the most important matter from a sanitary point of view, and is the favourite method of purifying water for use. Water may be both boiled and filtered, after which it is very pure, and free from all contamination and source of danger. Filtration is carried on on a large scale by our water companies, and their filter beds are elaborately prepared. The rate of descent should not be more than six inches per hour, nor the filtration exceed 700 gallons per square yard each twenty-four hours. But this rate is often exceeded. There are always spare filter beds to admit of the beds being cleaned and renewed.

Filtration on a small scale is now the rule in most well managed establishments, and private manipulation is not superfluous with the best water supplied by any

company. It is very useful also in the country, where the water is not of first-class quality; and that means very generally. There are all kinds of filters, of varying size, from the large family filter to the elegant article for the sideboard called the patent moulded carbon filter. It is almost invidious to mention any maker's name, as there are many excellent filters made by different firms, amidst which it is impossible to express a preference. The material chiefly used for filtration purposes is charcoal, pure or combined, magnetic carbide of iron, sponges, &c. These filters remove nearly all the suspended matters, a large proportion of dissolved organic impurities, and a certain amount of salts. By repeated filtration a very pure water can be obtained.

Filters, however, like most things, will not go on for ever, and attention to a filter from time to time is requisite. 'All filters after a time become clogged up, and have therefore to be taken to pieces and thoroughly cleansed; or, if this cannot easily be done, they may be purified by passing through them a solution of potassium permanganate or Condy's fluid, with the addition of a few drops of strong sulphuric acid, and afterwards two or three gallons of pure or distilled water, acidulated with hydrochloric acid. The charcoal in a filter may also be purified by exposing it for some time to the sun and air, or by heating it in an oven or furnace.'

In Eastern countries alum salts have been much used for the purpose of purifying water, and Condy's fluid is often so used; but these methods are not to be thoroughly relied upon.

Brackish waters are improved by the addition of

some form of alcohol; and tea added to water that is being boiled adds much to the purity so induced.

In addition to waters variously derived, and more or less impure, may be mentioned waters which contain salts and are charged with carbonic acid. Many of these are natural, while others are artificial. The chief of such waters are those charged with sulphur, with salts of soda, potash, and magnesium, with carbonic acid, which makes them sparkle, and with iron—the chalybeate waters. All these waters are of use medicinally in different and various complaints; but they are scarcely beverages, though many of them are pleasant to the taste as well as to the eye. Waters from the magnesian limestone are excessively hard, and produce the enlargement of the thyroid gland called goître or Derbyshire neck.

Ere leaving the subject of water, one word may be said as to the pollution of rivers. This is a most serious affair, bearing heavily on the matter of public health, especially in the manufacturing districts; where town follows town along the banks of a river, and where the sewerage of one town almost of necessity pollutes the water supply of the next. The condition of the Aire and Calder is such as to call for serious consideration upon the part of those who are located upon their banks; and the condition of the Spree, the river of Berlin, is even worse. Where there are large level plains the question of river pollution is a most serious one; as there exists no means of preserving the water supply from communication with the water of the various rivers which act as large sewers for the towns situated higher up. In Holland all the water is bad; indeed there is little good water all along the great plain which extends from the Maas to the Oural moun-

tains; nor is it easy to see how the inhabitants are to procure a decent water supply except by costly systems of public waterworks, and the use of filters in private houses; indeed these latter ought to be universal. In England, with our mountains forming the well-heads of our rivers, we are in an enviable position; and even if several hundred miles do separate our largest towns from our mountain lakes, this ought not to prove an insuperable difficulty to our modern engineers, with all the modern appliances they now possess: when we think what was done of old by such very much more limited means.

Closely connected with the subject of pollution lies that of a sufficiency of water, for no contamination can be more serious than a failure in the amount of a water supply. To secure us against such danger our well-heads should once more be converted into tracts of forest, which conduce so much to the induction of rain. First the Norman reduced our forests to root out the Saxon outlaw of our glades; then came the demands of agriculture; then again the Puritan dislike to woods; and lastly came sheep-farming, inimical to mountain forests; so that our river well-heads and our mountains are denuded of trees. This destruction of tree life has a most powerful effect upon the rainfall; and parts of Southern France have been so cleared of wood that they are almost sterile and desertlike from defective rain supply. A similar change is going on in what were once the almost trackless depths of the Black Forest. Drainage has also affected our rivers: and they now fail in dry seasons much beyond what they did when meres and stretches of water were untouched by drainage and high agriculture; and the draining away of the accumulated water of floods and heavy rainfalls was slower and more gradual.

Section V.—Sewage.

One of the gravest matters in connection with sanitary science is the removal of waste and of excreta. In addition to all our refuse, man passes daily 4 oz. of solid excreta and 50 oz. of fluids. Women and children pass somewhat less. From the offensive character of these excreta, especially when decomposing, and also the serious affections to which such decomposition may give rise; the question of the removal of excreta has always been a grave one to every community. These excreta are at the same time most valuable as manure: and if they could be returned to the country in a practicable form, countries would be nearly self-supporting, and would certainly be relieved from the necessity to resort to foreign countries for the material with which to cultivate the fields. The day will come when what goes to towns as food will return to the country as manure; this is *the question* of the day, which puts politics and the origin of man into the shade. Man must solve this problem for his own interests; as we are fast removing the accumulations of the guano islands, while the most valuable material is washing away to the bottom of the ocean; nor is there much probability that any future cataclysms will bring these buried lands to the surface to be the future feeding grounds of man. The question is a double one; it involves the question of the removal of our waste, such removal being essential to the maintenance of health; and also the question of the maintenance of existence in the future, along with the management of our fields in the present.

Various means have been adopted for the removal of

our waste; and it must be borne in mind that waste includes not only our excreta, but those of our domestic animals, the refuse of our food, and the disposal of the water requisite for domestic purposes. The complication of solid and fluid waste has rendered the whole subject much more difficult and intricate than it would be if these two could only be kept apart. 'The rainfall to the river and the sewage to the soil,' is what we want to achieve; if it is possible and practicable. In sparsely populated districts the water drains away through the soil, becoming in its course purified itself, while enriching the soil by leaving the solid matters behind. The accumulation of solid material forms the midden; and the instinctive conservatism of man has retained the primitive midden amidst dense populations and with advancing civilisation. But the means which were not unsuited to one period and set of conditions, are utterly unfitted for another. And this primitive plan will not meet the exigencies of the age. Solid excreta and other waste decompose gradually and more inoffensively when dry, than they do when water is largely present. The necessity for the combination of drains and sewers in towns has led to their more or less complete union. If separated, there would be required two sets of tubes, and the sewers would lose the flushings which result from their also being drains. Middens are not unsuited to the open country, provided that the fluids from them do not find their way into the wells and other sources of water supply; and can be periodically renewed. The same may be said of ash-pits and cesspools. But wherever they are employed as in the country, and in the lower quarters of towns, where water-removal is rendered impracticable by the habits of the people, they should be made watertight, and regularly emptied.

Plans have been adopted for their removal by air-tight conveyances filled by pneumatic pressure, so as to render the process of removal quite inoffensive. But this system, however modified, is unsuited to crowded neighbourhoods.

Another plan is that of adding dry earth to the fæces and then removing them to form manure. In France this manure is termed 'poudrette;' but it has not been found commercially profitable. It has been tried in England, but has also failed commercially. Though suited to large establishments in the country, it is a matter of question how far it can be introduced into towns commonly, as the amount of dried earth required is so large. One pound and a half of dried and sifted earth is requisite for the proper deodorisation of every stool, inclusive of urine. This plan, too, leaves all our slops and waste fluids still on our hands, and untouched. Nevertheless, the plan under certain circumstances is most excellent; and Moule's earth-closets are an unquestionable boon. The use of deodorants and disinfectants, along with these closets, makes the question of the removal of our excreta under many circumstances a very simple matter; and the use of these earth-closets will have an excellent effect upon the general health.

Another plan, 'Taylor's revolving disk,' is ingenious but not very desirable; and we cannot discuss it here.

Of all the plans for the removal of sewage, none equals that of removal by water; it is the easiest, quickest, and cheapest. It has become now generally adopted both at home and abroad, as the system *par excellence* for towns and cities. Its objections are its tendency to foul the streams below the point of exit, and the agricultural loss of the sewage. The different means of

preventing these two objections will be briefly discussed further on. At present it is desirable to pursue the question of the removal of sewage by water; and to see how to get the maximum of advantage out of it with the minimum of detriment. Firstly, as to the position of the water-closet. 'One of the gravest faults in the construction of even the better class of houses in the present day is the little attention which is paid to the position and arrangements of water-closets. They are too frequently situated in out-of-the-way corners, where only borrowed light can be obtained, and efficient ventilation is impossible. The best position is an isolated block, built tower-fashion, and abutting against the outer wall of the house, with a closet on each floor and the supply-cistern at the top. There should be an ante-room, or passage, between each closet and the house, large enough to admit of sufficient cross-ventilation by means of open windows, or windows provided with ventilating-panes. A double set of doors would be required —one leading into the house, and the other cutting off the passage from the closet. The closet-seat should face a window in the outer wall, so that abundance of light may be secured for inspection with regard to cleanliness, and direct draught from the window should be avoided. The window should extend up to the ceiling, and have double sashes. The closet may be permanently ventilated by keeping the top sash drawn down, or by air-bricks inserted immediately beneath the ceiling. In smaller sized houses the closet may be simply projected from the building, with the seat facing the door, and with two opposite windows reaching to the ceiling between the seat and the door. Cross-ventilation and sufficient light would thus be obtained without the interposition of an ante-room.'

The closets should have a good supply of water, should be kept in good order, and any defect or difficulty in the working should be attended to at once. One of the difficulties in connection with this plan of sewage removal is the tendency to have an escape of sewer gas from the water-closet, the consequences of which are often very serious. This is to be avoided by a well-constructed closet, kept in good order, and by the ventilation of the sewers and the establishment of air-shafts. These last, we have seen, may be furnished by the down-pipe of the spouting.

These closets should be connected with well-formed and well-made sewers. These sewers should be made so as to be water-tight, and with a gradual fall. The pipes should be in a well-formed bed, so as to secure them against breakage. Traps must be laid at the junction of street and house-drains; and here, and at the manholes, there should be charcoal trays to arrest and decompose the sewer gas. The construction of sewers and the points to be attended to in their formation need not detain us further.

What will interest us here is the grave question of the effects of sewers upon the general health; and also the question of how the sewage may be utilised, without detriment to the public health.

The effects of sewers upon the general health of communities is a complicated question. We have seen that sewer gas is a deleterious agent to be disposed of by proper ventilation, and the use of disinfectants. Sewer gas will occasionally, by rising in the sewers, produce disease, especially typhoid, or, more properly, enteric fever, in the well-to-do houses on the higher levels; at other times, where there is a backing up of sewage from floods &c., the low-lying houses suffer,

and the houses situated higher escape. Sewer gas varies much, and is sometimes comparatively pure. Men who work in sewers are not subject to disease to the extent that would be anticipated: though at other times the opening of a drain has been followed by most serious consequences to those engaged in the work. Much of this discrepancy is due, doubtless, to varying conditions of temperature, moisture, and electricity; at one time the products of decomposition are probably much more active agents, than those evolved at another time; but as yet this is mere hypothesis and cannot be demonstrated. There is no doubt however but that, granting certain drawbacks to our present system of sewerage, it is much superior to the systems it has supplanted; and is, to put it on the lowest ground, the substitution of a lesser for a greater evil. Various disinfectants are used to add to the water with which sewers and drains are, or ought to be, periodically flushed, and of these the common sulphate of iron, green vitriol, is one of the cheapest and best.

The next question is that of how our sewage may be best utilised for agricultural purposes, with the least detriment to the public health. This involves the question of sewage removal by the various methods mentioned above.

Sewage as manure is very valuable, however procured, and the solid manure of the midden and earth-closet is so much like the ordinary manure of farms, that there is little to be said about the one which will not apply to the other. It is said that disease is engendered by the manuring of ground, and some strong evidence has been adduced to corroborate this view. Dr. Clouston has published a remarkable instance of dysentery produced in the Cumberland and Westmor-

land Asylum by the application of sewage to a field about 300 yards away from the Asylum. The field was an unsuitable one, being a stiff brick-clay subsoil; and it seems probable that in this case the sewage was really to blame, as the action of other causes, as bad food and water, was carefully eliminated. Other less striking cases of disease being produced from manure, including ordinary farmyard manure, have also been recorded. In the same way the manufacture of 'poudrette' and other manures has from time to time been accompanied by outbreaks of disease. In all these cases, where disease has broken out in connection with the utilisation of sewage, we must not overlook the possibility that fever-poisons, especially that of enteric fever, have been among the sewage, and so given to it dangerous properties which sewage ordinarily does not possess.

The favourite method of water-removal of sewage presents difficulties of an intricate character. The readiest method of disposing of it has been to discharge it into running water. Here it is not only borne away but oxidised. How long time is required for the completion of this latter action is not very exactly determinable. A large bulk of water and many miles of flow are requisite, and though water plants aid in the purification, not only is the water polluted and unfitted for drinking purposes for miles along the river by the presence of sewage; but the stream may be silted up, and actions at law occasioned for injunctions. There are decided objections to this method of disposing of sewage besides the above mentioned, and the total loss of the sewage, from a utilitarian point of view. Among these are the effects of excreta in a river upon the health of those who either reside upon its banks, or spend much of their time upon its waters. The evidence

adduced upon this point has been far from unanimous, and some of it has tended to prove the innocuousness of such water pollution, while other portions of it are decidedly against the practice. There is a tradition in the Hôtel Dieu in Paris, that the cases from the Faubourg St. Marceau were more severe than those from other quarters. This demonstrates well the deterioration of the health, without actual illness, which is induced by dwelling amidst insanitary arrangements, which is only revealed by impaired power of resistance to disease, a danger discussed in a preceding chapter. Diseases which were prevalent along the Thames in 1858, when it was very filthy, were wanting in 1859 when matters were worse. But what the collateral circumstances are which determine the presence of disease at one time and its absence under similar circumstances at other times, we have yet to determine. It is one of the great difficulties yet unsurmounted.

There is no doubt but that the bulk of water in a river must have an effect, and if the organic matter at the bottom is laid bare by a droughty season, that there will be a new factor added to the mere emanations from the water in the production of disease.

The system of draining sewage into rivers is doomed: and the plan now rising in public favour is that of pouring the sewage on the land, or 'sewage irrigation.' Obviously this is the plan; and it is being every day rendered more practicable. As it is a most important matter, and affects the question of health, not only in regard to the effects of sewage irrigation in contaminating the atmosphere, but also as to the other question recently raised, viz., the effect of sewage irrigation upon the grass &c. grown on the land so irrigated; and

through it upon the animals that partake of it, and through them again upon the human beings who consume those animals, or their secretion, milk.

The first is much more important and serious, and will engage our attention in preference to the latter, which is rather an hypothesis than a sober fact. Sewage irrigation means the pouring of sewage over the land, having first removed the more solid material. The larger solid masses can be intercepted, but the finer matter is too minute for any such treatment. The plans advocated for the removal of the latter are those of filtration and precipitation. Probably such treatment of the sewage, ere being poured over the land, will be found desirable; but the grosser matter only is removed as yet. The water from the sewage farm is wonderfully purified, and when returned to the river is almost unobjectionable, and is much purer in quality than any precipitating scheme has as yet been able to achieve. How far the soil may become in time super-saturated, is a question to which no answer can yet be given. So far the sewage irrigation is a success, in reference to the water product resulting from it. But about the sewage farm itself there is less agreement. Some call them pestilential swamps, while others uphold them as innocuous, and maintain that the public health is generally benefited by this sewage irrigation, and its substitution for other plans.

Much must depend upon the position of the land, and still more upon its nature, as to how far this sewage irrigation will succeed. Stiff clay soils are obviously unsuitable; loamy and sandy soils are best adapted for this treatment. Grass, and especially Italian rye grass, is the best crop; and as many as seven successive crops are mown off the Craigentinney meadows, near Edin-

burgh. But large farms are required, and 100 acres to each 1,000 of the population is not more than sufficient. The productiveness of the land is enormously increased, while it is asserted that the public health is not injuriously affected. Thus Sir Robert Christison writes of the Edinburgh meadows: 'I am satisfied neither typhus, nor enteric fever, nor dysentery, nor cholera, is to be encountered in or around them, whether in epidemic or non-epidemic seasons, more than in any other agricultural district of the neighbourhood.' To all those who know Sir Robert Christison, and the careful manner in which he makes his remarks, this expression of opinion will carry much weight; and all that he says is asseverated and supported by Dr. Carpenter of Croydon, as to the effect of sewage meadows there. Others have supported these views, and corroborated them by their experience of other places, where sewage-irrigation has been tried. It is unquestionably a great step forward, and the ill-effects have yet to be demonstrated.

That such a plan has met with much opposition, is no more than what might fairly be expected; and the instinctive antagonism to what is new, and the effects of prejudices, will long oppose this utilisation of our sewage.

The statements rashly made, and worse supported, that sewage grass affects animals, and especially their milk, and that such milk and butter quickly putrefy, are much to be deplored, and never should have been made unless actually based on fact; and the introduction of this matter into the discussions upon the outbreak of fever in Marylebone in 1873, where milk was the vehicle of infection, was ill-chosen and untimely. It has also been feared that parasitic disease might be

propagated by sewage irrigation, and the spread of entozoa furthered. But the fears once entertained are now abandoned, and parasitic disease in man or animals from sewer irrigation is as yet unknown.

Where the land for sewage farms cannot be procured, and such is impracticable in many parts of the West Riding of Yorkshire, for instance, in the Worth valley, some form of the many precipitation processes will be rendered necessary. A word about these processes may not be out of place. They consist of the addition to the sewage of some ingredients which will precipitate the organic matter, by carrying it with themselves to the bottom. Alum and clay have formed a part of the ingredients in several plans; in the A B C plan, they are combined with blood, charcoal, a salt of manganese, and other things. The precipitate is a black mud, which is gradually dried, and sold as manure. After years of trial at Leamington it is pronounced a failure; it is a nuisance and it does not pay.

At Wimbledon another plan has been tried. Here lime,tar, magnesium chloride, and an unknown substance are added to the sewage. It is still upon trial. General Scott's plan is to add lime and clay, properly powdered, to the sewage some distance from the outfall. This does not silt up the sewers, but rather scours them; and the precipitate drops at the outfall, where it is dried and burnt, and when so treated forms a useful cement. The drying process is not a nuisance. Another process is that of Whitthread, and consists of adding lime, chiefly in the form of a phosphate, to the sewage. The precipitation is rapid, and the fluid remaining is clear and inoffensive, and would be well adapted for irrigation from the amount of phosphoric acid and

ammonia left in it. The deposit will probably be found to be a valuable manure. In this process the sewage goes to the soil, which is not the case in Scott's plan.

Then there are filtration processes. The simplest is to allow the fluid to merely deposit its solids, but this is very imperfect as a plan for purification. A modification of this by running the sewage first over ashes and then over charcoal, has not been successful. Another plan has been tried at Merthyr Tydfil, called the Intermittent Downward Filtration plan, which is the filtration of the sewage through a considerable depth of soil. The purification of the water is fairly sufficient; but much that is agriculturally valuable is lost, though cabbages &c. are grown on the land used for this filtration.

These different plans might be applied first, and then the fluid might be utilised for irrigation purposes with excellent effects. What will be ultimately decided upon it is impossible to say; but public attention is so drawn to the matter that some solution or other must be arrived at ere long. The reward of the successful plan will be no stinted one.

Section VI.—Zymotic Poisons (Fevers).

Closely connected with the impurities of water come several febrile affections, and diseases of the intestinal canal. But as they are also connected with air, we will class the two together as exciting causes; and then proceed to consider the different affections. Some of them too are distinctly associated with the question of sewage, and the contamination of air and water by animal excreta. Though public attention is only now being strongly attracted to sanitary matters, from the

earliest days of medicine there has been much agreement as to the causes of epidemic affections at least. The Greek, Roman, and Arabian physicians considered the miasms of soils and the putrid bodies of animals, together with atmospheric heat, as the causes of pestilences. To these the Arabs added stagnant water and unwholesome food. 'Many of the rites of religion and superstition, during early ages and in pagan countries, tended remarkably to diminish the sources of infection and pestilence. The embalming of the dead by the Egyptians and other ancient nations (including the Incas of Peru), the laws rigidly enacted by Moses and enforced by Jewish rulers, the burning of the dead by various nations, and the modes of sepulture adopted by the Chinese from the earliest ages, were all more or less calculated to prevent the bodies of the dead from proving sources of destruction to the living.' Like other insanitary arrangements of the dark ages, the huddling of dead bodies together in the God's acre, within the shadow of the Christian church, commenced in or about the year 999, the expiration of the term of one thousand years during which Satan should be bound; and though no great catastrophes occurred to justify their apprehensions, the devout Christian still wished to lie by the side of his church, and there await the call which he so confidently expected. This accumulation of the bodies of the dead amidst the congregations of the living, and in places of frequent public resort, has produced in the course of ages a state of soil which is most pernicious in its effects upon the living; both through the emanations into the air and its contamination of the water. Pestilences have followed desperate battles, and masses of unburied dead, when the air was laden with

the products of putrefaction. Outbreaks of disease are associated with the interment of the dead, and the Indian cantonment of Sukkur was most unhealthy from its being placed over an old Mussulman graveyard. An outbreak of disease in Auvergne was attributed by Vicq d'Azyr to the opening out of an old cemetery.

Ague, or malarial fever, is produced by the decomposition of vegetable matter, especially in stagnant water, and with a comparatively high temperature. It may, however, arise from other causes, as in Hong Kong, where it arose from the disintegration of old decaying granite. In Hong Kong it was only after extensive excavations were made into the disintegrating granite for building purposes that violent and fatal remittent fevers appeared. The followers of Cortez did not suffer from fever on the tierra caliente of Mexico, and yet after the establishment of towns &c. it became the scourge of white residents in that region. On the other hand malaria sometimes disappears before cultivation and subsoil drainage; as is seen in the freedom now experienced in our English fens from the ague which at one time pressed upon them like a curse. If the cultivating hand of man was withdrawn, the malaria would doubtless reappear! Fever still haunts the Pontine marshes of Rome, the shores of the Mexican Gulf, and notably Sierra Leone. It is also common in various parts of India. It is a great source of suffering and death to emigrants and settlers, though much relieved by the general and increasing use of quinine. Belts of water shut it off; the risk is much less at day than at night, the upper apartments of the houses are less dangerous than the lower floor, and belts of trees, especially pines and the fever tree—the Eucalyptus Globulus, are serviceable in destroying the malarial

poison. Draining the land is an excellent plan, and embankments against the sea are useful where the land is thus dried. Where the ground is now and then above water and below it, drowning it entirely under water has been advantageous. Clearing the soil from jungle and underwood is often effective; and in towns thorough deep drainage, good sewerage, and the covering of the soil by pavements, have been found useful measures in diminishing the amount of fever; and the removal of places of sepulture without the towns has been a useful auxiliary. The drinking water must be attended to, boiled and filtered, or if necessary disinfected.

Enteric or typhoid fever is the penalty we pay above all others for our insanitary arrangements. Dr. Murchison, the great authority on fever, proposes to denominate it 'Pythogenic Fever,' or 'fever bred of putrefaction,' and several French writers state that 'it is procurable at will, so to say.' There is no doubt whatever but that the typhoid fever poison is commonly and usually produced by decaying matter, and when to already decaying matter the poison of typhoid fever is added, then an outbreak may be at once anticipated with confidence. Dr. Murchison says: 'So far as we know it is necessary for the production of the poison of enteric fever that the matter undergoing fermentation be either in a confined space, as in a drain or sewer, or that it be in a state of stagnation. Free exposure to the atmosphere, or constant dilution in a running stream, may not only render the poison inoperative, but may altogether prevent its formation.' Another writer says: 'A particular drain becomes obstructed, bad odours arise into the houses in communication therewith, and sicken their inhabitants, and enteric fever soon manifests itself.' And again:

'The inhabitants of a marsh, seated in a basin of clay, or level with the bed of a river, must of necessity drink water contaminated by their excretions and other impure matters, if the water be derived from the marsh itself, and the drier the season the more concentrated the poisonous impurity.' Consequently we are not surprised to learn that in the London Fever Hospital enteric fever was very prevalent in a dry season, but after a fortnight's heavy rain its further progress received a sudden check, which continued until the effects of a succeeding drought became manifest. There is no doubt but that concentration of the poison in the remaining fluids by the drought had much to do with this.

On the other hand typhoid has been induced by opposite circumstances. A severe epidemic at Terling in Essex is thus accounted for by the Privy Council's officer. 'Some ten days before the outbreak, and after a period of prolonged drought, a sudden great rise in the water-level of the wells was observed to follow a heavy fall of rain and snow; in other words, the shallow unprotected wells sunk in the porous gravel had become converted into so many receptacles for the washings of the filth-sodden soil, and hence the epidemic.' The testimony in favour of the origin of typhoid fever from a contaminated water supply, and of its production by the air being laden with the results of decomposition, has now so accumulated that it is no longer possible to question the intimate connection of the two. One more instance of a most striking character may be adduced.

In October 1847 typhoid fever broke out in a terrace at Clifton. Thirteen houses far apart were attacked, the other twenty-one escaped. These thirteen drew

their drinking water from a well at one end of the terrace; the other twenty-one did not. The well had at last to be closed from its obvious contamination with sewage. Typhoid fever has been observed to be very prevalent during uncommonly wet seasons, from the overflow of contaminated surface water into the wells.

But, while admitting all this, there remains no doubt but that the alvine dejections of a patient suffering from enteric fever are the most certain means of inducing this disease in others, and that these finding their way into water, infect the drinkers; that it is in fact 'a direct contamination from the diseased intestines.' Sir William Jenner, whose opinion on fever is one worthy of all respect, says 'that the admixture of fæcal matter, but especially the bowel excreta of typhoid fever, with the water supplied for drinking purposes, is the most efficient cause of the spread of the disease.' A most striking instance of this occurred at Ackworth, near Pontefract, in March 1870, when it was found that an outbreak of typhoid fever was confined to an area of village and school supplied by water from one particular well. The water was analysed and found impure; 'and it was further ascertained that though it must have been contaminated with sewage previous to the outbreak, no cases of disease appeared until a person was brought down to the village who was suffering from fever. The discharges of this patient were thrown on loose ground, which drained into the water of the well.

How well this illustrates the common fact of a case of typhoid fever coming into a village, and then fever breaking out in an endemic form. Not from direct infection caught from the patient,—for typhoid fever is far from an actively infectious disease,—but from drinking water infected by the patient's stools. At

Bramham College in March 1869 two pupils came already infected with typhoid fever; shortly there was an outbreak. The discharges of these patients were found to have escaped into the supply of drinking water from a broken water-closet pipe. The boys who drank beer escaped, and the disease was confined to those pupils who drank the water. The boiling of the water used in cooking had obviously destroyed the poison.

But the most striking instances of the communication of enteric fever by fluids is furnished by the now well-known facts of its spread and propagation by milk. At Penrith first, then St. Andrews, Islington, Leeds, Wolverhampton, and later the severe outbreak in Marylebone which fell heavily on the families of the many medical men residing there, the outbreak has been clearly traced to the milk supply. It followed the round of the infected milk, skipping the houses where other milk was purchased; it selected those members of a family which drank that milk, and left those who drank other milk untouched. The evidence was complete: the sources of the milk supply were then investigated, and one of the farms, miles away from London, was found infected with typhoid fever. The Milk Company most properly at once ceased operations, and the outbreak was arrested.[1]

Thus we see that extreme care is necessary against the spread of enteric fever, which is propagated not as a danger incurred by our humanity in attending to the

[1] It is not typhoid fever only which is communicable by milk. My father once brought home small-pox from a patient. Myself and sister commenced in it, though he himself was not ill. Similar cases showed themselves in an outlying cottage whose milk supply came from my father's house. There was no further spread. The case is the more striking as there was at the time a severe outbreak of scarlatina in the village, and the two small-pox infected families were almost the only ones which escaped.

sick, not acquired by what we ordinarily understand as contagion or infection, but as a direct consequence of our violation of common cleanliness, of our disregard of the principles of sanitation. Typhoid fever used to hang around the Cumbrian hills as if haunting them, and severe attacks occurred repeatedly again and again, when the old-fashioned middensteads and pools of sewage water stood in front of the doors and lay underneath the windows, in close proximity to the well and pump, which generally stood as close to the kitchen door, and as near to the pools of sewage as was practically possible. It was the penalty of the prevailing habits of disregard of sanitary principles! That it took its origin in ignorance, exercised no ameliorating action over the results.

Typhoid fever is as preventible as it can certainly be originated and engendered artificially. It is a terrible scourge, and no respecter of persons. The highest families of the land have suffered as severely as the humblest; and all the safeguards of royalty, all that wealth and power can do, sentries and soldiers, all are as impotent to keep out the poison of fever, as was the old guard of the French kings to keep out death.

The annual tale of deaths by typhoid is a severer tax on the life of England than were the bloody rites of the Aztecs upon the subordinated peoples under their rule. It amounts to thousands yearly, to say nothing of those who while surviving either become the prey of tubercle, or after a protracted convalescence find themselves far from what they were before: in sober English, crippled for life.

Cholera is a recent scourge, and our first knowledge of it dates from Madras in 1769. In November 1817 cholera appeared in the camp of the Marquis of

Hastings then engaged in the Mahratta war, and in five days 5,000 died. It slowly moved westward and eastward. In 1820 China began to suffer, and for four years the pestilence raged. In 1822 it prevailed in Persia, and it was not till 1829 that it reached Orenburg. In 1831, in May it was at Moscow and Warsaw; in July at St. Petersburg and Cronstadt; in October it had reached Berlin, Vienna, and Sunderland; from whence it spread over the British Isles. In 1832 it had crossed the Atlantic and reached Quebec, from whence it continued its resistless march over the New World.

Thus, like all our infectious plagues, it took its origin in that birth-place of man, of art, and apparently of most things associated with humanity, viz. the East. North, south, east, and west it spread, regardless of climate, season, earth or ocean; if arrested partly by winter's cold, next spring it made up for its delay by a bound. Elevation alone gave any security. Birmingham has so far escaped.

Like typhoid fever, its spread is much facilitated by pre-existing conditions; its effect is aggravated where there is already a weakened condition, or systems undermined by previous insanitary arrangements, by bad food and impure air. A contaminated water supply is an essential factor. Thus in one outbreak only 37 per 10,000 of those who drank the water of the Lambeth Water Company died, the water being drawn from Ditton; but no less than 130 in every 10,000 died of those who drank of the water of the Southwark and Vauxhall Company, drawn from the river near Vauxhall and Chelsea. As a contrast to this there is the well-known case of the pump in Broad Street, Golden Square. A sharp outbreak of cholera occurred in 1854 in a limited area; it was found that it was confined to those who

drank of the water of this pump. The pump-handle was removed; and the cholera ceased to spread, and then subsided. It was afterwards found that the sewage of a neighbouring house had leaked into the well, and that cholera, or choleraic diarrhœa, had existed in that house ere the outbreak. A most striking case occurred in connection with this pump. A lady living in the north of London was seized with cholera, the neighbourhood being quite free from it. It was found that she had a bottleful of water brought daily from the Broad Street pump.

Cholera is, however, a much more communicable disease than enteric fever, and its poison will cling to clothes and stick to individuals. Thus its introduction into England was occasioned by the clothes of dead sailors being forwarded to their relatives—a costly economy; and it has followed individuals, as the case of Theydon Bois illustrates well. Here a gentleman and his wife were seized with vomiting, cramps, and diarrhœa on their journey home. Relatives, servants, and doctor were consecutively seized, and eleven of that little circle were dead in a fortnight. On the other hand it will march up one side of a street, seize on one section of a village, or limit itself to the wing of a building. It sometimes attaches itself to a locality, as a camping ground; and by arranging their march so as to pass this spot without resting on it, a regiment or company may escape untouched by it. But whatever may be its poison, and undoubtedly there is one, its spread is facilitated by insanitary conditions, and insured by any contamination of the water supply. The drao of the gipsies of old was not more deadly when introduced into a well than is the poison of cholera, which is chiefly contained in the rice-water stools.

Dysentery and Diarrhœa.—These diseases lie midway betwixt malarial disease and cholera and enteric fever. They appear to be due in many cases to the same, indeed identical causes, as malarial fever, and have been found to be associated with low moist grounds, containing much organic matter. 'It seems that just as we have banished malaria, so have we got rid of dysentery.' But at the same time it must be evident that its association with armies, with camps in different localities, its pursuit of their march and adherence to their route, establish for it many relations to cholera. Dysentery gradually grew up in our Crimean army; it was not there ere the arrival of the troops, it did not remain after their departure. It is associated with bad and imperfect food, with hardships and insanitary conditions. Its interest for ordinary readers lies in its malarial origin, and another quotation will give point to what has been said. 'Malaria is supposed to be a cause of dysentery, and there is reason to think the supposition correct. The disease occurs in the climates, situations, and seasons favourable to the production of periodic fevers. It is occasionally combined with them, and appears to succeed or supplant them, as though it were owing to a continuance of the operation of the febrific cause, modified in its nature or influenced in its effect by extrinsic circumstances.' The recent death of Dr. Livingstone in the swamps of Central Africa brings this home to one, and the association of dysentery with malaria, and the power of malaria to excite dysentery, must not be forgotten by the intending emigrant or traveller.

Diarrhœa varies from a mere action of the system to rid itself of offending materials in the bowels, up to a most serious affection running a fatal course. It is

common in many diseases, either from the intestines being implicated, or from the condition of the blood; where so laden with effete matters the 'intestines become the channel of purification by means of diarrhœa.' All cachectic influences have a tendency to produce diarrhœa. It is also a common consequence of a cold, which is thus carried off by purging. It often occurs in malarial countries, either as a direct consequence of malaria, or from the malarial action predisposing the system to diarrhœa on slight exciting causes. It is always common in hot weather, and in autumn, and is commonly attributed to fruit; an impression which interferes much with the consumption of fruit, a food too commonly avoided, and which might be more eaten with advantage. Of course if eaten in excessive quantity, or of an improper character, diarrhœa comes on and sweeps away the mass, and so is useful. Such diarrhœa is too often interfered with, and by checking the free action of the bowels the diarrhœa is restrained, and goes on more or less ineffectually for days, until the intestinal canal is emptied; or too active a medication may even lock up the irritant matters in the bowel and start up inflammation. Diarrhœa is common with children when their milk is curdled by acidity of the stomach, and by its means the indigestible curdled milk is got rid of. It is a common consequence of unsuitable milk in a wet-nurse; either from her diet or from some peculiarity which makes her milk disagree with the infant. It is often necessary to stick to the milk of one cow; a change produces diarrhœa in the infant. Change of food in the cow, as well as in the infant itself, is a common cause of diarrhœa.

Diarrhœa is, however, often produced by impure air and water. In camps it is common from the polluted

air; and it is not unfrequently induced by a bad smell, from open cesspools, or from the emanations of the dead. Very commonly the odour of the diarrhœal motion tells of its origin, and recalls the smell recently experienced. Diarrhœa is a common consequence of bad water, and is generally present amidst an outbreak of typhoid fever. Indeed, it would appear to be often a modification of typhoid fever, a mild form of the disease. Where water is contaminated with filth it is a frequent cause of diarrhœa. A most marked instance of this occurred in Salford jail, where fifty-seven per cent. of the prisoners were seized with it. None of the officers or their families were affected. This fact directed the attention to some cause by which the officers were not influenced. The water supply was different and was suspected, and it was found that the untrapped overflow-pipe of the cistern supplying the prisoners communicated with an open sewer. This was remedied, and the disease stopped.

Such are the diseases to which we are liable from impure conditions of our air and water, from peculiarities in the soil, or neglect of sanitary precautions. The air carries with it other poisons, as those of small-pox, scarlatina, measles, diphtheria, and whooping-cough. The three first are notoriously communicable, and the latter are beyond doubt. Small-pox is a deadly contagious and infectious disease, and in unvaccinated countries goes like wild-fire, leaving a desolated track behind it. Scarlet fever, or scarlatina, as it is variously called, is also very infectious; and measles less actively so. The great importance of the knowledge of the communicability of these diseases is to secure isolation of the affected, and so the protection of those living near them. It is necessary, too, that convalescents

from these affections should not come in contact with the healthy till all risk of infection has passed away; and that time, in small-pox, means the falling off of the last scab, and in scarlatina the peeling of the last piece of desquamating skin. The bed-clothes and body-clothes can also carry the fomites of the disease to others; and many an outbreak of infectious disease has resulted from the objections to destroying clothes, and the pernicious idea of their being useful to some one. Again and again persons in humble life suffer from this cause of infection. Even a long time may elapse without the destruction of the fever poison being accomplished, especially where the clothes have not been freely exposed to the air. Free exposure oxidises, or blows away the fever poison, exclusion of the air leaves it as active as ever. Sir Thomas Watson tells us of a case in point. Scarlatina had broken out in a mansion, and been of a very serious character. The house was cleared out, and the family went to Brighton for twelve months. On their return, a new maid-servant, on opening a drawer, found a piece of red flannel wedged betwixt the drawer and its frame. She playfully put it round her neck, when the housekeeper bade her put it away, telling her that it was used round the neck of a child who had died. Nothing more was thought of it, but the poor girl took scarlatina, and died. The poison was unoxidised, unaffected by time in its position, and the rag was as dangerous as it ever was; as the result showed.

But if these exanthemata do actually depend upon the presence of a specific poison; there can be no doubt but that pre-existing conditions have much to do with lowering the resistive power of the system, both as to the reception of the disease, and the power to throw off its effects. Epidemic disease spreads more rapidly and

is more fatal among those whose systems have been undermined or weakened by impure air or bad or insufficient food, than amidst those whose resistive power is high, and whose systems are maintained in good condition by full supplies of proper food, by pure air and water, and attention to hygiene.

Section VII.—Disinfectants and Antiseptics.

In this section we will discuss the means of obviating the above-mentioned maladies, especially by what are termed disinfectants—a most important body of chemical agents. A word of explanation as to their mode of action will profitably introduce the reader to their consideration; and he will thereby be better able to appreciate their importance.

Decaying bodies are bodies undergoing oxidation. Each minute particle is uniting with oxygen, and on its road to its ultimate products, ammonia, carbonic acid, and water. Bodies which resist oxidation do not decay, or putrefy. This condition of change is called 'atomic activity,' because there is a change going on in the ultimate particles by the constantly increasing volume of oxygen in combination with the original matter. Some of these products of decomposition are harmless, some are active. The quicker and more concentrated the atomic changes the more apt are they to produce dangerous products. Where this atomic change, decay, or putrefaction is going on extensively, the addition of the poison of cholera or enteric fever at once induces an outbreak of the disease. How far the poison of cholera and enteric fever can be produced as it were accidentally, by ordinary decomposition, we cannot say positively: it is very probable. Indeed, all fever poisons

must have had a commencement, and originated somewhere. These poisons are undistinguishable by the eye, even when aided by the microscope; but decaying matter is usually revealed to us by the smell. It does not follow that the most dangerous emanations or odours are the most offensive; but the stench and the poison are as intimately associated as are the rattle and the fangs of the rattlesnake. The one tells us the other is about; but it no more follows that you shall have fever because you smell a noisome odour, than that you shall be struck when you hear the rattle. It is a warning, however, which we do well not to disregard.

Now, these decaying bodies can be converted into harmless matter by arresting this atomic activity. The substances which alike arrest putrefaction and fermentation, another condition of atomic activity, are antiseptics, commonly termed disinfectants, or deodorants. They are matters which unite chemically with the oxidising material, and so form a stable compound, not easily broken up. Thus, for instance, we have the offensive and poisonous stools of a typhoid fever patient made at once odourless, and harmless, by adding carbolic acid to them. The carbolic acid has at once seized on and united chemically with the active particles, and arrested their activity and reduced them to a static condition. So sulphate of iron in solution poured into an offensive sewer exercises an identical action. Condy's fluid gives off oxygen in an active condition, and so completes the oxidation of the decomposing material; and leaves the rest of the mass free from active change. Thus Condy is of the utmost service in the sick-room by cleansing the atmosphere: it gives off free oxygen, and purifies the air like a thunderstorm. But different antiseptics have different uses, and at times one is to

be preferred, and at other times another. We will just briefly touch upon the leading antiseptics, pointing out their peculiarities; and then proceed to the important matter of practical disinfection.

Some of these, and the most active, too, are produced by disengaging fumes, thus we have :

Sulphurous acid, given off by burning sulphur; good for disinfecting rooms after the removal of the sick, or dead persons.

Chlorine is an energetic gas, and can be readily produced by adding a little muriatic acid to a wineglassful of Condy's fluid, or to crystals of chlorate of potash.

Nitrous acid fumes are given off when strong nitric acid is added to copper filings. They are very powerful.

Iodine is a violet fume produced by throwing some scales of iodine upon a hot plate. It is penetrating and powerful, and even dangerous, and apt to produce affections of the respiratory organs if respired in any quantity. These fumes are adapted for empty rooms, dead-houses, hearses, &c.

Carbolic acid. A very cheap and excellent agent; it cleanses air laden with putrefactive matters, or with the germs of lowly organisms; it disinfects fæces and sewers; it destroys fever poisons; and is an excellent application in surgical injuries and accidents. It can be used to scrub floors, to add to water for the steeping of infected clothing, and to place in utensils to receive excreta. It can be used for outbuildings, urinals, cesspools, and latrines. It is extremely poisonous, and consequently it is safest in the form of powder.

Chloralum is cheap, active, and inodorous, but does not give off gases. It is useless to clear air, but disinfects fluids, sewers, &c., and does excellently for washing and scouring.

Chloride of lime is odorous and its smell is offensive; it is a good but unpleasant disinfectant.

Chlorozone is cheap and useful; it gives off chlorine and oxygen, and is useful for all disinfecting purposes.

Chloride of zinc (Burnett's solution), is a powerful disinfectant.

Sulphate of iron is a good and cheap disinfectant for sewers, cesspools, &c., and anything needing flooding. It is readily soluble in water.

Next come a number of powders, excellent for water-closets, gullies, mouths of sewers, excreta, &c.

Macdougall's Powder is a capital disinfectant. So is *Calvert's Carbolic Acid Powder*, of which it is needless to speak further. *Leuder and Leidloff's Disinfecting Powder*, manufactured at Dresden, is an excellent and odourless powder.

All these arrest atomic change, and so neutralise the activity of decomposing matters, as well as killing all germs of low forms of animal and vegetable life.

Two other well-known disinfectants need a word or two.

First, *Condy's Fluid.* This is a violet or green fluid of useful properties. For clearing the air of sick rooms, of musty and close rooms, it is excellent, the solution being sprinkled about; the oxygen given off is non-injurious and agreeable. It is well adapted to sick rooms in which persons are; it forms a useful injection under certain circumstances, and readily cleanses an ill-smelling sore. It does not arrest atomic change, but completely oxidises the decaying material.

Then, *Cooper's Salts.* These are compounds of chlorides of soda, lime, and magnesia; they are disinfectant, deodorant, and deliquescent. This last property singles them out as specially suitable to street sanita-

tion, especially in hot weather; and one sprinkling of the solution is as effectual as three sprinklings of roads and streets with simple water. The solution is cheap, odourless, and colourless; in epidemics it will be found very serviceable.

Then there are several disinfectant soaps, as Calvert's carbolic soap, and Wright's tar soap—a pleasant and powerful disinfecting soap—suitable for cleansing the hands from infecting matter, foul odours, &c., and for washing the body after small-pox and scarlatina.

Having gone over disinfectants and their properties, we come to *Practical Disinfection:* which can be advantageously combined with hygienic precautions.

When there is an outbreak of infectious disease it is necessary (1), to isolate the sick, and prevent their communication with the unaffected; (2) to remove or disinfect all refuse matter, decaying material, &c.; (3) to inspect the water-supply and secure its purity; (4) to disinfect all outhouses and uncleanly premises by limewashing, &c.; (5) to prevent overcrowding; and (6) to secure good and ample ventilation. Then comes the measures to be resorted to in the sick room and around the invalid. The room should be kept clean and Condy's fluid used; there should be as little communication as possible betwixt the sick and the rest of the household, except the nursing staff. Those not connected with the nursing should bring the food, fuel, water, &c. into a neighbouring room, well ventilated and disinfected; and then the nurses should, after their departure, remove what is required, and put out anything done with; thus the direct communication of the sick and the household will be prevented. A sheet saturated with a disinfectant should be hung over the door of the room, so as to catch any poison wafted out when the

door is opened. All slops &c. should be disinfected ere being removed from the sick room; soiled linen should be immersed in a disinfecting solution; books and newspapers should be aired and disinfected, or if valueless they are best destroyed at once by burning. All unnecessary furniture, carpets, and curtains, &c. should be removed from the sick room. One caution, however, must never be forgotten, and I urge it with all possible force, the more from a keen and vivid remembrance of my own suffering therefrom; and that is, if the sick room be the room in which the sick person has previously slept for some time, and there is a prospect of delirium coming on, leave that room as little changed from its ordinary aspect as possible. For when delirium comes on and the disordered brain with difficulty recognises what is around it, and more especially after a slumber, the dismay created by the alterations of the room often occasions violent delirium, and the patient makes strenuous efforts to get away, and return, as he thinks, to his own room. The desire to be in the accustomed room when sick, the idea of being where it is either improper or unsuitable, occasion most painful feelings; the remembrance of which even delirium cannot wholly obliterate, neither does the memory thereof wear out by the action of time. It is very painful to stand by the bedside of the delirious and hear their piteous appeals to be taken away to their home; to me doubly distressing from the memories they evoke.

Then, when the disease has spent itself, care is still requisite, for then is the danger of causing infection at its height. This is especially the case in typhus fever, scarlatina, and small-pox. The scarlatinal patient should be rubbed with glycerine and carbolic acid, or washed with Wright's tar soap, and the poison-bearing ex-

foliated skin removed. In small-pox, after the vesicles have commenced to dry up, similar means may be resorted to. The convalescent should not mix with others as long as the skin is peeling in scarlatina, or a crust remains in small-pox.

After the convalescent is removed, the room should be cleared out, scrubbed with a disinfectant, floors, walls, and woodwork. The ceiling should be whitewashed, and the room repapered, the doors and windows being thrown open for several days; at nights they may be closed, and any of the fuming disinfectants might be disengaged, and the room kept closed till morning.

The bedding, clothes, &c. should be disinfected and washed; to hang clothes up in a room, and then disengage the fuming disinfectants, leaving the rooms closed for hours, is a plan which may be adopted where the clothes are too valuable to be destroyed and will not wash. Large disinfecting chambers for clothes are now available for public use, commonly in the hands of boards of guardians.

The hair of infected mattresses should be teazed out, exposed to air and disinfected; and feathers should be treated after the same fashion. Valueless articles should be burnt.

If the patient dies the body should be washed with a strong solution of carbolic acid, or other disinfectant; and as quickly as may be placed in a coffin, covered with disinfectants, and screwed down. Disinfectants should be freely used until the burial, which should take place without delay.[1] Unhealthy sentiment should not be permitted to interfere with obvious duty. Some disinfectants should not be used together, as they neutralise each other; notably carbolic acid and Condy's fluid.

[1] Cremation would be specially suitable to the cases of death from an infectious disease.

And now comes the question of the communication of disease from the sick to the healthy by indirect contact. The clothes of the attendants, and even of the doctor, whose visit is brief, may carry away the poison. The doctor might generally find a waterproof covering, though not looking very professional, a good precaution, as the poison would scarcely attach itself to the smooth surface; and to make doubly certain, it could be sponged over with a disinfectant solution. Under other circumstances the clothes should be changed. Attendants upon the sick should not, if it can be avoided, go backwards and forwards from their own houses to the sick chambers; though, goodness knows! nursing in the humbler classes would be impracticable if this were not done. The greatest care should be taken under all circumstances. Woollen clothes, especially thick ones, as loose clothes, blankets, &c., hold fever poison very tenaciously, and should always be well disinfected.

And now as to the washing of the clothes of fever patients. Are those who wash them liable to be infected, or not? So far as the subject has been investigated the answer is No. In the Calcutta European General Hospital, in twenty-five years not one of the washers ever took cholera, for instance. Neither do laundresses object to the clothes of fever patients, at least so far as I can learn by inquiries. Of course no reasonable person would send the clothes away without first putting them through a disinfectant solution. But all people do not act under the dictates of reason.

In one case which came under my personal notice fever, and that too of a grave character, broke out in a widow's house, where the clothes from a fever-stricken household had been sent; but here the mother had

been in the habit of passing to and from the fever-stricken house and room of the patient, ere bringing home the clothes; and further, the clothes were unremoved from the clothes-basket when the fever showed itself.

Disinfectants are so cheap and so efficacious as preventives of disease that their use is really imperative, and their cost should never be grudged. Nevertheless it once so befell that a medical man was called to a 'led' farm, that is, a farm worked by servants and not under the care of a resident employer, where the servants were sickening of typhoid fever. Disinfectants were freely employed, with the effect of staying the progress of the disease; the polluted water supply at the same time being changed; but the farmer declined to pay for them, alleging he had not given instructions for their use. The servants, who paid their own accounts, could not of course be charged for them, and the loss fell upon the medical practitioner who had furnished them. It is scarcely likely that such unparalleled meanness could often occur, but the case is related as instructive.

Section VIII.—Vaccination.

In 1768 an apprentice to a surgeon at Lodbury near Bristol made a discovery which has exercised the most beneficent action upon humanity at large, and for all time. The youth was Edward Jenner; and the discovery he made was that the cows of that dairy district had a peculiar passing affection of the udder which was communicated to the hands of the milkers, where the affection ran a precisely similar course to what it did in the cow. Milkers so infected were protected against small-pox. The impression made

upon him by this popular experience was never effaced, and it ultimately matured as 'vaccination.' Vaccination is the deliberate communication to a human being of the lymph from a vaccine vesicle in the cow; or from a vesicle in another human being which had its origin in a vesicle in a cow. The transmission of the vaccine vesicle to a series of human beings does not destroy the virus; though it certainly does render it less protective, and the vaccination less perfect; and occasional renewal from the heifer is desirable. Such vaccination is a great protection against small-pox, which instead of being a permanent scourge, as it was, is now confined to occasional outbreaks; where its severity is felt most by those unprotected by vaccination. As there exist many erroneous and too often prejudiced views about vaccination, a short view of it may not be out of place here. The two great points, not at issue—that would be putting the matter improperly, but in dispute—are (1) its utility, and (2) the propagation of disease by vaccination.

1. Its utility. We now-a-days have simply no conception of the condition of matters prior to the advent of vaccination. Those who were marked with small-pox seem to have formed the majority of the nation. The Quarterly Review (July 1855) says, 'Unless the reader has scanned the long list of villanous portraits exhibited by the *Hue and Cry* in the old papers of the last portion of the seventeenth and first portion of the eighteenth centuries, he can form but a faint conception of the ravages committed by the small-pox upon the population. Every man seemed to have been more or less speckled with "pock-holes," and the race must have presented one moving mass of pits and scars.' So much for the survivors. The mortality of natural small-pox is rarely below 20 per cent., and often 40 per cent. in

the unvaccinated. What a death rate in the past does this indicate! So alarmed indeed were people that they were frequently inoculated, that is, had the small-pox deliberately, by having some of the poison inserted beneath the skin. This practice was introduced by Lady Mary Wortley Montague in 1721, whose daughter was so inoculated, and was brought by her from Turkey where she had seen it practised. It gave a severe attack, but much less so than when small-pox was caught in the ordinary way. For instance, of 244 persons inoculated in one case, 6 died. Unfortunately each inoculated person gave to those around them the dangerous natural small-pox. In addition to the danger and disfigurement so induced, it was not a perfect protection; of 82 medical men who had had small-pox, most of them by inoculation, 3, or 3·6 per cent., contracted small-pox in after life. One attack of small-pox is not a certain protection against a second; neither is vaccination a perfect safeguard. Thorough and complete vaccination is as powerful a protective as an attack of small-pox. In the Small-Pox Hospital it has been found that 'when vaccination has been well performed—four or more vaccine cicatrices being the witness of this—only one half per cent. of those who contracted small-pox died.' The proportion of those who take small-pox after efficient vaccination is small; and out of 50,000 children examined by Drs. Seaton and Buchanan, for the Privy Council, only 1·22 per 1,000 of the efficiently vaccinated were found marked with small-pox. This makes out vaccination to be as good a protective as inoculation; making allowance for the exposure of the 82 medical men mentioned above. But to look at the question more broadly. 'The fatality of small-pox in Copenhagen is but an eleventh of

what it was; in Sweden a little over a thirteenth; in Berlin and in large parts of Austria but a twentieth; in Westphalia but a twenty-fifth. In the last-named instance there now die of small-pox but four persons where formerly there died a hundred.'

That we still have small-pox to any extent in England is due to the imperfect carrying out of the Vaccination Act, owing to the instinctive hostility of the English people to anything and everything compulsory. Thus of 268 persons who died of small-pox in the hospital, and reputedly vaccinated, only 191 exhibited any marks at all, and of these only three had been efficiently vaccinated. It is really this rejection of the benefits of vaccination which maintains small-pox among us; and it is the duty of the vaccinated to see that others are vaccinated; for among the unvaccinated small-pox gathers force and becomes a source of danger to those who would otherwise be safe from the milder outbreaks.

'In thirty years no nurse or servant at the Small-Pox Hospital has taken small-pox.' They are all re-vaccinated on their coming to live in the hospital. Can anything be more conclusive? By revaccination almost complete immunity might be secured to all against one of the most terrible of scourges, carrying with it high death rate, and leaving the survivors disfigured, often horribly so.

2. The propagation of disease by vaccination. This is the great argument of the anti-vaccination agitators; their citadel in fact. There is little in it in reality, and the so-called facts on which it is based fall to pieces on handling. Its foundations usually lie in a scrofulous diathesis, which the parents dislike to admit to themselves and so lay to the charge of vaccination; and in the syphilitic cachexia which is studiously concealed.

These are the two great causes of the so-called communication of disease by vaccination. In my own experience scrofulous families have always decried vaccination, because their children have suffered after the operation. But there are always two great facts against their hypothesis: and these are, that evidences of the diathesis were distinct enough in senior members of the family, who could have had nothing to do with the vaccination which they stated to have affected the child; and that other children vaccinated from the same child, as this scrofulous child was, did not suffer in any way or show any symptoms of any ailment; and further, the child furnishing the lymph was perfectly healthy and so were its parents. These are awkward facts, and militate against the idea of scrofula being communicated; indeed, attempts to inoculate scrofula have failed. (In the hands of Kortum and Lepelletier.)

Next as to syphilis. This is unfortunately a most common affection, and one which is usually studiously concealed; and a syphilitic father is more likely to encourage his wife to attribute a syphilitic rash in the child recently vaccinated to that innocent operation, than to undeceive her about himself. For instance, I remember well being consulted about a rash in a child that had been recently vaccinated, which was undoubtedly syphilitic. The parents were very indignant, and inveighed against vaccination generally and this vaccination in particular in no measured terms. My connection with them commenced a year before this in the treatment of an older child for constitutional syphilis. Such is a sample of these cases. It does so happen that young children are very liable to eruptions, and vaccination certainly does rouse up an eruption very commonly in those so disposed, and then it gets

the credit of occasioning it. Now these rashes attributed to vaccination generally come out alongside or immediately after the vaccine vesicle; true communicated syphilis has a period of incubation of some weeks. The cases of syphilis communicated by vaccination (?) are so rare that they would furnish no reliable data in themselves—though in one or two cases there really is room for fear that vaccination did carry the poison. Experiment has furnished those data. In Vienna Professor Sigmund performed a very horrible experiment, but a conclusive one. He mixed syphilitic poison with vaccine lymph, and then vaccinated with it. In these cases the syphilis destroyed or overruled the vaccine virus, and a syphilitic sore alone was the result. If then a vaccinated child has a vaccine pock there is no syphilis in the vaccination. In the above cases constitutional syphilis resulted in time, usually several weeks, after the formation of the syphilitic sore.

A number of experiments have been also performed showing that the vaccine lymph from children known to be syphilitic does not communicate the disease. In no single case did the experimenter succeed in communicating the disease. Then again in 50,000 cases of vaccination, Mr. Marson of the London Small-Pox Hospital never saw syphilis or other disease communicated. Dr. West, the well-known authority on children's diseases, out of 26,000 cases of vaccination has never seen the slightest pretext for supposing that syphilis had been communicated to infants through the medium of vaccine lymph. 'There is no subject in medicine on which there is greater unanimity of opinion.' That disease has been communicated by blood becoming mixed with the lymph is admitted; but blood should not be allowed to escape into the lymph, and where it does,

that lymph ought not to be used. But these cases even are very rare, and always attract much attention in the profession when published. There is no attempt made to hide them. In one of these few cases erysipelas was communicated, but inversely to the ordinarily supposed way of infection. A child sickening of erysipelas was vaccinated, and the disease was communicated from it to the child from whom the vaccine lymph was taken, and also to the next child vaccinated from the same arm. This is quite opposed to the ordinary impressions.

Finally all diseases which are infectious and contagious are communicated by actual particles from the sick person, as a fine particle of exfoliated skin in scarlatina, a fragment of a scab in small-pox, and in inoculation the small-pox matter was inserted, as vaccine lymph is. And yet we never heard of constitutional conditions being transmitted in inoculation, or conveyed with typhoid fever excreta, or in the scarlatinal infection, nor yet more marvellous to relate, in the contagion of small-pox. Who ever heard of any one undergoing a constitutional change from catching small-pox from unhealthy persons; or of their attributing the unpleasant after-consequences of scarlatina in certain persons to the constitution of the person from whom the scarlatina was caught? And yet surely this might be as well said of the one as the other. It is strange if the comparatively trifling affair of vaccination alone should be encircled by such dread dangers. The anti-vaccinationist has got a tough problem before him; and one not to be solved by rash assertion or loud invective, but by a complete knowledge of all the facts, and this is but too commonly awanting or unsought.

As a prophylactic vaccination has been a mighty

boon; and as a vehicle of disease a verdict of not proven must be returned.[1] It is a sad reflection that other nations should so prize the invention of Jenner—France has raised a monument to him, in Scandinavia the vaccination certificate is the most important document a person can possess—and yet that there should exist a large body in his own country who should deliberately undervalue his discovery.

Section IX.—Accidental Poisoning.

Man is subject to disease from other sources than excreta and fever-poisons. As to those connected with trades and manufacturing processes we have considered them before, as also lead poisoning from the action of water on lead pipes and cisterns. Another form of lead poisoning is that of the adulteration of cyder by the addition of lead to sweeten it. Though the proportion of lead is small, its continuous use is certainly productive of symptoms of poisoning.

Another form of poisoning is produced by the use of copper cooking utensils; but the grossest uncleanliness alone renders this possible. All copper vessels, and of course brass ones too, should be carefully cleaned after use, otherwise the formation of an acid which will unite with the copper and form a soluble copper salt, is rendered very probable. Criminal carelessness is the cause of copper poisoning.

[1] There is reason for grave fear that ignorant vaccinators, as druggists and old women, did actually mistake syphilitic sores for vaccine vesicles, never hesitating, but taking it for granted simply because vaccination (?) had been performed and results had followed. The children were syphilised and not vaccinated. With proper skilled vaccinators this is impossible, and the prevention of such a possibility is done away with by compulsory vaccination.

But even worse things are done than this; and the use of poisonous pigments to ornament confectionery is most reprehensible. Every now and again one reads of confectionery ornaments, often sweet and so consumed by children, containing large amounts of arsenic used as a pigment. So also chrome yellow, and other poisons. Arsenic, from its fine colour, is commonly present in coloured materials. It, chrome yellow, and other pigments are not uncommon in soaps, and troublesome skin eruptions, especially when the cuticle is thin, are commonly produced by a cheap, highly coloured poisonous soap. Ornaments, artificial flowers, green dresses, &c., are coloured with arsenical pigments, and produce symptoms of arsenical poisoning in the bonnet-makers, dressmakers, and wearers of the ornaments. Wall-papers have gained an unenviable notoriety by the repeated cases of arsenical poisoning which have resulted from the pigments used on the paper. Green wall-papers, like green confectionery, should always be regarded with grave suspicion.

Food is a common source of poisoning. Mussels often produce symptoms of poisoning, the face becoming swollen, red, or violently flushed, the eyes watery, while eruptions, of the nature of the nettle-rash, come out on the body. Vomiting is often spontaneous, followed by purging and the elimination of the offending material. These processes may be set up artificially with advantage.

Pork is often chargeable with inducing disease by being the vehicle of various poisons. The eggs of the tænia, or tapeworm, are often eaten in sausages; and a worse and more serious affair altogether is seen in the production of trichiniasis in man by the eating of measly pork. Here the trichinia spiralis is coiled up

in the muscles of the pig; and if the bacon or ham is imperfectly cooked, as it often is, digestion dissolves the capsule of the parasite, whereby it is set free, and symptoms not unlike typhoid fever ensue, usually with great fatality. Imperfect cooking is at the root of all parasitic disease connected with our food.

Vegetables are a source of danger; mushrooms notoriously. Different species of fungi are mistaken for edible fungi, and poisoning more or less serious follows. Watercresses are not always free from the brook-lime; the roots of the water-hemlock have been mistaken for parsnips; and the root of the monkshood (aconite) for horse-radish.

Rye is a dangerous food when diseased. Ergot, as the diseased rye is termed, or spurred rye, has produced dangerous epidemics on the Continent, where gangrene of the limbs has been a prominent symptom. Flour, wheat flour, is unfit for food when mouldy; and alarming symptoms often result when it is mixed with the ground seeds of the darnel.

Adulterations are a question which cannot be entertained here, as it is an almost endless subject.

Ordinary food becomes dangerous when decayed or in a state of putrefaction. Over-ripe fruit produces diarrhœa. Meat which has become 'high,' as it is termed, is a source of much illness. Hares, game, and venison are all more relished when the sapid, tasty products of incipient putrefaction are present. But ordinarily meat is preserved from this by three measures, heat, cold, and salt. Indeed, these might have been classed among the disinfectants quite properly, but their place seems to be rather along with the discussion of the preservation of meat, for which purpose they are so commonly used. Heat, variously applied,

preserves meat; boiling, roasting, baking, or stewing, all keep meat from decaying, and are used to prolong the time when meat may be safely eaten. Cooking, as this is termed, not only makes food more palatable, but it arrests atomic activity, and kills lowly organisms or germs. A heat equal to the boiling point is sufficient for these various purposes.

Cold arrests atomic activity when the freezing point is reached. Frozen mackerel from Norway, and frozen meat from Canada, are both known in our markets; and the ice of the fishmonger is a great agent in preserving fish fresh. Cold kills germs, and makes the air clearer and purer. In cold weather joints of meat will keep quite good and fresh for weeks; in thundery weather in summer a few hours will sometimes render them unfit for use.

Salt is an excellent antiseptic, and has long been used for our food, being both palatable and effective. Salt beef, salt herrings, bacon, ham, butter, &c., all are preserved by the use of salt. Indeed, we often add salt to our food as a condiment. Salt provisions are, however, undesirable when too long or too exclusively continued. They are comparatively difficult of digestion. Still, salt as a preservative is a most important matter, and without it we should often be awkwardly placed. Smoke-drying is often combined with salt-curing.

Meat is often too high for use; and at other times is unfit, from the animal being diseased.

Good meat has its red meat marbled or inter-streaked with fat. This shows it is well-fed. If the flesh is too dark in colour, probably the animal died unbled: if pale, it was young or diseased. The fat should be firm, and not moist or sodden. The juice exuding should be acid. Good meat, after a day or two,

is dry on the surface. The odour should be slight, and an unpleasant odour indicates disease or putrefaction. If there is any mucilaginous or purulent-looking fluid in the tissue, as well as a strong smell, the meat is unfit for food. Even cooking does not undo the effects of disease or decay. Fish have numerous signs of goodness; firmness of flesh, and redness of the eyes or gills, with an absence of putrefactive odour, mark fish that may be eaten without ill effects.

Sausages are a favourite food with many, and when they can be relied upon are unobjectionable. But sausage is often 'skin and mystery,' and at other times consists of many of the viscera not used as food. When the constituents are too old, sausages, without any poisonous admixture, may give rise to symptoms of poisoning. Cheese is sometimes poisonous from pigments which are used to colour it, as well as butter; at other times from putrefactive change.

Putrescent food is a cause of much disease directly, and of infinitely more indirectly, by undermining the health.

Game is sometimes poisonous from the birds having been killed by poisoned grain, either intentionally or unintentionally. They should always be examined to see if they have been shot. If so, it is highly probable that they are all right and fit to eat; though of course it is possible that birds may be shot just after a repast of poisoned grain and before the poisonous action was fully induced. Canadian partridges are often unwholesome from the nature of their food, and so are liable to suspicion at any time: though it is not known what that poison is.

With this, the chapter must come to a close. It has been a long one, but that is the consequence of the

aggregation of material; which ought really to have twice the space accorded to it, if it were possible. Hygiene is the more important in that it comprises the prevention of disease, and of what leads to disease. This is the most palpably effective method of influencing the public health.

PROPOSITIONS.

1. The plagues of past times were due to the insanitary arrangements of our ancestors.

Section I.

2. Sunlight has an important bearing upon health.
3. Pulmonary consumption is associated with a damp subsoil; and its prevalence is affected by drainage.
4. Sand soils are warmer than clay soils.
5. 'Rubbish' foundations are fertile sources of disease.
6. Drains, damp-proof courses, and dry areas, are required for houses in damp situations.
7. Porous, moisture-absorbing materials are unfitted for the construction of houses.
8. The rain-water ought to be carefully conveyed away from the house and its walls.

Section II.

9. The air-supply of a house must be sufficient in order to secure the health of the inmates.
10. Impurities in the air are often solid, as smuts, seeds, and germs.

(Fogs are smoke clouds.)

11. Fever poisons and vegetable odours consist of minute solid particles.
12. Diminution of oxygen in the respired air, or excess of carbonic acid gas, are both deleterious.
13. Poisonous emanations may arise from the earth or be given off in manufactories, and by chemical agents used in certain crafts.

Section III.

14. In imperfect ventilation the normal proportion of the constituents of the atmosphere is disturbed.
15. Not less than 1,200 cubic feet of air per head per hour are requisite for health. More is required for the sick.
16. The rate at which air passes through a room, or is renewed, is as important as the cubic feet of space allotted to each person.
17. Ventilation is much aided by the fires we use.
18. Draughts may be occasioned by ventilating an apartment.
19. Ventilators are placed in the ceiling because the heated air rises.
20. Double windows are very excellent for giving ventilation without draughts.
21. Fires are as efficient for the purposes of ventilation as for warmth; for the latter purpose they are wasteful.
22. Cold air usually finds its way in beneath the door.
23. Arranging the gas-lights of a room under the ventilator in the ceiling, forms an effective ventilating agent.
24. Air can be propelled into rooms, and be warmed ere being admitted, with good effect.
25. Too careful exclusion of air and closure of chinks produces all the evil consequences of bad ventilation.

Section IV.

26. Thirty gallons of water per head daily is the calculation of Waterworks Companies.
27. The waste pipe of cisterns should never communicate with the drain without a break, to admit of the escape of sewer gas.

    (Even traps are inefficient.)
28. Rain-water is soft, and though suited to ablution is not palatable as a beverage.
29. Water becomes hard from the presence of lime, and bright and sparkling from the carbonic acid gas contained in it.

30. The purer water is, the more powerfully it acts upon lead. Hence leaden cisterns are specially objectionable.
31. The quality of water is affected by the geological formations over which it flows, or from which it is derived.
32. Artesian, or very deep wells, furnish water of varying quality, usually very good; but they cannot be depended upon for the supply of large towns.
33. Water may be purified by boiling, distillation, subsidence, and filtration.
34. Family filters should be in use in every house. They can be cleansed by various means.
35. On large plains it is almost impossible to procure good water if the population be dense.
36. Our river well-heads should be covered with forests.

Section V.

37. The removal of our sewage is important to our health; while sewage is a valuable manure.
38. 'The rainfall to the river, and the sewage to the soil' is an apt maxim.
39. The presence of water adds to the offensiveness of decomposing matter.
40. The 'dry removal' is unsuited to densely populated towns.
41. The removal of sewage by water is the easiest, cheapest, and quickest.
42. The position of a water-closet in a house is more important than is commonly credited.
43. Sewers should be watertight and ventilated, to prevent the sewage gas from escaping at the water-closets.
44. Sewers should be periodically flushed, and disinfectants added to the water used for flushing purposes.
45. Sewage in rivers pollutes them, and is injurious to those persons who live further down the river and drink the water.
46. 'Sewage farms,' farms irrigated by sewage, are growing in favour. They are very productive, and not injurious to the public health.

47. Sewage does not exercise a prejudicial effect upon the grass, or upon the animals fed upon it, or upon the human beings who eat them.
48. Neither is parasitic disease engendered thereby.
49. Sewage is also cleansed by 'purification' and 'filtration' processes.

Section VI.

50. Many diseases are due to the contamination of water and air.
51. Malarial fevers arise from decaying vegetable matter and stagnant water.
52. Enteric or typhoid fever is the result of insanitary arrangements.
53. It is common in very wet and very dry seasons.
54. It may arise without typhoid-fever-poison being present, but its presence makes infection almost certain.
55. It is communicated to others rather by the contamination of the drinking fluids than by contagion proper.
56. Enteric fever may be communicated by the milk supply.
57. Cholera is very communicable by drinking fluids tainted with its poison.
58. Cholera is much more infectious than enteric fever, and may cling to clothes and to persons.
59. Dysentery is associated with malarial fever, and arises from like exciting causes.
60. It grows up in an epidemic form in camps and armies under insanitary conditions.
61. Diarrhœa may be a simple means of getting rid of offending matter in the bowels, or it may be a very grave disease.
62. Diarrhœa commonly arises from impure air and water, especially the latter.
63. The exanthems (eruptive fevers) are produced by infectious particles in the air.
64. The poison long retains its activity if not exposed to the air.
65. Epidemic disease is always most serious among those whose vital force is undermined by insanitary surroundings.

Section VII.

66. Decay or decomposition is a process of oxidation—of atomic activity
67. The particles of decomposing matter may be invisible to the strongest microscope, but are evident to the smell.
68. Antiseptics unite with matter in a state of atomic activity, and bring it into a static condition, where it is harmless.
69. Some fumes are very powerful disinfectants, as chlorine, iodine, sulphurous acid, &c.
70. Other disinfectants are liquid, as Condy's fluid, chloralum, &c.
71. Disinfectant powders of various kinds are useful in water-closets, privies, urinals, and sewer-traps.
72. Antiseptic soaps are often useful, and remove contamination and unpleasant odours.
73. The disinfection of the sick room, of the excreta, and the soiled clothes of the sick person is useful in arresting the progress of infectious disease.
74. There should be no direct communication betwixt fever-patients and the household: only indirect communication by the nurses should be permitted.
75. A sheet saturated with a disinfectant should be hung over the door of the sick chamber, to arrest any fever poison wafted through the open door.
76. All unnecessary furniture should be removed from the sick chamber; but it is undesirable to change the aspect of the room if the oncome of delirium be probable.
77. The infecting power is highest at the latter stages of fevers.
78. Small-pox is infectious till the last scab has fallen off; and scarlatina till the last bit of skin has peeled.
79. The rooms, wearing apparel, and bedclothes should be disinfected on the patient's removal.
80. Hair mattresses and feather-beds should be pulled to pieces and aired or disinfected.
81. Valueless things soiled or infected had best be burnt.

82. Attendants may carry away infection in their clothes.
83. There is no proof of infectious disease being transmitted to laundresses.

Section VIII.

84. Vaccination is the deliberate infection of human beings with the lymph from vesicles originally on cows' udders.
85. This is as protective as an attack of small-pox.
86. Inoculation was the artificial production of small-pox.
87. This form of small-pox was less serious to the individual, but was quite as infectively dangerous to others.
88. Vaccination has reduced small-pox from a prevalent malady to a comparatively rare disease.
89. Small-pox gathers force amidst the unvaccinated.
90. The propagation of disease by vaccination is an ill-founded charge, and its occurrence is of extreme rarity.
91. The ordinary statements of its occurrence are untrustworthy, and the resulting malady (so called) has had another origin.
92. Young children are liable to eruptions, and vaccination often lights them up.
93. If the transmission of disease by vaccination were a fact, it would be found to occur in other infectious maladies as well; in small-pox, for instance.

Section IX.

94. Poisoning may result from imperfectly cleaned copper cooking utensils.
95. Poisons are often used as pigments; to ornament confectionery; to stain soaps; to colour wall-papers and artificial flowers.
96. Parasitic diseases are communicated by imperfectly cooked meat, and especially the flesh of the pig, either fresh or cured.
97. Poisoning sometimes occurs from a poisonous plant being mistaken for an edible vegetable.

98. Putrefying meat is an active originator of illness.
99. Heat and cold, when sufficient, arrest putrefaction, as does salt. (See Props. 66 and 68.)
100. Cooking does not render diseased or putrefying meat wholesome.
101. Putrescent food not only causes disease directly, but more frequently undermines the constitution.

CHAPTER XII.

WHAT TO DO IN CERTAIN EMERGENCIES.

A PORTION of this book may properly be devoted to the consideration of certain emergencies which arise in the experience of individuals. Not that this chapter will usurp the function of the family practitioner; there is no such intention. It is merely designed to give the reading and reflecting public some general impressions, which may the more readily incline them to give heed to, and perhaps even to comprehend better the counsels of their medical adviser. Now of all the things to which humanity is liable, there is none which recurs so frequently, and whose consequences are more troublesome and often dangerous, than '*taking cold.*' Some persons have quite a faculty for taking cold, while others do so but rarely. And yet the one does not argue delicacy of constitution; nor the other strength.

The body of man has, as we have seen in one of the early chapters, a constant and agreeable temperature in health, the variation being slight. In fact any great variation is incompatible with health, and constitutes disease. The production of heat is associated with the interior of the body, and especially with the muscles. Consequently active muscular exercises raise the temperature, and produce perspiration with its cooling action. But we know much depends upon the clothing

and temperature of the surrounding air. If it is very cold and the clothing scanty, active exercise only gives a pleasant sensation of warmth. That is, the heat production is only equal to the loss of heat from the surface. On the other hand in cold weather, when there is no exertion being undergone, the skin is cold, dry, and marbly, and coverings are required to keep off the feeling of cold and the loss of temperature, especially in the parts most exposed, the extremities; the muffs and footwarmers of ladies in carriages are to the point. There is a balance maintained in the body which constitutes health, and if the loss of heat be much, we become so cold that we resort to any exercise for warmth. Thus the crossing-sweeper sweeps vigorously at a clean path, the cabman on his stand stamps about and beats his arms, and the tramp breaks into a run. Clothes, by preventing the radiation away of heat from the surface, retain it, and so the feeling of cold is not so great, that is, the surface does not become so cold. Clothes are non-conductors of heat when dry, but let them be saturated with water, and unless the loss of heat be met by increased production, there is a lowering of the body temperature, 'taking cold.' Thus, if exertion be continued, and more heat is produced to meet the loss, until a change of dry clothing is procurable, no injury results. But let the wet clothes be worn without a corresponding heat production, as when children sit down in school in their wet clothes, or the shopboy stands in his moist garments; then there is a rapid loss of heat, a lowering of body temperature, and a cold is 'caught.' So is a cold caught by wet feet, when the heat is radiated away from the feet; if exercise be continued the cold is not experienced. A damp bed gives cold because the moist bedclothes conduct away

the heat, and the body temperature is lowered. This is the more easily produced as in sleep the heat production is limited, and the vessels of the skin are full of blood, so that cold surroundings take away the body heat rapidly. This is why our bedclothes are so heavy as compared to our day clothes. When then a person sleeps in a damp bed, the loss of heat entailed by the dampness of the bedclothes gives a 'cold.' But the body has a power of self-protection, as is seen in the skin becoming dry and marbly on a cold day. The blood circulates through the cold skin in small proportion only, and so the loss of heat is partially arrested. But at the same time the blood accumulates inwardly in the heat-producing area, and more heat is evolved. Thus by diminishing the loss of heat and increasing its production, the body temperature is maintained and health preserved. Taking cold is the result of a disturbance of balance too grave to be rectified. It is easy to comprehend how education and experience will teach a system more or less perfectly how to take care of itself, and regulate the heat production to the exigencies of the body. A person exposed to all weathers habitually comes off scathless, when a person not so inured by habit becomes severely ill. This is the foundation of the idea of 'hardening' children. On the other hand 'coddling' tends, by disuse, to deprive the system of its power of regulating matters. And so the more persons 'coddle' themselves the more susceptible to cold they become, and slighter exciting causes induce colds. The system has lost the self-regulating power given by nature and developed by habit. Again, on the other hand, look at bathing. Custom confines it to hot weather. This is very desirable, as then the higher temperature of the water

takes away less heat, while there is often an excess of heat in the system. But the tub can be continued with advantage all the year round, because the exposure is shorter, and the temporary loss of heat is met by the exercise of rubbing the body dry. The cold tub is an excellent tonic. In bathing, too long exposure to water is followed by loss of body heat and cold. At first there is rapid breathing and an increase in the chemical interchanges which give heat, but this becomes quieter in a little time, and if the loss of heat be long continued the body heat falls and the bather becomes 'chilled.' When J. B. Johnson would swim from Dover to Calais he and his friends never dreamt of the loss of heat which would result from his long immersion, and which ultimately pulled him up short. Leander and Byron swam the Hellespont, where the water was warm, but an equal distance in a Norwegian fiord is impracticable.

The production of a sufficiency of heat at the time obviates all evil consequences, by meeting the loss of heat. But sometimes an interval occurs ere the heat-producing actions are inaugurated; and then the heat production is not met by increased loss of heat, and a feverish condition results. This is the history of a feverish cold. When there is this feverish condition, the treatment consists in giving remedies which increase the action of the skin, i.e. cause a large quantity of blood to circulate through the skin, and so give off the excessive heat. The restoration of the balance constitutes recovery.

Let us now consider the ordinary cold caught after a visit to heated rooms, especially a ball. There has been a high temperature of the surrounding air, and the skin is full of blood, especially after dancing. The

person goes out into the cold air, and catches cold from the loss of heat. Not only so, but if the blood-vessels in their dilated state are caught suddenly, contraction does not follow, but paralysis ensues in the muscular coat of the vessels. Then the large amount of warm blood in the skin prevents the feeling of cold, but the loss of heat is all the greater, and a severe cold ensues. Inflammation of the respiratory organs is very common, especially of the lungs. This is in all probability due to the chilled blood being sent into the lungs quickly, at the same time that cold air is being respired. This loss of tone in the vessels is the more apt to occur if the exposed individual be exhausted; for involuntary processes are affected by exhaustion, though not to the same extent as voluntary efforts. The cold rush of blood into the lungs from the chill caused by cold bed-clothes in getting into bed is the cause of the asthmatic attacks, so called, of elderly people; especially if the circulation be impaired from a diseased heart. In other persons a diarrhœa sets in after exposure; or an attack of indigestion, with an inflammatory state of the stomach; or jaundice; or congestion of the kidneys. The point of least resistance, the weak spot of the system, is the one which suffers.

Now as to the practical application of this. When a person's clothes become wet, a change is desirable as soon as exertion is no longer possible. The loss of heat can be met by dry non-conducting clothes, and especially a warm bed, and by warm fluids which give heat. These may advantageously be composed of some alcoholic beverage, which increases the heat production. But alcohol also increases the heat loss, and so, if the wet clothes are not changed, a draught of alcohol, in causing more warm blood to circulate in the vessels of the skin,

relieves the sensation of cold, but at the expense of the general body heat. Alcohol is obviously not a proper thing to take before going out and being exposed to cold. Some people wonder how they catch cold when their hands and feet are warm. Because the heat which warms the extremities is drawn from the interior, and in maintaining the temperature of the extremities the system suffers. It is like ancient Rome, which maintained her outlying regions until the enemy had nearly seized her centres, and then she recalled her legions to protect her hearth, but too late. If she had done it earlier and left the periphery, she might have put off her own evil day. So it is in the human body. In exposure to severe cold the extremities are left to their fate, and the warm blood gathers round the centres, and the organism survives at the cost of a frost-bitten limb. If the cold-contracted blood-vessels of the frost-bitten limb are suddenly dilated and paralysed by exposure to heat, as immersion in hot water for instance, rapid mortification sets in. Snow water, and then water slowly growing lukewarm, alone are safe remedial measures to be applied locally.

But the consequent fever is not always in direct proportion to the loss of heat; constitution exercises an influence, and the reaction in one is more violent than in another. Habit has its effect, and one inured to cold will get off much more lightly than the individual whose life is spent indoors. There is also a nerve influence not to be altogether overlooked; a very bad form of cold is often caught by a small and active draught playing on a limited portion of the skin. A certain movement of air we do not ordinarily feel, but if its rate of progress is increased, we become distinctly conscious of it. The cold particles of air are more quickly brought in contact

with the skin, and the loss of heat we feel as cold. We all know how different to the feel are iron and wood at the same actual temperature; the iron feels colder because it draws the heat away so much more quickly. The same effect is produced by a draught.

All this is very probable indeed, and the physiological explanation given here falls in with the experience of everyday life.

Many persons always feel unwell with cold feet. It is possible that the coldness of the feet may be the result of general debility, and that the coldness of the feet is merely the acutest sensation associated with general lowering of the body temperature, and which marks the general condition. Chilblains are very common with persons who have cold feet. They come in and put their feet to the fire to warm, the sudden heat paralyses the vessels, and then chilblains follow and form a mass of dilated vessels, forming a blue lump, which may pass into an open sore. Cold feet are to be met by immersion in cold water and then friction with a rough towel; just as persons in cold regions rub each other's noses with snow when frost-bite is threatening.

Railway accidents.—There is not at first sight any difference to be distinguished betwixt a railway accident and another accident; there is so much injury inflicted, but there the matter ends. Not so, however, and the question of shock is most serious. The rate at which a body is advancing affects the result called shock; a rifle-ball gives more shock than an arrow, a cab than a cart, in proportion to velocity, and an express train than a luggage train. Death from shock is a common occurrence in men run over, much more so than if a beam has given way and the person is crushed to an equal extent. Still there is something more in a

railway accident than this; whether the want of preparation to receive it, caused by not seeing the danger, or the helplessness and ignorance of the extent of injury or danger, or what; certainly railway accidents leave impressions on the nervous system unequalled by other accidents. The immediate injury is no measure of the future effect, and a trifling contusion in persons of certain diatheses is followed by much nervous prostration. Probably the future effects are more serious when the person, not feeling much worse at the time, resumes his ordinary work; and exercises his nervous system instead of resting it. This may seem impossible to a superficial observer, but it is the case. The brain feels for all other parts, but it does not feel for itself, and actual injury to the brain mass is unproductive of pain. Where a piece of brain protrudes from an injury to the skull, it is insensitive to pain, and if it is cut off the patient has no suffering. Indeed the brain's insensitiveness to stimuli applied to it has long delayed our knowledge of the function of the different parts of the brain, and baffled experimenters. The evidences of brain failure are found in its functional disturbance and in its increasing incapacity, often growing rapidly. This is fought against with the hope and expectation of 'fighting it off,' and so the ill effects are aggravated and matters made distinctly worse.

When a joint is sprained, the pain occasioned by movement compels one to keep it still; so also in a broken limb, the pain, powerlessness, and altered appearance all combine to cause us to keep it quiet. A stomach, when out of order, ejects its contents and so gets a rest. Diarrhœa after certain food secures the intestines against outrage, and compels attention to diet. Powerlessness, dyspnœa, and even syncope pro-

cure rest for a weak heart, and the painful sensations are directly preservative. But we are so accustomed to exercise a control over the brain and its working, that uneasy sensations, feelings of incapacity for exertion, and lethargy are treated as if crimes or vices, to be met by a sterner exercise of will; and so the failing nervous system is goaded on, as is a jaded beast, until utter exhaustion is the consequence. If care were taken, and the nervous system rested until repair has taken place, many of the after consequences of railway accidents would be obviated; but unfortunately it is not so easy to demonstrate the necessity for this as it is in the case of an injured limb, and the busy man will be back to his labours.

Railway accidents are difficult subjects enough in themselves, but the element of fraud which has been introduced into many of them has done much to complicate the subject, and involved it in many intricacies.

Still it is the bounden duty of a man to give himself rest, and to allow his nervous system to recover itself after a railway accident. As soon as the physiology of the nervous system becomes more generally understood, the question of rest will become an important matter for consideration in the adjudication of damages; and the Companies will no more hold themselves responsible for all the after consequences of an accident where the shaken nervous system is compelled to toil; than they would now be held responsible for the subsequent inflammation of a bruised joint if the injured person had neglected to take due and proper care of it. Of course the original injury led to the inflammation; but the man's own conduct would seriously affect the question of damages.

Still more necessary is it that the nervous system, with its delicate structure and organisation, should be rested after injury in the case of overworked individuals. When there is persistent overwork, then a small exciting cause will produce much mischief, like a slight acute disease in an invalid; the pre-existing condition must be taken into consideration. When men advanced in years are entering into those changes called senile degeneration, a railway accident will often give an impetus to the downward process, and cause an acceleration of rate of progress; but then the changes are inaugurated before.

After a severe shake affecting the nervous system, rest is as desirable, as imperative indeed, as it is after sustained over-exertion; and neglect of this obvious duty is followed by many ulterior consequences of a disagreeable character. When the brain is felt to be becoming less equal to the discharge of its wonted duty, no good but much harm will ensue from persisting in working it; or if the spine is injured and the power of one leg is waning, it will not restore it to persist in using the limb. Use will only aggravate the mischief and foster it, and the failing brain is to be treated as the increasing paralysis is met, viz. by rest and food, by non-stimulant nutrition.

Rest and quietude after a railway accident are as obviously a man's duty to himself as to the Company.

Another of the serious accidents to which man is liable, is hæmorrhage.

Hæmorrhage is the loss of blood either from an artery or a vein. It is of importance to understand this distinction, for by making a mistake the well-intended measures adopted may do harm where they are meant to do good, and ensure the calamity they are essaying to avert.

The blood goes from the heart towards the periphery by elastic vessels called arteries, and in them is found the 'pulse,' that is, each beat of the heart. When an artery is cut, the blood flows in jets corresponding to the beats of the heart and to the pulse. These jets mark that it is an artery that is wounded; and indicate that the pressure must be applied above the hæmorrhage, that is, betwixt it and the heart. On the other hand, the blood returns to the heart by the veins in a steady, continuous flow. When then the hæmorrhage is steady and not in jets, it indicates that the bleeding is from a vein. Here the pressure must be applied to the limb away from the trunk, on the peripheral end of the limb, or below the bleeding. In addition to this, arterial blood is bright scarlet, while venous blood is dark and crimson. But these are matters of comparison, and the presence or absence of jets is the great point of distinction.

When then a person is wounded, a handkerchief must be bound as tightly as may be about the limb; if the hæmorrhage is arterial above the point of issue, if venous below it. Under any circumstances it is best to lay the person down quietly, especially if the bleeding is from the lower limbs. If they faint, let them alone in the horizontal posture. Alcohol has done as much harm as good here, and by rousing up the individual, started the bleeding again. 'The more blood the more brandy,' is the idea with some; and the more brandy the more bleeding is the fact. The brandy or other spirits must not be given unless the unconsciousness is deep and prolonged. There is one form of hæmorrhage, often very severe, which is common, and that is in ulcer of the leg with enlarged veins—varicose ulcer. When hæmorrhage is due to the perforation of a vein by an

ulcer, the person must be laid flat, and on no account raised; and a handkerchief or bandage be tied tightly round the limb, not only below it, but also over it and a little above it, for the dilated veins may bleed downwards as well as upwards, and the amount of blood in the veins above the bleeding is often very great.

Fainting is alarming rather than dangerous. The person should at once be laid flat. If left alone, they fall down, and so the horizontal posture is secured. Fainting persons should never be propped up in a chair or on a couch, but laid flat. In fainting, or syncope, the heart fails to propel the blood to the brain, and unconsciousness follows. But if the person be laid down and the head is brought to the level of the rest of the body, the blood circulates through the brain as readily as elsewhere, and the person recovers from their faint. Eau de Cologne, sal volatile, and smelling salts may be used, but on no account is the question of posture to be forgotten. Fainting may not always be a case of mere heart failure, temporary and evanescent; in a diseased heart it may be the precursor of death.

A *fit* may occur, and when it does it is usually somewhat startling to those around. If an hysterical fit, it is generally in a young woman, who struggles violently. If there is utter unconsciousness it is a graver matter, and indicates either apoplexy or epilepsy. If there is paralysis and absence of motion it is probable that it is apoplexy; if convulsions, and still more if there is froth on the mouth, or a tinge of blood from the tongue being bitten, then it is epilepsy. If it is hysteria, a good dash of cold water, though apparently unkind, is an excellent remedy, and should be resorted to without delay. If it is epilepsy, it is useless and mischievous to hold the patient; all that should be done is to see that the

person does not injure himself, and for this purpose a pillow, or similar agent, is generally more efficacious than several pairs of hands. A cork, a piece of wood, or leather, or gutta percha, may be inserted betwixt the teeth to prevent the tongue being bitten. This is all. Loosing the necktie, unbuttoning the shirt, or cutting a lady's laces, are all well enough; the last being now rarely practicable.

Choking is an awkward accident, to which all are more or less liable, and consists of food either getting into the windpipe, or so blocking the gullet as to obstruct the passage of air. The best thing to do is to call in the nearest practitioner; indeed, this is the plan whenever one is at hand, but that is not always the case. Where time is becoming important the only thing to be done is to try and hook it out with the finger. If it is a mass of food this can often be done; where it is a bone it is not so easy.

Drowning is unfortunately a common accident. Four or five minutes under water, and life is gone. There have, however, been one or two exceptions to this rule, and therefore restoration may be attempted after a longer immersion. The old plan of holding a person up by the heels was very reprehensible, and so was rolling him on a barrel. An enema of tobacco smoke, once so prevalent a custom in the navy, has been found to be quite uncalled for, and is useless. The clearing of the mouth of phlegm, then a hot bath, or brisk friction, are very well as far as they go; their inefficiency being their great drawback. The passing of ammonia to and fro under the nostrils is unobjectionable at any rate. Artificial respiration is the most effective measure. The simplest form is to press upon the chest and abdomen at intervals, leaving the natural

elasticity to suck in some air each time. Dr. Marshall Hall's plan was to roll the body on its face, and to excite artificial respiration by pressure along the back, or rolling the body over on the side; doing this so as to imitate, in time, the natural respiration.

The method adopted by the Royal Humane Society is that known as Dr. Silvester's. It is carried out in the following way. 'The patient is laid on a flat surface on his back, with the head and shoulders slightly raised on a pillow. His arms are then to be grasped just above the elbows, and to be drawn gently and steadily upwards until they meet above the head, in which position they are kept for two seconds; they are then to be turned downwards, and to be pressed for two seconds gently and firmly against the sides of the chest. These movements are to be repeated deliberately about fifteen times in the minute, until natural efforts at respiration are induced, when they are to be discontinued, and the ordinary means to promote circulation and warmth had recourse to.' These last mean friction, hot spirits and water, and a warm bath where practicable.

When a person is drowning and those around cannot swim, one person might do his best to reach him while another held him by the ankles. Any method of seizing a drowning person is justifiable and excusable; hooking him by the readiest instrument being, under the circumstances, quite proper. If the accident has occurred on ice, a stick laid across the opening by which the drowning man can support himself, is of advantage till more substantial aid comes. But the loss of temperature will not permit the immersed person to hold on long.

Fire is a source of danger, and is very destructive to life at times. Spontaneous combustion of the human body when saturated with alcohol is a myth, though

perhaps the alcoholised body does burn more readily than one free from the inflammable fluid. When a lady is on fire, she should not, and ought not to be permitted to run; that fans the flames amazingly. She must be laid down, and rolled up in the nearest woollen article—rug, coat, or blanket. Such wrapping up in a non-inflammable article is a most effective method of extinguishing the flames. Immersion in water is, unfortunately, rarely practicable.

Few things are more terrible than the outbreak of fire in a building, ship, or other limited area. The utmost exertion of self-control is desirable in these appalling circumstances; and in the case of burning buildings more persons usually have died from being trodden under foot or squeezed to death, than from the fire. Each person should attempt, so far as in his power lieth, to control those around him, and to prevent that rush to the door which is so fatal to those over-anxious to escape from the burning building. When there is a prairie fire the hunter sets fire to a space near him, and then takes refuge on that burnt surface when the great fire approaches him.

Children often *swallow coins*, and so cause great alarm. There is little real ground for apprehension under these circumstances, unless the coins are bronze. If the latter, there is some cause for fear that copper poisoning will ensue, and the ready passage of the coin is desirable. This is best effected by meals of figs or pudding, in which the coins are imbedded and so passed harmlessly. As to bulk, whatever will go into the stomach will pass the various straits and emerge again.

Acute indigestion is a source of much suffering, and is most readily relieved by an emetic of mustard and water; the painful sensations are very acute, and relief is eagerly sought. Allied to it is colic, not rarely the

result of a cold indigestible mass. An emetic, alcoholic or otherwise, warm fluids with pepper or ginger, and hot cloths to the abdomen are necessary.

Poisoning happens occasionally, and the quickest method of meeting it is to cause the patient to vomit, and if the poison is, as it often is, an acid, the readiest alkali—wall plaster &c.—is the fitting thing.

But it is little that can be said here as to the adoption of means suitable to the different emergencies; they require rather to be met by the special knowledge which is possessed, certainly to a greater or less extent, by every medical practitioner. All that can be done here is to sketch the merest outline of the things, and rather to combat erroneous impressions than to inculcate any positive ideas.

Lightning.—Persons struck by lightning are not always dead when they appear to be so. There are few recoveries from this state, because no means are tried to restore the sufferer. In the tropics there are many instances of persons struck down by lightning recovering after a heavy tropical thundershower; and it would appear that the cold affusion to the body has a decided action in such cases. The injured person cannot be harmed by the free use of cold water, and if only an occasional recovery took place it would be well worth the pains bestowed. The persons so injured should have cold water poured or even dashed freely over them.

Sunstroke.—In sunstroke, the use of the lancet was almost invariably fatal. The proper treatment is to remove the sufferer into the nearest shade, strip him, and apply cold water freely to the head, neck, and chest. The patient should also be encouraged to drink freely, so as to induce vomiting, which does much good in relieving the congestion of the lungs.

PROPOSITIONS.

1. Animal heat is formed in the interior of the body, and given off by the skin and expired air.
2. Dry clothes are good nonconductors of heat; when saturated with moisture clothes conduct heat readily.
3. Wet clothes do not give cold if the body heat is maintained by exercise; if not, the body temperature falls.
4. 'Taking cold' usually is becoming cold, *i.e.*, having too low a body temperature.
5. Damp beds give cold from the loss of heat they occasion.
6. Bathing, when too long continued, or in too low a temperature, commonly gives cold.
7. An increase of the production of body heat at the time of exposure obviates the evil consequences.
8. If not induced till after exposure, the heat produced forms the consecutive 'feverish cold.'
9. When a person leaves a warm room with the skin glowing, the loss of heat is rapid and considerable, and colds often arise from exposure under such circumstances.
10. The cold may fall on the lungs, or on 'the weakest spot.'
11. Alcohol increases the heat loss more than the heat production. (See Prop. 15, Chap. VI.)
12. Warm hands and feet may actually aid in inducing a cold.
13. A frost-bitten limb may be the price of a life.
14. Draughts of cold air are apt to give 'colds,' from the rapid abstraction of heat they occasion.
15. Chilblains are usually due to suddenly heating cold feet.
16. Feet constantly cold are relieved by brief immersions in cold water, and then active friction with a rough towel.
17. Railway accidents are more serious in proportion to the injury actually inflicted than other accidents.
(This is due to the shock given to the nervous system.)
18. The nervous system requires rest after a shock, as a limb does after a sprain, and the effects of railway accidents are often aggravated by subsequent exertion.

19. Where there is pre-existing overwork, or commencing degeneration, the effects of a railway accident are, cæteris paribus, more serious than in other cases.
20. Hæmorrhage may be arterial or venous. Arterial blood comes in jets and is bright; venous blood is dark and flows steadily.
21. The bandage should be placed above the bleeding, *i.e.*, nearer the trunk, in arterial hæmorrhage; below it, or distally, in venous hæmorrhage.
22. In bleeding from a varicose ulcer the leg must be bound up over the bleeding point, and the person kept flat on the ground with the leg raised.
23. Fainting persons should be left in the horizontal posture until consciousness returns.
24. Persons in a fit should not be held.
    (Care however should be taken to see that they injure themselves as little as possible.)
25. In choking the piece of food should be hooked out with the finger. In hanging, the person should not only be cut down, but the noose round the neck should be removed.
26. Drowning is occasioned by a submersion of four or five minutes.
27. A hot bath, friction, and artificial respiration are the best restoratives.
28. Persons on fire must not run, but throw themselves down and roll, or be rolled, in a woollen article.
29. In acute indigestion and colic, emetics and hot applications are good.
30. In poisoning, vomiting may be induced while medical aid is being procured.
31. When coins are swallowed emetics are useless, and a diet of solid pudding is desirable.
32. In lightning and sun-strokes, cold affusions to the head and chest are useful.

CHAPTER XIII.

CONCLUSION.

THERE are several points not yet alluded to, exercising an influence over the health of humanity, that may be gathered together in a concluding chapter; which always reminds one of a Saturday's dinner. Among these hitherto unconsidered points are the effects of climate, of telluric influences, &c.

As to climate, it is well known that this exercises a profound influence over many people, as well those who are free from actual illness as the invalid. The inhabitants of low-lying, moist districts, as the fens for instance, are braced up, when lethargic, or when convalescent, by the air of Malvern and of Matlock; at other times the inhabitants of high-lying districts find the soft warm air of Torquay, and the southern coast, excellent and pleasing when they are recovering from an attack of bronchitis, or are suffering from gout or rheumatism. In fact, so well known are these effects of change of air and climate, of temperature and moisture, that it is almost superfluous to allude to them. But while certain changes as a general rule are beneficial; the peculiarities of each constitution and their effects must not be overlooked or under-estimated. We have perhaps learnt more from the treatment of pulmonary consumption than from anything, or indeed everything,

else, in relation to the effect of climate &c. upon the invalid, and the course of his malady. At first there came the not erroneously founded idea that if diseased lungs were to have any chance at all of healing, the respired air must be pure, moist, and warm, so as to obviate any irritation, and to put the lung under the most favourable conditions for healing. But, though this plan succeeded well in many, and the shores of the Mediterranean became studded by pretty little towns of villas inhabited chiefly by English and Russian invalids, the effects upon others were the reverse of gratifying. All the advantages of the air in reference to the lungs were more than counterbalanced by the depressing and relaxing effect upon the general health. The respired air was all that could be wished, but the effects upon the system almost paralysed its attempt at repair; and what was gained with the one hand was lost by the other.

Then came the suggestion of a bracing atmosphere in summer, with its tonic effects upon the general health, and some consumptives have resorted to Switzerland and the Tyrol in summer to avoid the depressing effects of heat and moisture, with excellent effect. This is, perhaps, rather a technical subject, but an explanation of an apparent therapeutic inconsistency may not be altogether useless in a popular work. In each case the question of to what climate an invalid must resort will be one to call for careful consideration and grave thought. While it is desirable that a patient be afforded every chance of recovery, indeed it would be cruel to deny it; still it is a serious matter to send a dying fellow-creature away to spend the brief remainder of his days on a foreign soil, far away from the friends

whose society and sympathy have now become so important and so grateful to him.

In the case of the chronically gouty and rheumatic, especially with a dry imperspirable skin or a tendency to bronchial attacks, a sojourn or a residence in a warm, soft atmosphere, is very desirable and beneficial, even curative; not so much perhaps of the general condition upon which the troubles depend, but so far as the troubles themselves are concerned. But for these latter cases the different spas of Europe—Aix-la-Chapelle, Wiesbaden, Kissingen, Carlsbad, Vichy, Barèges, Bath, Harrogate, Buxton, and Woodhall—all are useful and excellent for the cases suited to each; the dilution of the salts, and the quantity of water taken, exercising a decided influence over the curative action.

But while admitting that it is not difficult to comprehend the action of climate and temperature upon persons, we cannot avoid the conviction that there is often something more which is not so readily intelligible. There are persons, and it is fact not to be gainsaid, that are comparatively well at Hastings and yet are ill at Brighton; these two places having many points in common, an identical altitude, a similar southern exposure, south-west winds, and protection from the north. What then is the difference to which these persons are so subtly sensitive? The answer that has been most approved of is that it rests on telluric influences. This does not mean mere geological differences, or the question of different formations; it has rather to do with terrestrial influences on the side of magnetic forces. Be that as it may, the fact remains.

In America we see the effect of telluric influence in the modifications of race very strikingly. The squat Irishman, the broad-shouldered Englishman, the bulky

Hollander, as well as men of lighter build, all produce children of one type—the American of medium height, thin, of sparse beard, and a certain subdued energy, with great endurance, and a language expressive to exaggeration. Alike in the Six Nations, the Aztecs, and the descendants of Spanish conquistadors and Puritan emigrants, the influences of American soil are sufficiently powerful to mould all; alike the wandering Mongol and the Celt, and even more, the Teuton himself. In certain districts too, an unusual stature and grandeur of physique are common, as in those sons of Anak, the Kentuckian and the men of Illinois.

It must be admitted that there are influences, powerful as well as subtle, which profoundly modify man, and show him how much he is under the dominion of his surroundings.[1] It does, indeed, seem strange that conditions as to the nature of which we can but speculate, may determine for a man not only the type, but the stature of his offspring.

In fact, man is to a great extent under the dominion of laws, organic and natural, inexorable and immutable; many matters he has subdued and made subordinate to his will and his aims, but others rule him with unwavering sway. These laws are often termed nature's laws, in contradistinction to God's moral laws, and man's laws, or social laws. We know them by the consequences which follow their infraction; exposure to heat burns, exposure to cold freezes, violence is attended with injury, and if a man falls from a house he will hardly escape from broken bones. These laws are ever in action around us, and we must obey their behests

[1] Nostalgia, or home sickness, is as rare in America as it was in Napoleon's army in Egypt. This has been explained as due to the character of the air, which is bracing and endues the individual with a sense of energy.

or suffer for our disobedience. The result of breaking them is to have to take the consequences, and very unpleasant and serious these consequences often are. Man chafes and sets himself to work courageously enough to grapple with them. The lightning conductor, the steam-engine, and the ship, all tell of man's ingenuity; the drain and the sewer are two great outcomes of his distaste for malaria and pestilences. But after all man is under nature's thraldrom yet.

Man is not a purely reflective creature, and in pursuit of certain aims, objects, and intentions, infringes these immutable organic laws, and suffers therefore. His forgetfulness or inattentiveness arises, according to Combe, from three causes. 1. The imperfect subordination of the animal nature; 2. Extrinsic influences acting upon him; and 3. Ignorance. The animal instincts of man, often acting with almost irresistible force, impel him to commit certain actions whose consequences his better judgment would have foreseen; had not his inclinations blinded him. And yet we must make some allowances, as moral agents, for some men's powerlessness to control their inclination, or to curb their appetites. The brain has its controlling and inhibitory centres which in man ordinarily restrain the instincts or impulses of the animal brain; in others they are defective and comparatively powerless. For instance, the born criminal can no more control himself and restrain the impulse to avail himself of an opportunity to thieve or steal, than apparently can some animals. No matter what the consequences, the momentary impulse is all-powerful and irrestrainable. So in regard to natural and organic laws the infractions of which are committed at the suggestion of momentary

impulse or caprice, the consequences follow with unerring certainty and unswerving directness.

2. The action of extrinsic influences is often a sore temptation; and man can never be sufficiently on his guard against momentary and passing indiscretions which may exercise the most baneful influence over his future. This action is closely bound up with the foregoing, and the curbing of natural inclinations is the training which will best enable a man to resist temptation.

3. Ignorance. This is a fertile source of action entailing disagreeable consequences and unavailing regret. Again and again has this been insisted upon in the foregoing pages; and the fact that ignorance is no tenable plea for extenuation in the action of outraged natural laws, has been frequently insisted upon.

The consequences are in strict proportion to the offence, and the explanation of the motives which led to the offence is nothing. If a man falls from a height, the consequences of the fall are the same, whatever may have been the occasion which led to the fall; he may have been escaping from a burglary or fleeing from a fire, the result is the same. There is not here, as in the consideration of the moral aspects of matter, the question of motive; the missionary and the slave-dealer are alike under the influence of natural laws, and malaria hangs over each. If the missionary is a man careless and reckless of his own health in his thought for others, he will fall before the consequences of broken natural laws; when the slave-dealer, if selfish and circumspect, escapes. Morality has no influence over natural laws, and the sun shines alike on the righteous and wicked.

These natural laws though beneficial and just in

the abstract, seem at times to press unduly upon individuals, and cause extensive and severe suffering as the consequence of action neither sinful nor criminal. And yet man is better and happier under natural laws which are unyielding and inelastic than if he were free from their action. The following fable from Combe's 'Constitution of Man' well illustrates this.

'It happened in a remote period, that a slater slipped from the roof of a high building, in consequence of a stone having given way as he walked upright along it. He fell to the ground, had a leg broken, and was otherwise severely bruised. As he lay in bed suffering severe pain from his misfortune, he addressed Jupiter in these words: "O Jupiter, thou art a cruel God, for thou hast made me so frail and imperfect a being that I had not faculties to perceive my danger, nor power to arrest my fall when its occurrence showed how horrible an evil awaited me. It were better for me that I had never been." Jupiter, graciously bending his ear, heard the address and answered, "Of what law of mine dost thou complain?" "Of the law of gravitation," replied the slater. "By its operation, the slip which my foot made upon the stone, which unknown to me was loose, precipitated me to the earth, and crushed my body, never calculated to resist such violence." "I restore thee to thy station on the roof," said Jupiter, "I heal all thy bruises, and to convince thee of my benevolence, I suspend the law of gravitation as to thy body and all that is related to it. Art thou now content?"

'The slater, in deep emotion, offered up gratitude and thanks, and expressed the profoundest reverence for so just and beneficent a deity. In the very act of doing so he found himself in perfect health, erect upon the ridge of the roof, and rejoicing gazed around.

His wonder at so strange an event having at last abated, he endeavoured to walk along the ridge to arrive at the spot which he intended to repair. But the law of gravitation was suspended, and his body did not press upon the roof. There being no pressure there was no resistance, and his legs moved backwards and forwards in the air, without any progress being made by his body. Alarmed at this occurrence, he stooped, seized his trowel, lifted it full of mortar, and made the motion of throwing it on the slates, but the mortar freed from the trowel hung in mid-air—the law of gravitation was suspended as to it also. Nearly frantic with terror at such unexpected novelties, he endeavoured to descend in order to seek relief, but the law of gravitation was suspended as to his body, and it hung poised at the level of the ridge, like a balloon in the air. He tried to fling himself down to get rid of the uneasy sensation, but his body floated erect, and would not move downwards.

'In an agony of consternation he called once more upon Jupiter. The God, ever kind and compassionate, heard his cry and pitied his distress, and asked, "What evil hath befallen thee now, that thou art not yet content? Have I not suspended, at thy request, the law which made thee fall? Now thou art safe from bruises and from broken limbs; why then dost thou still complain?"

'The slater answered: "In deep humiliation I acknowledge my ignorance and presumption. Restore me to my couch of pain, but give me back the benefit of thy law of gravitation."

'"Thy wish is granted," said Jupiter in reply. The slater in a moment lay on his bed of sickness, endured the castigation of the organic law, was restored to

health, and again mounted the roof that caused his recent pain. He thanked Jupiter anew from the depths of his soul for the law of gravitation with its numberless benefits, and applied his faculties to study and obey it during the remainder of his life. The study opened up to him new and delightful perceptions of the Creator's beneficence and wisdom, of which he had never even dreamed before; and these views so excited and gratified his moral and intellectual powers that he seemed to himself to have entered on a new existence. Ever afterwards he observed the law of gravitation, and in a good old age, when his organic frame was fairly worn out by natural decay, he transmitted his trade, his house, and much experience and wisdom, to his son, and died thanking and blessing Jupiter for having opened his eyes to the true theory of his scheme of creation.'

This is a deeply instructive fable, and demonstrates to us how much we would have to forego of that which gives us acutest pleasure if the organic laws did not exist. That breaches of moral laws are as certain in their results as infractions of natural laws is highly probable, if we could but trace their working; and in time doubtless we will no more commit breaches of the moral laws than we now infringe the organic laws—simply from an intelligent comprehension of the consequences that will follow. The working of moral laws is apparently influenced by the motives of actions which palliate or extenuate the actions; but of this we must not be too certain.

Much depends upon education and the manner in which we are brought up and taught to regard things. The mind needs as careful education as does the body during the period of growth in each, and the develop-

ment of each is greatly influenced by extrinsic forces and the manner of the education. General exercise, and special exercise of the various parts of the body, are requisite for perfect development; and again a quotation will serve to point this better than any words of the writer can express it.

'When any living part is called into frequent and regular exercise, especially if the system is not yet arrived at full maturity, it is observed to become gradually more and more susceptible of action; to increase in size within certain limits determined by the constitution, and thereby to gain strength, as indicated by an increased power of enduring fatigue, and a greater capacity of withstanding the influences of the common causes of disease to which previously it would have yielded almost immediately. The physiological explanation of this, as found by experiments, is, that exercise causes an increased action in the nerves and blood-vessels of the part, by which its vitality is augmented; and a greater supply of blood and nervous stimulus sent to it to sustain and repair the greater waste that is taking place, and also to supply additional substance to fit it for the unusual demands made on it. The results of this process are visibly exemplified in men whose habits or profession lead them to constant muscular exertion: in sportsmen for instance, in blacksmiths, dancers, and porters, &c., and if it is less manifest in other parts of the body besides the muscles, it is only from other tissues admitting of less expansion, and showing their increased power in a different way.

'The improvement of the memory is a familiar instance of an increase of mental power produced by exercise; and the beating sense of fulness and quickened circulation in the head induced by intense study or

thought, shows that an organic process goes on when the brain is in activity, similar to that which takes place in the muscular system under exercise. On the contrary, when the organ is little used, little expenditure of its power and substance takes place, little blood and little nervous energy are required for its support, and therefore little is sent: nutrition in consequence soon becomes languid, and strength impaired. To all these laws the brain is subject equally as the rest of the body. Frequent and regular exercise gives it increased susceptibility of action, with power to sustain it, the nervous energy acquiring strength as well as the vascular. Disuse of its functions, or, in other words, inactivity of intellect and of feeling, impairs its structure, and weakens the several powers which it serves to manifest. The brain, therefore, in order to maintain its healthy state, requires to be duly exercised; and as it consists of several parts, each performing its proper functions, and as what holds good with the whole collectively, is equally true of each part individually, it follows that for healthful and adequate exercise every function requires its due share of employment; else not only do the portions assigned to inactivity become impaired, but the general health becomes deranged by the irregular distribution of nervous stimulus thus occasioned. But such is the nature of the mental functions, that each must be excited by its proper stimulus, or both it and the portion of the brain subservient to it, are consigned to inactivity and consequent loss of power. No one would think of exercising the eye by sound, or the ear by colours. The effect of mere quiescence arising from the want of appropriate stimulus is signally manifested in the case of persons, and especially of the young, who in one situation manifest certain

faculties very feebly, but who, when removed to another in which appropriate and adequate stimulus is applied, evince powers such as they were never previously supposed to possess. When we consider how few of all the faculties which the mind possesses are duly exercised in the courses of education, both for males and females, which prescription, prejudice, and fashion have ordained, we can have little difficulty in comprehending how nervous derangements of various kinds result from causes so efficient in producing them.

'An appropriate example may be found in the case of a nervous young lady, whose education has communicated nothing but accomplishments, who has no materials of thought, and no regular and imperative occupations to interest her and demand her attention; who takes no active part in promoting the welfare and comfort of those about her, who looks to others for support and sustenance, and whose brain is in fact half asleep. Such a person has literally nothing on which to expend half the nervous energy which nature has bestowed upon her for better purposes. She has nothing to excite and exercise the brain, nothing to elicit activity; her own feelings and personal relations necessarily constitute the grand objects of her contemplations; these are brooded over until the mental energies become impaired; false ideas of existence and of Providence spring up in her mind; the fancy is haunted by false impressions, and every trifle which relates to self is exaggerated into an object of immense importance. The brain, having literally nothing on which to exercise itself, becomes weak, and the mental manifestations are enfeebled in proportion, so that a person of good endowments, thus treated, will often exhibit something of the imbecility of a fool. But suddenly change the circum-

stances in which such a person is placed; suppose, for example, that her parents lose their health or fortune, and that she is called upon to use her utmost energies in their and her own behalf, that in short her brain and mental faculties, her intellect and her moral and social feelings are blessed with the stimulus to act; the weakness, the tremors, the apprehensions which formerly seemed an inborn part of herself, disappear by enchantment; and health, vigour, and happiness take their place, solely because God's law is now fulfilled, and the brain, with which He has connected the mind, is supplied with that healthful stimulus and exercise which He ordained to be indispensable to our comfort and happiness.'[1] (Barlow). How much cause then have those, who regard themselves as most unfortunate in being poor, to be thankful for, that they are preserved against indolence and its consequences by the necessity for exertion!

The lot of woman is singularly unfortunate in matters of physical education, and if the mind is frequently untrained, the body also commonly suffers from the trammelling effects of those causes which tend to dwarf the mind. That exercise which is necessary to healthy bodily development is too often denied, and an unfortunate girl is coerced and restrained from the natural activity of youth under the plea that it is indecorous. 'Even under the favourable circumstances of country life, they are too much restricted from the free exercise which health requires. Their very dress unfits them for taking it, and the alleged indecorum of those active movements to which youth and spirits

[1] Such restoration, however, is only possible before the functional inactivity has actually led to organic changes in the brain-cells. After that, the stimulus would only cause more complete prostration.

instinctively incite, is a bar to even the attempt being made. If this be true of the more hale and robust inhabitants of the country, how much more forcibly does it apply to the delicate and attenuated residents of towns, and especially to the inmates of female schools. Of these establishments the systems and habits require much revision, and until some effective reformation takes place, of which there is yet but little prospect, they will not fail to excite our sympathy and regret for the blanched aspects, shadowy forms, and sickly constitutions so continually presented, and which it is so painful to witness. Such beings are as little fitted for encountering the toils or fulfilling the duties of life, as are plants of a hothouse for being transferred to the open borders.'

At a time when so much is said about woman's rights, and of the desirability of her entering the lists of competition with man in the struggle for existence, could not something be done towards giving woman a healthier education, mental and bodily; a more suitable training to make her that for which Providence designed her—the healthy vigorous mother of our children, the affectionate and competent tyrant of our domestic life.

During the long decline and decay of the Roman Empire, the physique of the Roman was maintained by the scrupulous attention paid to the health of their women, and the effect this exercised over the physique of their progeny.

The combined training of mind and body in both sexes is a matter calling for the strictest attention, and training exercises the gravest influence over the development of the individual. You cannot have 'figs of thistles, nor grapes of briars;' but care and patience

developed the apple in its numerous forms from the crab; and the varieties of plums from the sloe—under those grand old gourmands and gardeners the monks. Much may be done by cultivation, and the rude, boisterous lad often develops into the most energetic man. Self-cultivation is the most important matter after all; and school education but serves to fit persons, and often very inefficiently, for the real education of life. How frequently do we see men settling down to a drone-like, indolent, selfish existence after a brief and brilliant college career; and suddenly ceasing their efforts when they had just reached the point that their work was beginning to have in it the possibilities of worth; when they could have entered upon a career which might have made them useful to their fellow creatures, and enabled them to make some return to the world for what the world had done for them. Or again, what a satire upon all information, all education, all knowledge, is the finishing school of girls! Finishing of what; in the name of common sense? Surely not the bitterest misogynist would wish to see woman's information restricted to the superficial acquaintance with different subjects, which is the utmost extent of knowledge given by a finishing school. No wonder women bow tamely to the dictates of a fashion which has the effect of attempting to make them look hideous as well as being ruinous to their health, or persist in a mode of life which is as mentally destructive, as it is sanitarily injurious, because it is the fashion, and neither more nor less; or feel surprised that others, in their energetic revolt against such a state of matters, should go to the opposite extreme of rushing into professions, making public appearances, and glibly discussing subjects their grandmothers would have blushed carnation to think of.

Before man is very severe in his censure upon woman he must first search diligently and enquire if he has done his duty fairly and honourably by her; and until such time as he can fully demonstrate this, it may be well to withhold severe reprehension.

Perhaps he might advantageously commence by setting an example in himself; and when man has become more thoughtful, earnest, broader-minded, and better informed, he will be all the better able to set about the regeneration of woman, and the reformation of feminine habits and practices. It would be well for all to remember the saying of an old writer, 'He lives long that lives well; and time misspent is not lived but lost.'

And now, gentle reader, we must take farewell of each other with the courtesy which is due from those who have journeyed some distance in company.

During this time some instruction may have been imparted, which may have rendered the perusal of these pages not altogether unprofitable, and rewarded the reader for his attention and his expenditure of time. Nothing renders the labour of a writer so much a pleasure, and so little a toil, as the satisfaction of the reader. But as it is not possible for the writer to arrive at a knowledge of this, he endeavours to acquire a substitute for it in the hope that it will be so; that the reader has not given up his self-elected task in disgust or despair, but that he has continued his perusal to the end with unimpaired ardour and undamped enthusiasm, and has closed the volume with a sense of satisfaction which manifests itself in a lingering look at the final sentence. Such is the pleasing vision each writer would wish to call up; the airy castle

erected by his daydreams. Reality, stern and practical, often sweeps away the pleasant illusion, and substitutes for it the incisive review, and the contemptuous casting away of the volume almost ere its perusal is commenced.

But hope whispers ever its flattering tale, and enthusiasm gathers together the scattered fragments of self-pride; the process of construction is once more inaugurated, and the glow of fancy once more gilds with its halo of light and play of colour the erection of the imagination. The new work will surely be born under happier auspices, be fostered by more favouring circumstances, and be reared by a wider experience and built up on a broader basis of knowledge. Such is the trust of every author. But how far the graceful erection of his imagination, tinted by his aspirations and fashioned by his hopes, will be in harmony or form a contrast with actual reality—plain, imperfect, and even deformed—he scarcely ventures to conjecture, and strives to shut out the contemplation of the gloomier prospect. What a profusion of literature, of erroneous views and cramped fancies, of deliberate untruth and fierce fanaticism, would have perished in the egg, if the aspiring author could but have had one momentary glance in the magician's mirror, and seen his book, about which he is so enthusiastic—the very contemplation of which sets his heart beating fast and brings a glow to his cheek—lying on the second-hand bookstall with its leaves uncut, and the gilt lettering of its title still untarnished by time; nay its very material only preserved from the polluting and desecrating touch of the butterman's hand out of consideration for his feelings, whilst the publisher writes down its cost as a dead loss. If, I say, but one prophetic shadow could be projected across his day

dream, from what would it not save us? Such peering into the future is impossible; and consequently hope holds out the cheering prospect of possible success.

But success, mere success, is not all that is to be looked for and secured. Many works are eminently successful, and yet their career is most brief. Written to harmonise with passing opinion, when those opinions become relegated to the dead past, the literature which embodied them passes away with them. Success, temporary success, is too often a mere matter of tact rather than skill; not so much due to the knowledge of the individual as to his quick perception of the public wants or desires, and of his readiness to meet or anticipate them. These are the means which attain the earliest success; but such work rarely holds its position long. The intention of the book is the really essential matter; and if its intention be sound and its information trustworthy, success, though it may be long delayed, will come at last. It may happen that some of its most important information is information for which there is no demand; the world does not feel any interest in the matter, has not begun to take the question up; and those parts must just wait until the world wants them, and then it will find them; and not before. There is no blame to be imputed to the world for that; it cannot be expected to appreciate information on matters with which it is not even acquainted. Once introduced to them, and then the acquaintance quickly develops into familiar intercourse. How many people are there with whose society we should be unquestionably delighted when we come to know them, but about whom we are profoundly indifferent for the excellent reason that we do not even know of their existence? Neither if met casually have we any opportunity of learning how much

there is with which we may be pleased. And so with knowledge and information. It is very probable that such a matter as physiological bankruptcy, though entertained by Liebig thirty years ago, is one of those subjects for which the public interest is not yet ripe. In a few years it may be enthusiastic on the matter. It is a well-known fact that certain procedures, inventions, &c., have to be introduced, or rediscovered, several times ere the world is ready and fitted to take them up; and when at last it does, it troubles itself very little about the past history of the subject. There are other things than men that are born before their time!

In the preparation of a little work like this there is little to be adventured, the subject matter has been before the public for some time, and there is a growing familiarity with the matters discussed. This is especially true of hygiene. The world is becoming vividly conscious of the disastrous consequences of dirt, uncleanliness, and filthiness. No matter where or of what character, accumulations of waste and filth in close propinquity to the habitations of man endanger his existence. The devastating plagues of the insanitary dark and middle ages are now becoming things of the past, though what we know of the spread of cholera points with warning finger to the causes of epidemic disease. On this subject there is no need to rouse or awaken public opinion; it has received two or three rude shocks of late years which have effectually disturbed its slumbers. What is to be feared is that a too confident belief in Health Acts, and the potency of disinfectants, will again furnish an excuse for further slumber. It would seem, indeed, that a persistent knocking at the door, or constantly recurring demand upon the attention, is absolutely requisite to attract the world's notice and

divert it for a brief period from the absorbing occupation of the accumulation of wealth. The importance of an intelligent attention to the necessities of growth; a knowledge of the baneful consequences of too early toil, or precocious and premature indulgence in neurotics, no matter of what description; a clear comprehension of the injurious action of overwork; a nice conception of the desirability of combining intellectual and physical exercise and cultivation, and of their mutual action and reaction; an acquaintance with the pernicious results of certain habits and practices, extending from mental strain to indulgence in stimulants: all are as necessary to man, to his health, his comfort, and his length of days, as are public waterworks and the innocuous disposal of sewage.

That there is not a more widespread knowledge on these matters is not a subject for surprise. No long time has elapsed since the discovery of the printing-press, and hitherto man has been mostly engaged in the perusal of that with which he is most familiar; the revelations of science being far from either the most or least conspicuous matter, but still occupying a position unworthy of their importance. On these matters man is but at the commencement of his career: even yet he trembles at the thought of what theologians may have to say, and how far his intellectual pursuits may clash with pre-existing beliefs. As yet the question 'Has man really advanced in happiness in proportion to the increase in the knowledge of the natural man?' meets with but an uncertain answer, from lips which still quiver at the thought of their own audacity. Ere long the answer will come ringing with the sound of conscious truth, and man, amidst other things, will awaken to the full conception and understanding of that precept

which tells us that 'cleanliness is next to godliness.' Where ignorance prevails there is much suffering, individual and general; and the increasing spread of knowledge will carry mankind forward on the surge of its waters; and intellectual evolution will rapidly free humanity from the fetters of superstition.

The teachings of history, the experience of past ages, tell us in no hushed tones that there exists no reason for limiting our estimate of what man may yet accomplish. Far from it indeed! Retrospection bids us hope, and prophetically tells us of a future stretching away before us where civilisation and knowledge are the pioneers, and points to a time when man will find the earth fitted to his needs, a globe matured to meet his wants. We need no 'coming race' to teach man to trust his inborn powers, to follow confidently his hidden intuitive forces—fast blooming into active life. The day is coming when man will stand free to make the best of himself in this world of God's—given to him as a heritage. The first dawnings of that day are to be seen in the rays of light already illuming the mountain peaks—the great intellects of our times, and tell us by unmistakeable signs that the day of man's deliverance is coming, when the dominion of disease and dirt shall no longer reign over him; when it shall become possible for man, even in the midst of mighty masses of aggregated humanity, to live in health—secure under the laws of sanitary science and protected by a philosophy now advancing with giant strides; when it shall become practically possible for man so to live that he may reach a green old age; when he has put ignorance and its hosts beneath his feet, and can look back with satisfaction and forward with confidence.

Instead of looking back with longing eyes to a

golden age in the past, the fabulous creation of dead dreamers, man will gaze steadily forward until he sees in front of him and around him a land of promise—a second Garden of Eden, the outcome of his own industry, of his own steady perseverance, more suited to him and his needs than that from which he was originally expelled, and will feel that he has earned it by the sweat of his brow. In time, indeed, man may remove many of the effects of the primal curse, and acquire for himself an earth which will more and more approach his ideal land; until indeed, as some say, a millennium will be reached, when man is at last fitted for true happiness and prepared for the rule of perfect justice and love.

'In consequence of his profound ignorance, man, in all ages, has been directed in his pursuits by the mere impulse of his strongest propensities, formerly to war and conquest, and now to the accumulation of wealth, without having framed his habits and institutions in conformity with correct and enlightened views of his own nature, and its real interests and wants. Up to the present day, the mass of people in every nation has remained essentially ignorant, the tools of interested leaders or the creatures of their own blind impulses, unfavourably situated for the development of their rational nature; and they, constituting the great majority, necessarily influence the condition of the rest. But at last the arts and sciences seem to be tending towards abridging human labour, so as to force leisure on the mass of the people; while the elements of useful knowledge are so rapidly increasing, the capacity of the operatives for instruction is so generally recognised, and the means of communicating it are so powerful and

abundant, that a new era may fairly be considered as having commenced.'

So wrote one now resting in the grave; one who would rather bid us hope and look to the promise of the future, than find an excuse for inaction in the contemplation of the past, and who as a popular writer, in his day and generation, gave encouragement to many to trust the living present and to have faith in man and his destiny. If what is written in this little work may be found ultimately to have been of any similar service; and to have borne a part however humble in the inculcation of similar views of physiology and its bearings upon health; to have taught man but another letter in the alphabet of general knowledge, or even made one letter more distinct to him: it will be a source of no small satisfaction. Whatever the result, I can say sincerely,

I writ it also out of great goodwill
Unto my countrymen.

PROPOSITIONS.

1. Change of air is wholesome in some cases. The cold air of high-lying places is bracing, that of low-lying plains is warm and relaxing.
2. Constitutional peculiarities modify the effects of change of air.
3. Cold air in summer suits some consumptives, and a warm climate in winter is best for others.
4. Change of air may be attained by a visit to a spa, with advantage in many cases.
5. There are also telluric influences which are important to some persons.
6. The effects of telluric influences in modifying the physique of native-born Americans are striking.

7. Man is under the dominion of immutable natural laws, and suffers when he breaks them.
8. Impulse, temptation, and ignorance are the great causes of man's violation of the natural laws.
9. General and special education are desirable for all.
10. Action of a part leads to greater development of it: disuse leads to a less perfect condition.
11. The brains of many persons are not developed by proper stimuli, and so remain in an imperfect condition of limited power.
12. Cultivation alike affects mind and body.
13. The effects of defective education are more marked in women than in men.
14. There is every reason to believe that man's happiness will be increased by the growth of knowledge.

APPENDICES.

I.

Chapter II., Proposition 15.

On this matter I wish to quote a passage or two from Lawson Tait (Hastings Prize Essay, 1873). He says, in speaking of a form of trouble to which girls are subject at puberty:

'In the case which I have narrated, my first advice was, that the patient be removed from school, and that for six months, all instruction, especially in music, should cease. I notice music especially, for I am quite certain that instruction in that art, as carried out in boarding-schools, has to answer for a great deal of catamenial mischief. To keep a young girl, during her first efforts at sexual development, seated upright on a music-stool, with her back unsupported, drumming vigorously at a piano for several hours, can only be detrimental. It is usually the habit of those who superintend the education of girls to make no difference whatever in their physical and mental exercises during certain periods; and at a time when the great necessity of the system is perfect rest, laborious efforts have to be made. This is most pernicious, and I have repeatedly had to trace to it the existence of serious disease in young ladies. Musical exercises are especially hurtful for the further reason that music, in those who are devoted to it and gifted with its necessary peculiarities, is a strong excitant of the emotions: while to those not so gifted, and who do not care for it, it is an intolerable and useless burden.'

He further makes some remarks deserving of wider dissemination than is permitted by the pages of a Medical Journal.

'There is a good deal to be done in moral treatment. It may only be a coincidence, but I have noticed these troubles chiefly in girls who have had no brothers, or brothers only younger than themselves, and I am quite certain that great harm is done to many girls by their rigid seclusion in youth from the companionship of boys. Under proper supervision no wrong could happen from more unrestricted association of boys and girls at their critical periods; and it seems to me that it is a mischievous plan to draw wide barrier-lines between the sexes at a time when they ought to begin to understand themselves and each other, and by harmless intercourse many of the risks may be obviated which afterwards beset them when an unaccustomed association is opened out at an age when passion has the chief ascendancy.' (*British Medical Journal*, June 6, 1874.)

On these appropriate remarks of Mr. Tait's I make no comment, but merely endorse them.

II.

Chapter III., p. 16, and Chapter V., p. 23.

The problem of how to secure the feet against external moisture and yet to admit of the perspiration evaporating effectually has attracted much attention amongst practical bootmakers. The plan of having a layer of cork betwixt the inner and outer sole is good, but can never be popular with ladies in consequence of the thickness of sole so produced. A thin layer of gutta-percha or indiarubber is found to work out at the edges, so that it has to be abandoned from its unsightliness. The last suggestion is to subject the leather forming the outer sole to a process which makes it impervious to damp, the leather so treated being termed 'anhydrous' by the patentees. Mr. Dowie of West Strand, the well-known

authority on 'The Foot and its Coverings,' has furnished me with a pair of shoes containing this material. They seem, so far as I can observe, to fulfil the different requirements, are dry on wet ground and are comfortable on warm days. Ladies' boots made with these anhydrous leather soles would be at once sightly and protective in walking out on cold or damp subsoils.

Chapter III., Proposition 6.

Perhaps of all foreign customs, one of the most difficult for Englishmen to embrace at first is the waist-belt of warm climates. Having tried it they adhere to it, however. It maintains the heat of the abdomen, and protects it from sudden changes of temperature, which are a great cause of bowel attacks and allied complaints. It is a useful article, not to be despised.

III.

Chapter VIII.

The grimmest summary of the effects of inheritance ever penned is that of 'Junius,' in his denunciation of the Duke of Grafton, the descendant of one of the natural children of Charles the Second. He writes: 'The character of the reputed ancestors of some men has made it possible for their descendants to be vicious in the extreme without being degenerate. Those of your Grace, for instance, left no distressing examples of virtue, even to their legitimate posterity; and you may look back with pleasure to an illustrious pedigree, in which heraldry has not left a single good quality upon record to insult or upbraid you. You have better proofs of your descent, my Lord, than the register of a marriage, or any troublesome inheritance of reputation. There are some hereditary strokes of character by which a family may be as clearly distinguished as by the blackest features of the human face. Charles I. lived and died a hypocrite. Charles II. was a hypocrite of another sort, and should have

died upon the same scaffold. At the distance of a century, we see their different characters happily revived and blended in your Grace. Sullen and severe without religion, profligate without gaiety, you live, like Charles II., without being an amiable companion; and, for aught I know, may die as his father did without the reputation of a martyr.'

The bitter invective with which this charge is hurled is something terrible; and altogether the passage is a remarkable one.

Chapter IX., Section 8.

This reserve fund of force in the system is that fund by means of which life, together with manifestations of energy, is maintained after all food and drink are withheld. The ordinary period during which the human system can live entirely upon its reserve fund is usually from eight to ten days; if a little water be obtainable the period is longer. Man's reserve fund then, is about nine days' needs, or in other words, man has a reserve fund of force equal to the needs of nine days on the average, and this is his body capital of force. From this he borrows by stimulants, and repays the loans from the force furnished to him as food. In healthy men this fund is unimpaired, and forms a sufficient reserve, especially when some food is additionally furnished; and that is feasible in most diseases. The man who is exhausting himself by stimulants is diminishing this reserve, and thus becoming gradually bankrupt.

Circumstances exert much effect upon this reserve fund. In cold climates the accumulated stores of fat are soon burnt up in maintaining the body temperature, and a brief abstinence from food and drink would be much sooner fatal in Arctic than in tropical regions. The prolonged fast of the crew of the 'Arracan,' who were for thirty-one days in a boat in the Indian Ocean, seventeen days almost absolutely without either food or drink, was only possible because the accumulated stores of material convertible into force were not consumed in maintaining the body temperature; as would have been the case in a colder clime.

The waste in the different organs in starvation is instructive. The fat wastes to the extent of 93 per cent.; then the blood and viscera; and lastly and least, the nervous system. The organic system, the force-producing division of the body, is that chiefly affected, and the force-manifesting division, maintained by the organic system, suffers least diminution. It is supported at the expense of the organic system.

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