

Domestic medicine.

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powerful flash of lightning, while from the largest single circle ever constructed, not the slightest chemical effect can be exhibited. On the other hand, a small single circle, composed only of a few square inches of copper and zinc, will temporarily magnetize a large bar of iron, while a powerful voltaic trough will not magnetize a lady's sewing needle. Throughout the whole of the practical details of the electro-magnetic apparatus, a far greater amount of carefulness of workmanship is required than in those of the voltaic one. Thus, the whole of the joinings of the conducting wires require to be in perfect metallic contact, and carefully isolated, whilst the electro-chemical communications may be transmitted through the medium of a wire fence. The inventor lately exhibited an experiment which proves the practicability of this application.

In this case, the communicator and indicator were attached to the contrary extremities of an iron wire fence of a length of 1800 yards, when a number of signals were despatched with the greatest facility. This economical adaptation will doubtless render it worthy of the attention of railway proprietors, as a metallic fence may in this manner be rendered doubly useful.

DOMESTIC MEDICINE.

MEDICINE is defined to be that science which treats of the means most effectual for the prevention of disease, and for removing it when it does actually exist. The first part of this definition will be chiefly kept in view in the following article, which is intended to be more of a chart, to point out the various rocks and shoals on which a strong constitution may be injured, or a weak one shattered to pieces, to guide the frail bark in safety over the sea of life to the desired haven of "green old age," than to encounter the difficult task of saving it after being engulfed in the whirlpool of disease. This, in our opinion, is the only legitimate object of a treatise on medicine, written expressly for the benefit of the non-professional reader. The curing of disease is completely beyond his province. To attempt such a thing would be to act the part of a blind man with a club, who, hearing a struggle between nature and disease, deals random blows around him. If he strikes disease, he kills disease; if he strikes nature, he kills nature. Let us leave the curing of diseases, therefore, to those who have spent a lifetime in acquiring a knowledge of them; who thoroughly know the mechanism and intimate structure of our bodies; who are perfectly acquainted with the different properties of remedies, and the various modes of applying them; and who can bring the light of science to bear upon the practice of their profession.

CHAPTER I.

HISTORY OF MEDICINE.

At first sight a person may be apt to think a sketch of the history of medicine a dry and uninviting subject. He has probably heard of Esculapius, Hippocrates, Galen, Harvey, Sydenham, Boerhaave. He has some faint idea that they were great names in medicine; but at what age they lived, or what peculiar claims they have upon the grateful remembrance of posterity, he has not the most remote conception. The history of medicine is so intimately connected with the history of literature in general, the progress of civilization, the development of the human mind, that it cannot fail to be interesting to every inquiring member of society; a view of the various phases which the science has assumed, is both useful and instructive, as showing that from some of the false notions of the ancient physicians have arisen many of the popular errors respecting disease and the causing of it, that exist at the present day.

In the first ages of the world, man chiefly led a pastoral life. He was subject to few of those laws which civilization has now imposed upon society; he was in a great measure left to follow the instincts of nature, as to his eating and drinking, and other habits; his tastes were as yet uncorrupted by luxury, and his constitution unimpaired by vice; it is not

then to be wondered at that his diseases were very few and very simple. To show us that they were far from having attained that complexity of character which now calls for the utmost skill of the physician, we have only to look at the present condition of man in his primitive state. In the "far west" of North America, where the country is still in the quiet possession of the Red Indian; where the foot of the white man has scarcely yet trod; where the contaminating influence of civilization has not yet poisoned the atmosphere, and infected the natives with habits of intemperance and other vices, the savage enjoys an extraordinary immunity from disease. Even from the very curse that was originally pronounced on Eve and her daughters, woman in her natural state seems almost exempt. In the frequent marches from one part of the country to another, the women and children of an Indian tribe are placed in the rear; and it is no unusual thing to see a female, when about to give birth to a child, step aside accompanied by another female, bear her child, bundle it up, and again overtake the marching tribe; so little is she influenced by those pains which are well known to be more severe, the more artificial the life of the woman.

During the patriarchal ages of the world, the history of the art of medicine is lost in mystery and fable. But however few the diseases, and however simple the remedies employed in these early times, we have reason to believe that considerable attention was paid to the healing art; for in the most rude and barbarous nation that has ever yet been discovered, a system of medicine, and a knowledge of a number of remedies, have been found. The art of surgery was undoubtedly the first branch of medical science that was cultivated, and the department chiefly followed by the most ancient physicians; very probably from the circumstance, that man in an uncivilized state would be frequently exposed to wounds and bruises, that his attention would thus be directed to the use of means for stopping the flow of blood, for protecting the wound from the air, and so forth. By-and-by he would have recourse to some expedient when affected with internal pain. Remedies would thus be tried at random; some would fail; others would succeed; experience would be gained, and in this manner would the art of physic gradually come into existence.

It was a notion universally prevalent amongst heathen antiquity before the days of Hippocrates, that the origin of disease was to be attributed to the anger of the gods, and means were therefore adopted to appease their wrath. In these circumstances the priests were had recourse to; and hence we find, among all the ancient nations, religion and physic combined, and the priests the only physicians. The Egyptian priests, at a very early period of the world's history, possessed almost all the knowledge of the arts and sciences that then existed. They, moreover, did not neglect the science of medicine; but they surrounded it with such impenetrable mystery, that they made much greater use of charms and incantations than of any actual remedy. They regarded magic and divination as the highest branches of the profession, and these were exercised solely by the chief priests—the study of disease and its treatment were left to a subordinate grade. Among the Jews, also, the priests were the only practitioners of medicine; but their practice was much more rational, and seems to have been guided by a superior intelligence. They confined their attention almost exclusively to the prevention of contagion, by separating the sick from the healthy, by the strictest attention to cleanliness, using frequent ablutions, and by the use of a few uncertain medicines.

From Egypt the art of medicine was carried to Greece, where it was practised with such success by Esculapius, about 1192 years before the Christian era, that after his death he was raised to the dignity of a god, and temples, in which he was worshipped with divine honours, were raised to his memory in various parts of the kingdom. The priests of these temples were the only practitioners of his art; to them the sick of all classes resorted; and, as the trade was lucrative, it is natural to suppose that they would endeavour to profit by their experience, to enlarge their number of reme-

dies, and to become skilled in their profession. We accordingly find that there was considerable jealousy between the priests of the different temples, that the one tried to rival the other in their number of cures. A stock of knowledge was therefore preserved, and handed down from one set of priests to another; and tablets describing the symptoms and recording the cures were hung up in each temple.

The skill of these priests, founded, as it was, on observation and experience alone, without the least knowledge of the construction of the human body, the nature of disease, or the properties of medicines, must have been very often at fault; and we have good grounds for suspecting, that when at a loss for a remedy, they found that a charm answered their purpose equally well, and took advantage of the superstition and ignorance that prevailed, to work upon the imagination of their patients, and act the part of crafty knaves.

Greece gradually rose in the scale of civilization, philosophy and the arts were cultivated with the greatest ardour and success, and it would have been very improbable that the science of medicine should continue at the low ebb in which we have seen it to exist, or that it should remain in the temples of the priests. Accordingly, between four and five hundred years before the Christian era, a set of men arose who devoted themselves solely to the art of physic, and spread over the country as regular medical practitioners. The most celebrated of these was Hippocrates, who has justly received the designation of the "father of medicine." He was born in Cos, B.C. 460, an island famous as having been the birth-place of the greatest physician, and of Apelles, the greatest painter of that age. The master-mind of Hippocrates rescued the science of medicine from the trammels of superstition, and the delusions of a false philosophy; instead of attributing the origin of diseases to the direct agency of Heaven, he assigned it to natural causes; instead of trusting solely to experience and observation, he taught that, in addition to these, we should endeavour to acquire the knowledge of disease and its cure, by careful experiment, patient investigation, and sound deduction. He ascribed all the phenomena of life and health to a fundamental principle which he denominated "nature,"—a vital principle, which influences all parts of the body, directing and promoting actions which are beneficial, and counteracting those of an opposite tendency. So accurate an observer was he, that many of his descriptions of disease are recognised at the present day as models of correctness and precision. To errors of diet and vitiated air, he ascribed the greater number of diseases. Attention to diet, exercise, and bathing, constituted the chief part of his practice. When these failed, he had recourse to purging, bleeding, diaphoretic and diuretic remedies. He is said to have been the first inventor of bandaging; his treatment of wounds is wonderfully correct; he used the trepan in injuries of the head, and he tapped in hydro-thorax. In his writings we find the first traces of physiological science, and some of his opinions on this subject are wonderfully near the truth.

Up to this period, and long afterwards, anatomy was totally neglected; the dissection of the human body would have been looked upon with infinitely greater horror, than amongst the most illiterate of the present day; all the knowledge, therefore, which physicians in the days of Hippocrates possessed of the human body, was derived from their dissections of inferior animals; they did not even know an artery from a vein, a nerve from a sinew; of the circulation of the blood, and the phenomena of digestion, they had not the most remote conception. How then can we wonder at their frequent and egregious errors in the exercise of their art? As well might we be surprised at getting our watches destroyed by a blacksmith, who knows nothing of their delicate machinery, if we consigned them, when deranged, to his care. Hippocrates taught that the body was composed of four primary elements—fire, air, earth, and water; that these, variously combined, produced the four cardinal humours; and these, in their turn, the different organs of the body. He paid great attention to critical days, on which he fancied that the morbid matter being duly concocted would be

evacuated. The works of Hippocrates which have come down to us, have shared the fate of all ancient writings, and are considerably corrupted; several of them have evidently been written at a later period by some of his followers; but enough of them are undoubtedly genuine, to show him to have been the most surprising man of his age.

The followers of Hippocrates, having deviated from the true path in the prosecution of medical science which he pointed out, from their adherence to theory to the exclusion of experience, were called Dogmatists, and for many ages did they reign paramount in the schools of physic.

The next remarkable revolution in the history of medicine happened at Alexandria, about 300 years before the Christian era, during the reigns of the Ptolemys of Egypt—those munificent patrons of literature, who founded the celebrated library of Alexandria, which was said to have contained 700,000 volumes. At this period, Herophilus and Erasistratus first dissected the human body in this city, and made many discoveries in anatomy, which may be called the foundation-stone on which the whole superstructure of medicine is raised. Almost all the parts of the human body which Herophilus discovered and named, retain their anatomical names to this day. Soon after this, however, arose an individual, who is not without a numerous host of followers even at this hour; but whose name no honourable-minded physician would pronounce without indignation. This was Serapion, who may be aptly surnamed "the Quack." He was the founder of a sect called Empirics; his leading dogma was, to admit experience alone as the only source of medical skill, thus running into the opposite extreme from the followers of Hippocrates; he employed remedies for the different symptoms without the slightest reference to the causes of disease. In every science, theory and experience should go hand in hand; idle is the theory that cannot be supported by experience, and our experience would be a confused jumble of facts without sound theory to digest and generalize them. Serapion, also, like all other quacks, availing himself of the superstition and prejudices of his countrymen, the Egyptians, who had the utmost aversion and horror at touching a dead body, discarded anatomy from the list of medical studies, thus flattering the prejudices of his age, and retarding the progress of medical science for the sake of filling his coffers, and earning a short-lived fame.

Having now traced the progress of medical science in Greece and Egypt, let us direct our attention to its introduction into the once illustrious commonwealth of Rome. For more than 500 years after the foundation of their city, the Romans were too much engaged in war to attend to the cultivation of literature and the arts; medicine was therefore only practised in its rude and primitive state. But as they gradually increased in power and opulence, philosophy and the sciences were brought from Greece, and along with them the art of medicine. The first practitioner who acquired any eminence among them was Asclepiades, a native of Bithynia, who, failing as a teacher of rhetoric, without any medical education, commenced to practise physic. His ignorance led him to despise anatomy, and, as a matter of course, to ridicule the practice of his contemporaries and predecessors, declaring that the object of their attendance on their patients was merely to watch the manner of their death, and not to effect a cure. Like all other quacks, he had the cunningness to suit his practice exactly to the manners and taste of the Romans, who by this time were so enervated by luxury, as to dislike whatever gave them pain and uneasiness; and, glad of an opportunity of escaping the strong remedies and rather harsh treatment of the Greek physicians, flocked to a man who proposed to cure, *tuto, celeriter, et jucunde* (safely, quickly, and pleasantly); who followed them in all their inclinations, even permitting the use of wine, in some instances to excess. From these circumstances, and very probably also from the degree of credit which mankind are inclined to give to those who have sufficient assurance to vaunt their own abilities, he gained a very high degree of popularity. There is no doubt but he was a man of great acuteness, and with all his ignorance of his profession he

introduced some improvements; he was the first who divided diseases into acute and chronic, and to have discovered the shower-bath. After Asclepiades we have his pupil Themison, who is celebrated as being the founder of the Methodics; a sect that professed to steer a middle course between the Dogmatists and Empirics. The Methodics became the prevailing sect at Rome, and a great number of distinguished physicians ranked themselves under its banners. This sect was also in its turn divided into three, the most celebrated of which was the Eclectic, professing to adopt whatever was useful from all the sects, and to retain the errors of none. Of this last sect was the elegant Celsus, whose writings have come down to our day, and who was the only Roman citizen who ever became distinguished in physic. From the writings of Celsus, we find that medical science was by this time considerably advanced. The greater part of diseases were distinguished, and names given to them; many had been very carefully described, and the proper treatment in numerous instances adopted; a considerable number of nice and difficult operations in surgery had been performed with success; such as the operation of lithotomy, the operation with the needle for the cure of cataract, the treatment of goitre by extirpation and also by caustic, tapping in dropsy, the use of the catheter in retention of urine, and manual delivery in midwifery after the death of the fetus. He also gives us a treatise on fractures and dislocations. The knowledge of the structure of the human body, his directions as to diet, regimen, exercise, bathing, and the use of medicines, must surprise those who are apt to look back with contempt on the ignorance of the ancients as to their skill in the healing art.

After Celsus we have no other physician of note till the time of the celebrated Galen, whose name constitutes one of the most remarkable eras in the history of medicine. Hitherto the art of physic had been sometimes retrograding, at other times advancing; but, upon the whole, every succeeding century saw it in a greater state of perfection than the preceding. In Galen, however, was found the limit of that perfection which medical science was destined to attain for a subsequent period of 1400 years. Galen was born at Perganum, a city of Asia, A.D. 131, of wealthy parents, and enjoyed all the advantages of a liberal education. These advantages he turned to the best possible account, and, by diligence and perseverance, he became acquainted with every kind of literature. He was early instructed in the doctrines of Aristotle and Plato, which gave such a bias to his youthful mind, that, in after life, his opinions and theories in medicine were based upon the principles of these doctrines. He studied medicine in the most celebrated schools in various parts of the world, and applied himself to every branch of the profession with the utmost ardour; of anatomy, in particular, he was as perfect a master as his opportunities permitted. Thus prepared to practise his art, he settled in Rome at the age of thirty-four, where his success soon made him an object of envy and jealousy to all the Roman physicians; to such a height, indeed, was this carried, that he was ultimately compelled to leave that city and return to his own country. During his residence at Rome, he was much resorted to by philosophers and men of rank; even the Emperor Marcus Aurelius was attracted by his fame, and, at the invitation of this illustrious prince and philosopher, he again returned to Rome, and soon rose superior to every rival. He gained the confidence and favour of the Empress Faustina, and, as a matter of course, that of all the ladies about court—a circumstance alone sufficient to raise the reputation of a physician far less deserving than Galen, to the highest pitch of fame.

From the days of Hippocrates downwards, physicians had all ranked themselves under some one of the many sects that prevailed. Galen, however, from the superiority of his education, his strength and originality of mind, saw the errors of all the sects, and exposed them with such effect, that after his time they never obtained any credit. In his medical researches he gave himself up entirely to the guidance of nature and Hippocrates; he gave to every kind of remedy a

fair trial, and adopted the most efficacious; he availed himself of every improvement which experience afforded, and studied remedies without becoming empirical. In this manner he put the practice of medicine upon the best possible footing. At the same time it must be admitted, that his theories were too limited for the length to which he extended their application; and we must also allow that his system was more theoretical than practical. Galen was fond of writing, and composed a great many books, leaving no department of medical science without bearing evident marks of his industry and genius, and giving a more complete and comprehensive system than had ever before appeared. There are still in existence 137 treatises said to have been written by him, and of these 82 are undoubtedly genuine.

We would naturally suppose that the science of medicine, having received such an impulse from the genius of Galen, would have gone on progressing; but this was not the case. Galen lived at a period when the Roman Empire had passed the meridian of its splendour. In such circumstances, when a system of science is once thoroughly established, and obtains a very high degree of credit, so as to gain a complete ascendancy over every other, the progress of that science is arrested. The great majority of physicians are always servile imitators, from its being so much easier to follow than to lead. An original mind may now and then arise, who can see the errors of the system he has been taught, and who has the ability to correct these errors; but such a person is generally too timid and modest to attack an established system; or if he attempt to do so, he is soon borne down by the hostility and envy of his professional brethren. The system of Galen was, therefore, secured and perpetuated in the schools of physic for many centuries. Physicians of some note appeared, it is true, but their systems were all based upon his model, and the greater part of their writings were merely commentaries on some of his various works.

It was not the science of medicine alone that suffered after the days of Galen; for in the end of the 5th century after the Christian era, the Goths, Vandals, and other barbarous hordes from the north, overran Italy, destroying every vestige of literature and art in the western parts of Europe. Driven from a country which had for a long time afforded them only a feeble protection, the arts and sciences took refuge in Constantinople, the capital of the Eastern Empire. This city maintained its position as capital of the east for many centuries, after Rome, the capital of the west, fell into the hands of the barbarians; it even asserted its independence after being stripped of all its provinces; and it was not till A.D. 1453, that it was captured by the Turks under Mohammed II. During the whole of this period, literature subsisted at Constantinople, but in such a sickly and languishing state, that no advancement was made in any department of science. Galen's system of physic was exclusively followed in the schools, and instead of being improved became gradually deteriorated.

In the 7th century, a new religion and a new empire arose in Arabia. In the year 622, Mohammed proclaimed that there was no god but Allah, and no prophet but himself. He propagated his doctrines by fire and sword, and soon brought all the tribes of Arabia, and the inhabitants of Syria and Palestine, under his subjection. The empire of Mohammed arose among the rude, illiterate, and wandering tribes of Arabia; superstition was its origin, and a blind adherence to the doctrines of their prophet the means of its extension. In these circumstances, the cultivation of literature would be the last thing thought of. We even find that it was a maxim of some of the followers of the prophet, that books which are in accordance with the Koran are useless, and need not be preserved; and if they disagree with its doctrines, they are dangerous, and ought to be destroyed. Fortunately, however, for the world of letters, the Saracens (the name given to these eastern warriors) became at length a mighty nation, and several of their monarchs threw aside the arts of war, and cultivated those of peace and civilization. In this manner was that holy spark of literature preserved, which was afterwards destined to burst forth into a

flame to enlighten the whole of Europe. The capture of Alexandria by the Saracens, towards the middle of the 7th century, gave them an opportunity of studying the books, and becoming acquainted with the literature of the Europeans. They translated many of the Greek authors into Arabic, and thus laid a foundation for prosecuting the study of the various arts and sciences. By chance they were led to adopt the philosophy of Aristotle, and, as a matter of course, the medical system of Galen, which was founded on that philosophy.

Under the dominion of the Saracens, numerous schools of physic were established, and they produced many writers of various degrees of celebrity. About the end of the 8th century, a college was founded in Bagdad, public hospitals were built for the benefit of students, medical science was zealously cultivated, and most of the works of the Grecian physicians and philosophers were translated into the Arabian language. Rhazes, Avicenna, and Albucasis, seem to have been the most celebrated writers on physic of whom the Saracens can boast. These authors, indeed, obtained such repute in Europe, that their works served as text-books for the professors in all the universities for many centuries; the doctrines of Avicenna maintained their ascendancy amongst the European physicians till after the revival of literature. The Arabians, however, added little to medical literature by their own experience and observation. They were the casual inventors of chemistry, it is true; but almost all their knowledge of the healing art was derived from the Greek and Roman authors; they were only useful to medical science indirectly, from their being the means of disseminating a knowledge of the art over Europe. About the middle of the 8th century, the Saracens, having extended their conquest to the west of Africa, from thence came over to Spain, and acquired possession of that kingdom. There they established schools, and inculcated a taste for the various branches of learning; thus repairing the injury to science in the west, which was inflicted by their predecessors in the east, and laying the foundation of that revival of literature in Europe, which now sheds its benign influence over every region of the habitable globe.

Before the arrival of the Saracens in Spain, the only remains of literature in Europe were preserved by the professors of Christianity, and were confined chiefly to the cloisters of the monks; but the surrounding darkness was so intense, and so slight could their influence have been upon the brave but unconverted and most illiterate barbarians of the north, who poured down in hordes over the Roman Empire, that the wonder ought not to be, that they allowed the world to continue so long in darkness and ignorance, but that they were not swept away with the mighty current of paganism and barbarity, and along with them all they possessed of the religious and scientific learning of the age. Amid the war of religious discord, the minds of men get so warped with the narrow views of their sect, that they can only see the virtues of their opponents through a distorted medium, darkened by the mists of prejudice. It is too much the cant of the present day to assert, without the slightest investigation, that the professors of religion in those days were a set of men whose sole aim and interest was to retard the diffusion of knowledge, to place a check upon the progress of civilization, so as to enable them to retain that wicked and selfish hold which they possessed over the minds of men. But what a length of time, may we ask, does it require to civilize the barbarian, or Christianize the heathen million? What progress has Christianity or civilization made among the natives of Africa, Asia, and America, during the last three centuries? And what stupendous efforts have been made, under the most favourable circumstances, by the various denominations of Christians? Let us reflect on these things, and let us impartially investigate the history of the period, and we will find the professors of religion—not all good men, for that will never be—but the great majority, making noble efforts, not only to preserve what they possess of the arts and sciences, but taking every means, under the greatest disadvantages, to disseminate learning over the dif-

ferent provinces of Europe: they established centres of instruction in literature in various places, assembling together the most illustrious talents and learning, and diffusing rays of light in all directions. It is a curious fact, that it is to the period which is known by the name of the "Dark Ages," that we owe the foundation of most of the universities of Europe. The great medical school of Salerno was founded in the 9th century by a monastery of Benedictine monks; and it rose to such distinction, that by the middle of the 10th it was resorted to by invalids of every rank from all parts of the world. The emperors of the period endowed it with many privileges—amongst others, that of granting medical degrees, the examination for which was conducted with the greatest strictness; candidates were required to be examined in various Greek and Arabic authors, to have studied seven years, and to take an oath to obey the rules of the college, to refuse all fees for attendance on the poor, and not enter into any compact with a druggist or apothecary. The druggists and apothecaries were also compelled not only to compound their medicines faithfully according to the prescriptions of the physicians, but also to sell their drugs at a price regulated by competent authority, and not according to their own caprice. The University of Oxford was founded in the end of the 9th century; the Universities of Bologna in Italy, and Montpellier in France, attained great celebrity early in the 12th; in the course of this century, also, the University of Paris was founded; that of Salamanca in 1200; that of Cambridge in 1280; that of Prague in Bohemia in 1358; that of Vienna in 1365; that of Ingolstadt in Germany in 1372; that of Leipsic in 1408; that of St. Andrew's in Scotland in 1412; that of Louvain in Belgium in 1425; that of Glasgow in 1450; that of Aberdeen in 1494; that of Basle in Switzerland in 1469. These, and many others, were granted various privileges, and had the highest honours and distinctions bestowed upon them by the head of the Christian church of the day, who patronised the learned with the greatest liberality, supplied them with abundant resources, and incurred enormous expense in purchasing the best manuscripts for their perusal. In all these universities, the faculties of philosophy (or arts), theology, law (civil and canon), and medicine, were more or less fully developed. Medical science, however, could not have made great advances towards perfection, as long as the professors took the works of the Arabian writers, Rhazes and Avicenna, as text-books for their lectures, which they did up to the middle of the 15th century.

We are told by an eloquent and impartial writer of the present day,* that the origin and progress of civilization depends upon—1st, The intelligence; 2d, The moral principle (based on religious faith); 3d, The facility of communication; and, 4th, The amount of wealth possessed by the individuals composing a given community. Civilization must therefore be retarded, or decline, according to the deficiency of one or more of these requisites. Keeping this in mind, we can easily account for the decline and fall of the empires of ancient Egypt, Greece, and Rome; we can easily account for the slight progress which science and civilization made during the "middle ages;" we can also easily account for the revival of literature in the 15th century. During the middle ages, war was almost the sole occupation of the inhabitants of Europe; the different governments were so unsettled as to leave little leisure for the cultivation of literature, or the acquisition of wealth; the great body of the people were semi-barbarian; commerce was at a stand, and facility of communication was entirely wanting. With this deficiency in the requisites of civilization, is it any wonder that its progress was slow? Is it any wonder that the knowledge of physic should have stood still? Can we wonder that the arts and sciences should not have burst the barriers of ignorance, by which the great body of the people were hedged round?

In 1453 the Turks took possession of Constantinople, and drove the unfortunate Greeks that remained there to seek

* History of Civilization, by W. A. Mackinnon, Esq., M.P.

refuge in Italy, and they carried with them their literary remains. This circumstance contributed greatly to restore and diffuse a knowledge of Greek literature in Italy, and by degrees to spread it to other parts of Europe. Soon after this the Greek language was taught in most of the universities, giving men an acquaintance with the writings of their celebrated philosophers and poets, and contributing in the highest degree to improve the national taste. Other circumstances occurred to favour this progress of learning; the invention of the art of printing, the different governments of Europe having become more settled and tranquil, the discovery of America by Columbus, and the accomplishment of the passage to India by the Cape of Good Hope, giving a spur to commercial industry and enterprise; all contributed powerfully to forward the progress of learning, and the various arts and sciences. The 16th century, therefore, opened with many of the requisites for civilization which had hitherto been unknown; everything was favourable to the advance of literature, and its study was accordingly pursued with great vigour. Early in this century the Greek physic was diligently studied, and the greatest pains were bestowed in illustrating the Greek writers. The Arabian writers by degrees came to be entirely neglected, although the system of physic in both was fundamentally that of Galen. It indeed spoke very ill for the advancement of the science, that his system had now reigned paramount in the schools for 1400 years, and it was a lucky incident that occurred to break the chains which bound men's minds so exclusively to the system.

The art of chemistry appeared first among the Arabians, and was applied by them to the preparation of medicines. Some knowledge of it was communicated by the Arabians to their disciples in Europe, and spread there with their physic. We find, however, little mention of chemical remedies in the medical writings of the 13th, 14th, or 15th centuries; very probably from the fact, that their operation was unknown, that they were prescribed empirically and at random, and that their effects were much more violent than the mild remedies which the Galenists employed. Considerable attention, however, must have been paid to the art by some bold empirical practitioners; for, about the end of the 15th century, a chemical writing appeared, under the feigned name of Basil Valentine, said to have been the production of several authors, but whose names are still unknown. From this work, it appears that chemical pharmacy had been privately cultivated, and was then pretty much advanced. The venereal disease appeared about this period, and completely baffled the skill of the Galenists to cure; it was soon, however, found to give way to the use of mercury, one of the chemical remedies. Many other diseases also, in which the inert medicines of the Galenists proved useless, readily yielded to chemical preparations; thus shaking the public confidence in the perfection and efficacy of the established system. The noted Paracelsus appeared about this time, whose boldness, ignorance, and impudence, took advantage of this state of things, to overturn the medical system of Galen, and raise a chemical system, in direct opposition to it, on its ruins. His vanity and presumption soon gained him great fame, and raised him to be professor of medicine at Basle, when, at his first lecture, he publicly burned the works of Galen and Ovicenna, proclaiming that they were entirely superseded by his discoveries. Although his doctrines were the most extravagant and visionary, he succeeded in founding a sect which shared the public favour with the Galenists, till the middle of the 17th century. Thus was the science of medicine practised by two sects—the Galenists, who adhered as closely as possible to the doctrines of their master, labouring to reconcile every phenomenon to his tenets; their practice was often very complicated, and their medicines were chiefly taken from the vegetable kingdom; and the chemists, whose system was grounded upon attachment to particular remedies, which they fancied had extraordinary power and efficacy; the study and discernment of diseases they entirely neglected; medicines were employed at random, and if a remedy was found useful for

one disease, and in one particular constitution, it was set down as a universal cure. The followers of Paracelsus were, therefore, pure empirics; and, unfortunately, it seems to be that which is adopted by the non-professional part of mankind at the present day. The chemical system began by degrees, however, to assume a more scientific form, and continued to rise in public estimation; while the doctrines of the Galenists came to be proportionally neglected.

Towards the middle of the 16th century, the study of anatomy was revived by Vesalius at Pisa. Eustachius followed in his footsteps, and their discoveries tended much to shake the authority of Galen and the ancients in this department. Galileo and Bacon also introduced a new method of philosophising, if not a new system of philosophy, which had the effect of overturning the system of Aristotle, and of loosening that hold which it had so long maintained in the schools; so that, by the middle of the 17th century, the authority of Aristotle in philosophy, and of Galen in physic, were all but completely destroyed.

Every department of the science had now undergone a thorough revision; anatomy had been gradually improving for the space of 100 years, the minds of men were prepared for receiving new facts, when our immortal countryman, Harvey, about the year 1628, discovered and promulgated his grand doctrine of the circulation of the blood; overturning all the former theories of the constitution of the body, and placing the science of medicine on the sound basis of mathematical demonstration. Already had the lacteals been discovered by Asselius, the receptacle of the chyle and the thoracic duct by Pequet. The true course of the blood and the chyle being thus known, the liver was removed from the important function it had held so long in the system of Galen. In this manner, the animal economy, which had hitherto been viewed in separate parts, was studied as a connected whole, and the science of physic placed on a foundation that all the waves of theory will never be able to shake.

Before this period, the Galenists, and still more the chemists, had been accustomed to look upon the state and condition of the *fluids* of the body, both as the sole cause of disease, and the only means of explaining the operation of medicines. They were, therefore, called *Humorists*. But after Harvey's discovery, the attention of physicians was, in some measure, forced towards the *organic* system. The study of mathematics, also, prevailed at the same time, and what were called the mathematical or mechanical physicians arose. By degrees all the systems became blended together, and the science of medicine was gradually improved.

Our celebrated countryman, Sydenham, who has been styled the English Hippocrates, free from the attachments and prejudices of any sect, and studying the writings of all, proposed, about the middle of the 17th century, by his own observation alone, to form a system for himself; he sought rather for theory to unite his observations under general heads, than for facts to confirm his theory. In this manner he gave a model for the prosecution of the study of the art of physic, which has been followed by every sound practitioner since his time. His works still continue to be a standard authority; and, what is extremely rare, they are as much esteemed now as when they first appeared.

Among the most distinguished names in medicine during the 17th century may be mentioned—Glisson, Bartholin, Rudbeck, Fabricius, Hooke, Sylvius, Willis, Riolanus, Fallopius, Bellini, Pitcairn, Mead, and Freind. Towards the conclusion of this century and the beginning of the 18th, we have the celebrated Stahl, Hoffmann, and Boerhaave, each of whom formed a new and considerably different system of physic. After these, in the 18th century, we have the names of Haller, Heberden, Cullen, Brown, and Gregory, all of essential service in bringing the science of medicine to the state of perfection in which we find it. Since the time of these distinguished men, we have many names well known to the student of medicine; but as the art of healing from thenceforward ceased to be theoretical, gradually assuming the character of a science of simple observation, and the

patient investigation of facts, they would not be interesting to the general reader.

We have now traced the history of medicine from the time when it was lost in the depths of an unrecorded antiquity—when we have barely sufficient evidence of its existence to form the ground of a plausible conjecture, down to the present day, when it has arrived at comparative perfection—when the study of pathology, of chemistry, the microscope, and all the allied sciences, can be brought to elucidate its darkest paths, and its most intricate windings; and when, in short, it is capable of conferring the most incalculable benefits on suffering humanity.

MINERALOGY.

CHAPTER II.

Amongst the Aluminates are usually placed many of those minerals which have been sent up to the surface of the earth in a melted state by the action of subterranean fire. As might be expected the composition of these minerals varies with the localities where they are found, but there is always a good deal of alumina detected on analysis. Some varieties are porous, others are massive, others are thickly interspersed with crystals of augite, mica, leuzite, &c. *Basalt* is a species of lava generally found in a columnar shape. It is of a greyish black, or brown colour, and opaque. It is found in many parts of the globe. The architectural formality of its structure on a great scale is in striking contrast to the usual irregularities of the external appearance of nature. The Giant's Causeway and Fingal's Cave are fine examples of columnar basalt. *Pumice* is a porous lava of a light grey colour which swims in water. It is found in large quantities at the Lipari Islands. *Clinkstone* occurs massive of a greenish colour; it is to be met with in Scotland, particularly the Isle of Mull and in some mountainous districts of the Continent. Its name originates from the clear tone it gives out when struck. *Pitchstone*, though not a lava, is found in many volcanic districts in company with lava. It has a slaty structure and a vitreous appearance. Its colours are black, brown, grey, and red.

We now turn to the third class, *Calcia*, and the minerals in which it is a principal ingredient.

Calcia, or *Lime*, is never found pure, but combined with acids and other earths; it is very extensively diffused over the globe. When artificial means are used to obtain it pure, it is found to be of a white colour, opaque, and without smell, having a strong acrid taste, infusible except by the strongest heat of the oxyhydrogen blow-pipe. It has a specific gravity of 2.3. When exposed to the air it quickly imbibes water and carbonic acid gas from the atmosphere, and falls to powder. It has a strong affinity for carbonic acid, forming carbonate of lime.

Chalk is a carbonate of lime. It is found in vast deposits, generally including nodules of flint. It is of a white colour, has an earthy fracture, adheres to the tongue, and is perfectly opaque. It is extensively used in various manufactures. When burnt it forms an inferior kind of lime. An immense quantity of fossilised organic remains is embedded in the chalk group.

Limestone occurs in great variety, both as regards colour and compactness. Some kinds are beautifully veined, and hard enough to be worked into a fine marble. The statuary marble of Carrara is a limestone. It is a very useful stone for building purposes, being durable and of a neat appearance when hewn. It makes an excellent lime when burnt. The deposits of limestone in Great Britain are large. The crystallised variety is called

Calcareous Spar, which occurs in an extraordinary number of

forms, upwards of 700 having been enumerated. The primary form is a rhombohedron. Hardness 3. When pure it is colourless, but it frequently occurs tinted with various colours by the admixture of other minerals. Its lustre is vitreous. When transparent, as it usually is, it possesses the remarkable quality of double refraction, and hence it is often called double refracting spar. Some fine specimens are brought from Iceland. Dog's Tooth Spar is a variety frequently found in Derbyshire.

Oolite, a species of sandstone found in compacted grains like little eggs, whence its name. It occurs in large beds in many parts of England, and is a good deal used as a building stone. Its appearance is very neat, but it is soft and not durable. Bath stone is an oolite.

Satin Spar takes a fine polish. It is white or grey in colour, and marked with black streaks; this, with a satin-like lustre, gives the stone its name. It is found, amongst other places, at Alston Moor in Cumberland.

Agaric Mineral is a beautiful mineral of great variety. It is of a pure white colour, and is light enough to float like flour on the surface of water. It is found in the crevices of rocks both here and on the Continent.

Peastone, or *Pisolite*, is found in compacted lumps of the shape and size of peas. It is usually white, soft, and bitter. It is not common.

Stalactite and *Stalagmite* are names applied to those deposits of carbonate of lime found in caverns and similar places. When water, strongly impregnated with lime, drains through the roof of a cave, long ropes and wreaths of matter are left as it evaporates, clinging to the waters or depending from the ceiling. These are stalactites. As the water drips down to the floor a deposit gradually rises, and this is called stalagmite. Water thus charged may also be induced to deposit the lime upon substances for which it has an affinity, and thus, what is vulgarly termed a petrification is formed; but the fact is, that there is but one external coating of earth placed upon the substance. Some natural springs of water are so saturated with the lime that a deposit is readily laid upon anything—thus a bunch of grapes, and a twig with leaves, have been "petrified" by them in a short space of time.

Dolomite, called after its first observer Dolomien, occurs massive, grey or yellowish in colour; sometimes it has a slaty structure. It is a good deal softer than limestone, and sometimes it will allow the nail to make an impression. It contains about 59 per cent. of carbonate of lime, and 40 per cent. of magnesia. The Apennines are almost wholly formed of dolomite. There are several thicknesses of magnesian limestone, a species of dolomite, in the north of England.

Bitter Spar is the name given to the crystallised varieties of dolomite. In colour is greyish or yellowish white, but it is often coloured brown, yellow, green, and pink, by metallic oxides. Hardness from 3 to 4. It is with difficulty distinguishable from calcareous spar and tale-spar, the crystals being of a very similar shape.

Pearl Spar occurs massive and crystallised in obtuse rhomboids of a white or yellow colour, and with a pearly lustre. It is found in Derbyshire and Cornwall.

Arragonite, so named from its having been abundantly found in Arragon, is a mineral composed of from 95 to 99 per cent. of carbonate of lime, with a little strontian. It is met with both massive and crystallised. The primitive crystal is a right rhombic prism. Hardness from 3 to 4; specific gravity 2.9. Some varieties are very beautiful. One variety, called *flos ferri*, consists of numerous fibrous crystals, radiating from a centre with a satin-like lustre. Occasionally it is seen in a stalactitic shape, hanging from a roof or poured out on the ground. In the Soane Museum, London, there is a remarkable specimen of Arragonite

his place. This is perhaps the wildest tradition of the reckless pride of ferocious strength, that the annals of mankind preserve. But in the original form of the Salic dances, and their ruder songs, we have ebullitions of maniac ferocity, scarcely softened from the Bacchanal congratulations which the weird-like priestesses are heaping on the triumphant murderer.

The first moral admixture in this lawlessness of will and imagination—the first softening effort of control of the passions we can recognise, is the injunction of continence as a strengthener of the warrior's arm. The next was the practice of justice and kindness to the fellow-citizen. Hatred and contempt of the foreigner were allowed, and even encouraged as a sort of lightning conductor, to lead off the desolating influence from the inmates of the same city. These narrow virtues—like those of all rude nations—were the cold result of calculating selfishness. But the habits of self-restraint which they prompted, in course of time, lent greater grace and nobility to the character notwithstanding. To save a Roman citizen in battle was to earn the proudest of the wreaths bestowed on victors. From the earliest periods of the recorded history of Rome—and even tradition breathes the same feeling—we find women occupying a happier position than in any other state of antiquity. We can recognise this in the legend of the Sabine women, who although rudely torn from their friends were soon taught to love their ravishers better.

These were the elements of the popular mythology and tradition of Rome—for the secret knowledge of the pontiffs and augurs was a very different thing. This superstition was of indigenous growth, and was fashioned into a kind of consistency and coherency by the lapse of time, not by deliberate forethought. The elementary powers of nature wielded, according to it, the sovereign sway. The advancement of the nation in a rude morality communicated in time something of a moral character to their duties. The ferocity of the ebullitions of savage enthusiasm became regulated rather than softened; for, down to the close of the Roman republic, the *virtus* which the Romans admired was more akin to valour than to what we now designate virtue. Reaching back into the past in order to confer at least a past eternity upon the deities of their imagination, the old traditions of volcanic agency were blended with other elements of awe; and hence the pit of Acheron, the fire-breathing Cacus, and other inflammable apparitions. This mass of superstition filled up the popular imagination of Rome, and domineered over it for centuries,—the growth, in the first instance, of Roman character, it became mainly instrumental in keeping the Romans what it found them. To appreciate the Roman aright—to understand him—we must remember that his belief was ever present and powerful in him; that whatever physical objects might greet his eye, these were ever present, "Lords of the visionary eye, whose lid falls not and cannot fall." Dreams we may call them—fantastical, unsubstantial they are—but they regulated the actions of a powerful people for a thousand years; and if they be dreams, they have outlived their dreamers.

DOMESTIC MEDICINE.

CHAPTER II.

ON THE ADAPTATION OF THE EXTERNAL WORLD TO THE PHYSICAL WELL-BEING OF MAN, AND ON THE MORAL CAUSES OF DISEASE.

The Scriptures tell us, and geology proves to us, that man has been only a few thousand years a tenant of this world—a drop of time, compared to the ocean of ages that intervened between the creation of the first simple vegetable and the first simple animal on the earth's surface, and the appearance of the human race, surrounded by the palm, the cedar, and the sycamore, the elephant, the camel, and the horse. There is abundant evidence to prove, that during the whole of this vast period, the world was undergoing a silent and gradual preparation for the reception of man. It was made subject to the universal law of gravitation, without which it could neither have been retained in its sphere round the sun, nor would water or any moveable body have remained on its surface. By gravitation, water falls to the

earth, seeks its lowest level, and forms itself into rivers, lakes, and seas. The globe was raised up in various parts into mountains. At first sight one is apt to think that the sole use of these is to preserve the boundary between the dry land and the sea, but, on a closer investigation, he will discover that they have other uses of great importance. In a country destitute of high mountains, rains suddenly swell the rivers to enormous torrents, bursting their banks, expanding into internal seas, inundating cities and villages, and involving the labours of man in wide-spread ruin; whereas, lofty mountains, covered with their eternal snows, not only serve as the grand storehouses of nature for retaining the superabundant rain, giving out, by the summer heats, a gradual and inexhaustible supply to the otherwise dried up river channels; but they also contribute in a great degree to temper the climate, by cooling down the air with which they come in contact, and which, by its increased density, descends to the plains below, producing those cool and refreshing breezes which are unknown in a flat country, where extreme vicissitudes of heat and cold are apt to prevail. The globe was also provided with an atmosphere and an ocean of peculiar composition and qualities. The ocean was destined to be the receptacle for all impurities soluble in water, which might prove noxious to animal life. The atmosphere was intended as a receptacle for the vapours and all noxious exhalations which arose from the earth's surface; it was also to serve as the medium for purifying the waters of the earth and the sea, and redistributing them over the dry land in genial showers of rain, which are absolutely necessary for the continuance of vegetable and animal life. These showers produce springs, springs brooks, brooks rivers, the rivers flow into the ocean, to be again evaporated into the atmosphere in the form of clouds, to descend in showers; and thus to flow in a beautiful circle of endless harmony. Even the very rocks of which the world was composed evinced supreme wisdom on the part of the Creator. The nature of the huge unwieldy masses of rock, whose decomposition by water forms the soil, would in our opinion be a matter of little importance; whereas, had they not contained the identical chemical ingredients which they do contain—had they not been of the very *hardness* which we find them, it would have been impossible, according to the present constitution of vegetable substances, that the earth could have been covered with trees and herbage—they could not otherwise have had the gradual supply of nutriment necessary for their health and growth.

The globe being thus provided with air and water—with light, heat, day and night, change of seasons, and with rocks capable of becoming the food of plants, "God said, Let the earth bring forth grass," and the first vegetable sprung into existence, and the barren rocks became clothed with verdure.

We have every reason to suppose, from observing in nature a scale of being, rising by insensible gradations from the simplest vegetable to the most complex form of animal life, that plants of the simplest structure would be first created. By degrees, vegetables of more complex structure would appear; and, as we ascend in the scale, we find animal life coming into existence, but as yet in so simple a form, that it is almost impossible to distinguish the animal from the vegetable. We thus see the three kingdoms of nature—mineral, vegetable, and animal—running into one another by almost imperceptible steps, the line of demarcation between them being nearly impossible to draw.

Plants must have been created before animals; for, to enable animal life to exist, vegetable life must have been in existence, to serve as a connecting link between the inert or dead matter of which the earth was composed, and the living fabric of animals. Vegetables throw out their roots into the soil, from which they absorb or suck up part of their nourishment. They expand their leaves into the air, and absorb another part of their nourishment from the atmosphere. Animals are not formed to derive their nourishment from the soil. Should they endeavour to do so, the attempt would soon be fatal. Vegetables were therefore necessary first, and that of the simplest sort, to be the food of

the simplest forms of animals. All animals must thus, in the first instance, have been herbivorous, or adapted for living solely upon vegetables. But if no other provision had been made, these herbivorous animals would have increased to such a degree, that the whole of the herbage of the earth would not have been sufficient for their maintenance. They would have died of starvation, and the different species would have become extinct. Carnivorous animals were, therefore, necessary to keep the animal kingdom from outgrowing the means of its subsistence, before the world was occupied by man.

The globe, being now covered with vegetation, and inhabited by numerous species of animals, might seem to our short-sighted comprehension to be properly prepared for the abode of man. But had he been created at this period, how limited would have been his means of progressive improvement! Coal, that valuable mineral, to whose power the wonders of steam are so much indebted, would not have been in existence. An insurmountable obstacle would thus have been presented to the improvement of commerce, manufactures, and a thousand useful arts. Limestone and several other minerals would have also been wanting. A wise and benevolent Providence, however, decreed otherwise; and geology tells us, that five races of plants and four races of animals were successively created, that each lived for several ages, and that, by the physical revolutions of the globe, they were swept away, before the earth was considered fit for the permanent abode of the human race.

By this brief sketch, we see that the world was gradually prepared for the abode of man; and were we to study the physical constitution of man and of external things, we would see, at every step, how beautifully the one is adapted to the other. Had he not had air to breathe of the exact composition and density of our atmosphere—had he not had water to drink of that fluidity and quality which it possesses—had not the world been of the size and shape that it is—been placed at that distance from the sun at which it is placed—had not man been created neither herbivorous nor carnivorous, but omnivorous, so as to enable him to live on vegetables or the flesh of animals according to circumstances; in short, had not man been constituted exactly as he is, and the external world been constituted exactly as it is, his life would have been contrary to the laws of nature, and we cannot conceive how he could have existed. The various relations of man to the external world, and their beautiful adaptation to one another, would fill volumes; and how strangely constituted a mind must he have, or how ignorant must he be, who can conceive it possible that such an arrangement could have taken place without infinite design, power, and wisdom!

Every member of the animal and vegetable kingdoms was placed originally in circumstances favourable for accomplishing a certain period of endurance, and, if no accident occurred, for accomplishing this period in good health, at the end of which its life terminated. But if an animal or vegetable happened to be placed in unnatural circumstances, such as to be deprived of a sufficiency of nutriment, or exposed to any noxious influence, that animal or vegetable fell a prey to disease, and was thus prevented from accomplishing its natural period of healthful endurance. Vegetables and animals have, therefore, their diseases, more or less severe according to the cause. The finer the organization of the living being, the more liable it is to disease, and its diseases are the more complex. Man is, therefore, more liable to disease than the inferior animals, the inferior animals than plants; the diseases of the human being are more complex than those of plants or animals, in proportion as his organization is infinitely more complex than theirs.

Man was placed in this world subject to the same physical laws as the inferior animals; but, in addition, the impress of his Creator was stamped upon his mind—he was created a rational being, he was endowed with intellectual capacity, he was to be the subject of future rewards and punishments; and he was placed under moral laws. Man's reason tells him, that if he breaks the physical laws, he subjects himself to injury, disease, or death, as the case may be. For ex-

ample, if he allows himself to fall from a precipice, he either lames or kills himself, being subject to the physical law of gravitation; if he continues to breathe air deprived of oxygen gas, he very soon dies, it being one of the physical laws that a certain supply of oxygen to the lungs is absolutely necessary for the continuance of life; and so on of other physical laws, as we shall afterwards see. Our object in this chapter is to show, that an infringement of the moral laws is also a most powerful cause of disease, tending to shorten the natural period of existence, and is a source of much acute misery to mankind; so that, even in a medical point of view, "virtue is its own reward, and vice is its own punishment."

The rudest tribe of savages, that occupies the lowest place in the scale of moral degradation, and which appears little elevated above the higher classes of the brute creation, has still left within it some perception of right and wrong, has still some moral laws by which the members of its community are governed, to the infringement of which penalties more or less severe are attached; thus verifying the words of the apostle, that "the Gentiles, who have not the law, do, by nature, the things contained in the law; these, having not the law, are a law unto themselves; which show the works of the law written in their hearts."

It will be found that the more elevated the moral code of any nation is, and the clearer its perception of right and wrong, the higher is the place it will occupy in the scale of intellectuality; that the whole of the human body, the brain in particular, will be more finely developed—the greater will be the exemption from disease, and the longer will life be prolonged. Whereas, on the other hand, the lower the code of morality, the more deficient in intellect will a nation be; the more deformed, the more diseased, and the shorter-lived will its inhabitants become. It is, therefore, a fatal mistake to affirm, with the Phrenologists, Materialists, *et hoc genus omne*, that the low state of morality and deficiency of intellect in a country, is to be ascribed to the small and misshapen brains of its citizens, to the preponderance of their animal propensities over their moral faculties. The very reverse of this is true; and these pretended philosophers commit the egregious error of mistaking the effect for the cause. It is a fact well known to physicians, that the development of every bodily organ is increased by continued healthful exercise. It is also well known to every student of mental philosophy, that the moral and intellectual faculties of the mind are vastly improved by cultivation; and every breeder of cattle is aware of the law in animal organization, that "like produces like." If, then, it can be proved—which it can be—that a child, born with certain animal propensities, and certain moral and intellectual faculties, can have these moral and intellectual faculties cultivated and developed by education, so as to balance or preponderate over its animal propensities, according to their original relation to one another; that this increase in its faculties will influence the size and form of the brain, and that this child will transmit these acquired physical and mental peculiarities to its progeny: it therefore follows, that the intellectual capacity and physical development of the inhabitants of every nation are in a direct ratio to their intellectual and moral training; in short, to the purity of their moral code, carried through a series of generations. The history of antiquity shows, that the higher a nation rises in the scale of virtue, the higher it rises in its superiority over other nations; the more powerful, both physically and intellectually, does it become, and the various arts and sciences arrive at the greater perfection. But let it sink in that scale, and exactly in the proportion in which it descends does it lose intellect and physical superiority, and the development of the brain more nearly assimilates to that of the savage. The kingdoms of ancient Greece and Rome afford melancholy examples. As long as their moral codes were strictly adhered to and faithfully obeyed—as long as national virtue maintained its superiority—so long did they maintain their sway over the surrounding nations; so long did they improve in all the arts and sciences; giving posterity the most splendid proofs of the strength of the national intellect, in their philosophy,

their poetry, their architecture, and their art of war: their citizens were virtuous, their sons men of genius, their soldiers were brave, and their armies powerful. At length, however, immorality and vice took possession of the land; their rulers became intoxicated with voluptuousness and dissipation, their citizens were dissolute, their soldiers effeminate, and their armies vanished like smoke before the brave barbarians of the north, whose moral discipline was more stringent, and to whom the short-lived and debasing pleasures of wine and other luxuries were unknown. What became of the finely-developed brain and corporeal form, and the high intellectual faculties, of the Grecian and Roman then? And where are they now? Their laxity of moral discipline sank them in the scale of civilization and intellectual development, to a condition little superior to that of the savage.

But diminished intellectual capacity and deficiency of physical power, are by no means the only national and individual evils produced by a laxity of moral discipline; for, wherever there is the greatest moral depravity, there is, of course, the greatest crime; wherever there is the greatest crime, there is the greatest ignorance; and wherever there is the greatest ignorance, there is the greatest amount of disease, decrepitude, delicate constitutions, premature old age, and earthly misery. What a tremendous responsibility, then, is there upon every individual head of a family! As he is accountable to his children and his posterity for his character and position in society, so is he infinitely more accountable for the improvement of his moral and intellectual faculties, and for the preservation of his physical constitution from disease. The Scriptures tell us, that the "children are punished for the sins of their fathers, even unto the third and fourth generation;" and there is no doctrine more clearly established by experience and observation than this—that the child inherits in a greater or less degree the physical and mental peculiarities, and even the very diseases of its ancestors. Many of the diseases which are termed *hereditary* are the worst which can afflict the human race; and although physical causes contribute considerably to their *original* production, moral causes operate by far most powerfully, not only in producing them originally, but also in aggravating any predisposing tendency to their occurrence, which may be inherited from our forefathers. Among hereditary diseases may be enumerated, insanity, epilepsy, scrofula, consumption, cancer, gout, asthma, &c.; and were we to trace the history of any of these in the records of medical science, we would find their origin mainly attributed to the operation of moral causes. Dr. Winslow, in his *Psychological Journal*, alludes frequently to the marked yearly increase in the number of cases of general insanity during the last twenty years. He says they are far more than can be accounted for by the increase of population; and this circumstance he ascribes to the greater prevalence of opium-eating in the community. Opium-eating is the worst species of drunkenness; and that it is increasing to an alarming degree, the account-books of every apothecary can testify. Dr. Macnish, in his "*Anatomy of Drunkenness*," says, that though at first it excites pleasurable feelings, its continuance brings on disease upon the constitution, and, "instead of disposing the mind to be happy, acts upon it like the spell of the demon, calling up phantoms of horror and disgust." "Nor," says he, "is this confined to the mind alone; for the body suffers in an equal degree. Emaciation, loss of appetite, sickness, vomiting, and a total disorganization of the digestive functions, as well as of the mental powers, are sure to ensue, and never fail to terminate in death, if the evil habit which brings them on is continued."

We next come to epilepsy. Have moral causes anything to do with the production of this horrible malady, which is so apt to terminate in madness or apoplexy? Listen to Dr. Watson, in his celebrated "*Lectures on the Principles and Practice of Physic*." In vol. i., p. 627, he says, "There are certain vices, which are justly considered as influential in aggravating, and even in creating, a disposition to epilepsy: debauchery of all kinds; the habitual indulgence in intoxicating liquors; and, above all, the most powerful cause of

any, not congenital, is *masturbation*—a vice which it is painful and difficult even to allude to in this manner, and still more difficult to make the subject of inquiry with a patient. But there is too much reason to be certain, that *many* cases of epilepsy owe their origin to this wretched and degrading habit; and more than one or two patients have voluntarily confessed to me their conviction, that they had thus brought upon themselves the epileptic paroxysms for which they sought my advice."

Dr. Stapf, in his "*Spirit and Scope of Education*," says, in talking of the vice of solitary gratification, "The stamp which nature imprints upon the sinner is horrible in the extreme. He is like a faded flower, like a withered tree blasted in the vigour of its youth. He is a walking corpse. All fire and life are extinguished within him; the dumb vice of which he is the slave, leaving nothing behind but feebleness and inactivity, death-like paleness, a withering away of the body, and a general depression of the soul. * * * Natural talents and cleverness give place to slowness of intellect, and, perhaps, to decided stupidity. The soul no longer relishes good and great thoughts, and the imagination is entirely corrupted. * * * Add to all this, the loss of digestion, the corruption of the blood, oppression of the chest, with filthy phlegm, ulcers and corruptions of the skin, emaciation of the whole system, epilepsy, consumption, chronic fever, fits of fainting, and, at last, a premature death."

The next in our list of hereditary diseases is scrofula. Scrofula may be termed a defective constitution, consisting in a deficiency of physical development from weakness of the powers of life, predisposing its unfortunate possessor, in a peculiar degree, to almost all the diseases in the catalogue. Dr. King, in an excellent article on this subject in the fifth volume of the "*Medical Gazette*," says, that "the diseases to which a scrofulous constitution gives rise are, water in the head, tumours, tubercles, abscesses, epilepsy, insanity, hysteria, amaurosis, cataract, fungus, deafness, running at the ears, inflammation of the eyes, enlarged glands in the neck, consumption, disease of the heart, diseases of the stomach and bowels, worms; diseases of the liver, kidneys, bladder, uterus, mesentery; various diseases of the scalp and skin generally; and, lastly, disease of the joints. * * * The human being who comes into the world with a scrofulous constitution is liable to all sorts of petty illnesses, from his birth upwards, till water in the head, or mesenteric disease, or consumption, or disease of the heart, or insanity, put an end to an unfair struggle which ought never to have begun. All men are doomed to die, but a scrofulous child is born and lives in the arms of death. * * * It is supposed that scrofula affects one-fifth of mankind; that one-half of those who are born scrofulous perish in infancy; that a quarter of scrofulous foetuses die in utero; and that not more than one scrofulous person in five lives to be married." We have here a most fearful description of this disease, or state of constitution; let us see what are its causes. Dr. King says, that "the grand source of scrofula is direct hereditary principle;" but he proceeds to enumerate "certain causes which seem to *originate* scrofula, or the scrofulous constitution or poison, *independent* of hereditary taint." He says, "the first cause is *syphilis*;" that horrible malady which has been called the retaliation of the New World upon the Old, for the cruelties inflicted upon the former by its discoverers, and which was unknown in Europe till the beginning of the 16th century. He gives cases to prove that the offspring was healthy till the parents contracted this complaint; but that children born afterwards were scrofulous, and generally died young, of consumption, or some one or other of the many diseases which scrofula originates. Astruc, a great authority on this subject, says, that "when scrofula is not derived from scrofulous parents, it is invariably derived from syphilis." What a dreadful prey to disease does he become who is the victim of syphilis—that loathsome malady! Scurf of a yellow colour appears in blotches over his skin; his throat and other parts of his body become covered with corroding ulcers; his bones, particularly the

bones of his nose, get diseased and ulcerated; they become brittle, and break on the least accident; at other times they become soft, and bend like a willow: his eyes are affected with itching, pain, redness, ending very often in total blindness; his ears are affected with ringing noises, pains, deafness, becoming carious and ulcerated internally. At length all his animal and vital powers give way, galloping consumption supervenes, the face becomes pale, a hectic flush appears on the cheek, the body becomes emaciated, and death closes the scene. Women who become affected with this disease fall a prey to hysteria, inflammations ending in abscesses and mortification, cancers, ulcers of the womb; they generally either become barren, or subject to abortion; and if they are so unfortunate as to have living children, they are born diseased, scrofulous, consumptive; and, instead of proving a source of happiness to their parents, aid in filling up the bitter cup of human misery which they themselves have prepared.

"The second *originating* cause of scrofula," says Dr. King, "is the excessive abuse and indulgence of the sexual instinct." He gives cases illustrative of this cause, and traces the scrofulous affections—*hæmoptisis*, *ophthalmia*, pulmonary tubercles, or worms in children—to the early habitual sexual dissipation of the father. Such cases are an affecting commentary on the remarkable and forcible expression of Job (ch. xx. v. 11), "His bones are full of the sin of his youth." "This," he says, "is one of the many ways in which wealth may prove a curse. Wealth is power, and the first tendency of power is to abuse itself, in all the modifications of which that power is susceptible." "The formation of this product (the seminal secretion)," says Dr. Carpenter, in his excellent *Manual of Physiology*, "is evidently a great tax upon the corporeal powers; and it is a well-known fact, that the highest degree of bodily and mental vigour is *inconsistent with more than a very moderate indulgence in sexual intercourse*; whilst nothing is *more certain* to reduce the powers, both of *body and mind*, than excess in this respect. * * * There can be no doubt that, in the human race, early death is by no means an unfrequent result of the excessive or premature employment of the genital organs; and where this does not produce an immediately fatal result, it lays the foundation of future debility, that contributes to produce *any* forms of disease to which there may be a constitutional predisposition, especially those of a scrofulous nature."

"A third *originating* cause of scrofula," says Dr. King, "is *premature indulgence of the sexual instinct, and premature marriage*." "It is remarkable," he says, "that among the German nations which overran the Roman empire, Tacitus relates that it was held disgraceful to indulge the sexual instinct before the age of twenty. And by the laws of Moses, a married man was forbidden to indulge the instinct on the day or night previous to a battle." So well were they aware of the fact, that a considerable loss both of physical and mental power was the consequence. There can be no doubt of the injurious effect of premature marriage, both upon the married couple and their offspring. We have well-known examples of such results, in the diseased, short-lived, and imperfectly civilized nations inhabiting warm climates. If premature marriage had been preceded by indulgence, the effect on the offspring is still more unfavourable; if by syphilis, it is disastrous. The gradual extinction of the higher and aristocratic classes, by the want of direct heirs, and the decline of states, may be generally traced to these sources, engendering a scrofulous, and therefore a perishable constitution.

Marriage too late in life is another originating cause of scrofula, and other forms of disease; and we may trace, even in the unconscious infant, the lines of that care which is ushering the decrepit parent to the grave.

Marriages betwixt near relations are another originating cause of scrofula in the progeny. This cause tends to the degeneracy, physical as well as moral, of the human race; to it we may perhaps fairly ascribe that imbecility which has been fatal to royal dynasties, and is even visible at the present day.

Other originating causes of scrofula might be given; but as they do not bear directly upon our present remarks, and as enough has been already said to prove to any rational being the truth of our assertions, we shall pass them over.

In our list of hereditary diseases, we come next to consumption and cancer; but as they appear to be merely forms, though the most fatal forms, of the scrofulous constitution, any additional remarks upon them would be superfluous.

We then come to gout; and it is so well known to be a hereditary disease, and to be generally originated by dissipation, that little need be said upon this head. Like other hereditary diseases, it seems to skip a generation, to reappear in the third. "How many young and interesting persons," says a medical writer, "without any fault of their own—how many juvenile rakes, are seen martyred and disfigured by the gout, from which their fathers, but not their grandfathers, were free!—a disease which occurs rarely in youth, unless it be hereditary."

How true, then, is the remark of Horace—

"Fortes creantur fortibus et bonis."

(The brave are procreated by the brave and good.)

And as we see that not only may these diseases descend to us from our forefathers, but are capable, chiefly through the influence of moral causes, of being *acquired* by a constitution free from any hereditary taint, and of being transmitted to our children and to our children's children; what a fearful responsibility rests upon every member of society in general, and every parent in particular, to guard sacredly against the causes of these maladies! And how consoling to think, that although we may inherit some of these diseases from our ancestors, yet, by carefully avoiding the exciting causes of them in ourselves, and by the proper moral and physical education of our children, we have it greatly in our own power, primarily to lessen the predisposition to their occurrence which exists, and ultimately to eradicate the taint from our posterity! A knowledge of these hereditary diseases is of the highest importance to every person, whatever his rank and station in life. Such knowledge must increase the desire for the diffusion of moral and physiological training amongst all classes of society. It ought to regulate, in some degree, the choice of a partner for life. Instead of parents making rank or wealth their great aim in the matrimonial alliances of their children, they would infinitely more promote their future happiness, by making the moral and physical constitution of the parties a primary consideration in their approval or disapproval of the union; when both parents have a predisposition to any complaint, the chances of a diseased offspring will be doubled; for this reason, lawful intermarriages between members of the same family are often highly objectionable. This knowledge ought to warn every individual, if his family have a predisposition to any of these diseases, such as scrofula, apoplexy, gout, gravel, &c., not only sedulously to avoid the causes, but to take every means to strengthen his constitution, so as to eradicate, if possible, the hereditary taint.

But hereditary diseases are not the only ones that are produced by moral causes. "Very many diseases," says Dr. Watson, in his *Lectures* already quoted, "have a mental origin. The domination of violent passions—the frequent recurrence of strong mental emotions—vicious and exhausting indulgences—each and all will sap the strength, and grievously impair the health of the body; and perhaps there is no cause of corporeal disease more clearly made out, or more certainly effective, than protracted anxiety or distress of mind." It is well known to physicians, that moral causes of disease act by diminishing the nervous influence, and weakening the vital energy of the corporeal powers; and that whatever tends to weaken that vital energy, is a most powerful predisposing cause of disease. Those whose vital energy is weakened by the abuse of stimulants, and other exhausting indulgences, fall the first victims to fever, to cholera, and to all contagious epidemics. What a train of diseases follow the abuse of ardent spirits! Dr. Watson, in enumerating the causes of apoplexy, says, "and large obser-

vation of the habits of those who fall victims to this terrible malady, leaves no room for doubting that intemperance often paves the way for its invasion. The continued abuse of ardent spirits, in particular, lays the foundation of many of those morbid conditions of the sanguiferous system, and of the viscera, which constitute the predisposition we are now considering." Diseases of the liver, of the stomach, of the brain, of the kidneys, of the bladder, and of the eyes, gout, tremors, palpitation of the heart, hysteria, epilepsy, sterility, emaciation, premature old age, ulcers, melancholy, madness, delirium tremens, are all given in detail by Dr. Macnish, in his "Anatomy of Drunkenness," as arising from intemperance; and he says, "there are still several others which have not been enumerated—nor is there any affection incident to body or mind, which the vice does not aggravate into double activity. The number of persons who die in consequence of complaints so produced, is much greater than unprofessional people imagine. * * * Dr. Willan, in his Reports of the diseases of London, states his conviction, that considerably more than one-eighth of all the deaths which take place in persons above twenty years old, happens prematurely through excess in drinking spirits."

We have said enough to satisfy any reasonable and reflecting mind, that moral causes exert a most powerful influence in the production of disease; and enough to show the necessity, even from no higher motive than a desire of temporal happiness, of shunning the slightest deviation from those precepts of virtue, which are so beautifully inculcated by our Divine religion. We have seen the external world adapted with the greatest exactitude to the physical well-being of man; and we cannot help pitying the miserable blindness or ignorance of him who cannot see and admire that wonderful adaptation of means to ends, which so visibly marks infinite power, intelligence, and design, on the part of the Creator. In the same way we may see, in the Christian religion, its beautiful adaptation to the moral well-being of man, in all the various circumstances in which he may be placed; and sincerely do we pity those who can suppose it possible that such precepts of self-denial and virtue could have arisen, in a comparatively rude and corrupt age, without a Divine origin; with equal reason might it be asserted, that the world created itself.

POLITICAL ECONOMY.

CHAPTER II.

VALUE.

THE first result of the divisional system of employment, says Mr. John Little, is the accumulation, in the hands of the producer, of a surplus beyond the amount of his own necessities of the commodity produced; thus, the man whose industrial energies are solely occupied in the production of cloth, accumulates more of that commodity than is necessary for his own personal use. The baker also accumulates a greater quantity of bread than he himself requires; but the weaver wants bread and the baker wants cloth, hence the former with the surplus of his cloth, and the latter with the surplus of his bread, are necessarily and naturally led to effect a mutual exchange, the baker supplying the weaver with bread, and the weaver supplying the baker with an equivalent, that is, with equal value, in cloth. In the same way the tanner, the tailor, the shoemaker, the hatter, the hosier, &c. &c., accumulating their respective productions beyond the extent of their personal necessities, part with the surplus for their value in other commodities which their varied necessities demand. These mutual transactions between man and man, or between nation and nation, are, in commercial language, termed "barter," which means the exchanging of one commodity for its value in another. We

are thus brought into contact with the word "value" as associated with barter, or exchange of commodity for commodity, and which is by far the most important in the lexicon of political economy. As the misapprehension of what value really is, and what it is not, has proved a most fertile source of error in the conclusions of even the most eminent writers on political and monetary science, and of the most disastrous consequences in every department of industrial practice; and, moreover, as a correct knowledge of its true substance is inseparable from anything like an intelligent apprehension of the first principles of political economy, a demonstration of what constitutes the essence of the element referred to is indispensably necessary. The air which we breathe is essential to every moment's existence of both the animal and vegetable creation, yet, because all can enjoy its possession *gratuitously*, or without the expenditure of labour, it is, as a commodity of barter, *valueless*. Again, although the light of a candle is to the light of the sun as a drop of water is to the oceans of the universe, yet a single rushlight is, as a commodity of exchange or barter, of more value than the whole mass of light that floods away to a thousand worlds from the great centre of our solar system. In other words, while the rushlight *does* possess value as a commodity of barter, the light of the sun *does not*; but the former is possessed only through the medium of labour, the latter is received by man *gratuitously*, or *without labour*; that is to say, that which costs labour *does* possess value, and that which costs no labour *does not* possess value, as a commodity of barter. But suppose that the rushlight, like the light of day, could be got without any outlay of labour, it would then, as an article of barter, be valueless also; hence, possessing labour it possesses value, possessing no labour it possesses no value. Again, a small quantity of flax, whose original labour-cost is only threepence, after being manufactured into a certain description of lace, possesses in the market a value in money of twenty pounds. Now, as nothing but labour has been absorbed by the flax since its value was threepence, it follows that the additional value, amounting in money to £19. 19s. 9d., which it now possesses, is derived from and composed of the additional labour expended on the flax in the process of its manufacture into lace. The conclusion, therefore, that labour, and labour only, constitutes the true essence of value is unavoidable.

But although the truth, that the essence of value is composed of labour, has been clearly recognised in the school of political economy, yet an *alloy*, that is to say, *something else than labour or value*, has most unaccountably been permitted undiscernedly to mix itself up with that element, and which has not only destroyed its distinctive character, but formed the producing cause of incalculable havoc and confusion in every form of industrial pursuit. We refer to the confounding of value with *price*, to the mixing up of that which is *unchanging* with that which is *fluctuating*. Value, as has been proved, being composed of labour, it is evident that, if *anything else than labour* is added to or recognised as value, the latter is, *as value*, in the same proportion *alloyed* and rendered *fictitious*. Thus, suppose that the value of a quarter of wheat in the hands of the farmer is 60s., and that it fetched that sum in the market, then the *value* of the wheat and its *price* would be *equal*. Again, suppose that, in consequence of a great and sudden demand for wheat, without a corresponding increase of supply, the farmer receives for the same wheat 120s. per quarter, its price would thereby be *doubled*, but that which constituted its true value would not be increased by a single farthing, because the increase of its price from 60s. to 120s. was derived *not from labour*, which *alone* constitutes true value, but from a surplus of demand over supply, which is *not value* because it is *not labour*. On the other hand, if, instead of an increase of supply over demand, the demand, in consequence of some sudden diminution of the consuming population, fell so much short of the supply, that the same wheat falls from 60s. to 30s. per quarter in the market, in that case the price of the wheat would suffer a diminution of *one-half*, but its real value would still be the same, viz. 60s., because the reduction in the price of the

wheat from 60s. to 30s. was derived, *not* from a corresponding reduction in the *labour* which the wheat had cost the farmer, but from *something else*, viz., from a deficiency of demand for wheat in proportion to the supply. In the one case, the price of the wheat rose 60s. above its value, that is, above its labour-cost; in the other it fell 30s. below its value or labour-cost, but the value did not rise above *itself* at the one time, and fall below *itself* at the other. It could no more do so than a yard length could be two yards at one time, and a half yard at another. Now the practical error to which we refer makes value and price one and the same thing, and consequently confounds that which is *fixed* with that which is *fluctuating*. In the case of the wheat just mentioned, it would say that its value was at one time 60s., at another time 120s., and at another only 30s.; while, in reality, the value never for a moment either rose above or fell below 60s.; the 120s. on the one hand, and the 30s. on the other, were the *prices* to which it rose and fell—not the value, which was always 60s.

It may here be proper to refer to a practical difficulty which has always been experienced in comparing one kind of labour with another; the labour of a farmer's servant, for example, with the labour of a working jeweller, or the labour of a common blacksmith with the labour of a professor of mathematics.

Labour and value, as has already been demonstrated, are *one thing*—are convertible terms; hence, if one commodity be equal in value to another commodity, the two commodities must possess the same quantity of *labour*. Thus, if a hat and a pair of shoes have in their production respectively absorbed an equal quantity of labour, then they are equal in value; and equal in value, the remuneration due to the producer of the hat will be exactly equal to the remuneration due to the producer of the shoes. Or, if the hat in its production cost double the labour which is required to produce the pair of shoes, then the value of the hat will be double the value of the shoes; and if double the value of the shoes, the wages due to the manufacturer of the hat will be twice the amount due to the manufacturer of the shoes. The wages being thus determined and measured by the *amount* of labour performed in the production of each of their respective commodities, it follows, that the proper remuneration due to each depends, not upon the time employed, but on the *amount* of labour performed by each during a specified time. Thus, if the labour performed by the hatter in ten hours is greater or more dense than the labour performed by the shoemaker in the same space of time; then, in proportion as the labour of the former is greater or more dense than that of the latter, in the same proportion is the remuneration due to the hatter greater than the remuneration due to the shoemaker. Illustrative of the principles by which the *density* of the various forms of labour is ascertained, suppose that, between Edinburgh and Glasgow, there are three different roads of *equal* length, say 40 miles each, and that the difficulties in travelling by the second road are two times greater than those by the first, and also that the difficulties which present themselves to the traveller by the third route, are not only equal to those occurring on the second, but imposts amounting to £1, or 6d. per mile, are leviable on the third, with which the other two are not burdened. Further, if I engage three messengers to walk the distance between the two cities, one by each road, and if the messenger by the first road is entitled to 6d. per mile, the one by the second road is entitled to 1s., and the one by the third to 1s. 6d. per mile, because the difficulties in travelling by the second road are twice as great as those by the first, and because, in travelling by the third road, the physical difficulties are not only equal to those of the second, but the messenger by the third is taxed at the rate of 6d. per mile, with which the other two are not burdened. Thus, while the lengths of the roads travelled by each are *equal*, I remunerate the messengers by very different amounts, and yet the proportions are in harmony with the principles of the most rigid justice to each, because I pay them according to the amount of *value* received from each, that is, according to the amount of *labour* performed by each; value and labour being *one thing*.

In the same way, the just remuneration payable to the various parties travelling by the various industrial routes, is in proportion not to the time occupied, but to the amount or density of labour performed by each during a specified period. Suppose that thirty years form the average length of man's industrial existence, and that the difficulties in travelling over that period by a man as a working carpenter, are equal to the difficulties encountered in the same length of time by another man as a working agriculturist, but that, in order to qualify him for his professional journey, the carpenter is obliged previously to labour gratuitously for five years as an apprentice, which the agriculturist is not required to do; besides, he is subjected to an outlay for tools of £5 per annum, from which the agriculturist is free. Then, if the agriculturist is entitled to £40 per annum, or £1,200 for 30 years, the carpenter is entitled to £56. 13s. 4d. per annum, or £1,700 for 30 years; that is, he is justly entitled to 1s. 4d. per day, or £16. 13s. 4d. per annum, or £500 for 30 years, *more* than the agriculturist, because duties are leviable (to use the former figure) on the industrial road of the carpenter, amounting to £500, equal at £40 to 12½ years' labour, which are not leviable on the agriculturist. In like manner a third party, whose profession requires an educational or some other qualification, is entitled to an additional remuneration, corresponding to the cost, in money and labour, of that qualification, the money being here only another name for labour, because the money is purchased with labour. So on with every other industrial pursuit.

Thus, if left to the natural action of natural laws—that is to say, if labour or value is weighed with *labour* or *value*, and with *nothing else*; or if labour or value is measured with *labour* or *value*, and with *nothing else*—the difference between the amount or density of labour or value in one profession, and the amount or density of labour or value in another, is at once exposed, and, consequently, the true proportion of remuneration due to each is determined.

DEMAND

THE CAUSE OF, AND CO-EXTENSIVE WITH, PRODUCTION.

Anterior to the division of labour, and to its offspring, barter, the primary cause of production had its existence located in the wants or necessities of mankind. That the expenditure of labour, for example, to procure the possession of food or of water, of shelter or of raiment, had its generating cause in the wants of the producer for these various commodities. Now, the laws of nature being, like their Author, unchanging and unchangeable, and because the wants of men were the primary cause of the outcoming of industrial exertion prior to the division of labour and barter, production under that system must still be the result of the same cause; but, apart from any analogical deductions, the truth is quite palpable, that the concentration by any individual of his industrial energy on the production of any one commodity, does not nor cannot destroy or lessen the realisation of his need for other commodities. That as the farmer, merely because he confines the application of his energy to agricultural pursuits, does not destroy his requirements for cloth, or for shoes, or for any other article, so neither does the confinement of the industrial energies of any other individual to any other pursuit, prevent the outcoming of his necessities for other commodities than those which he himself is employed to produce. No doubt the change to the divisional system of employment from its primitive opposite was accompanied by immense results; but these were social in their character, and in no way did they touch the relative positions which demand and production, as cause and effect, originally, and by the laws of nature, occupied towards each other. Hence, under the operations of the division of labour at the present day, the production of cloth or of coals, of iron, of ships, or of any other commodity, has its existence in the wants of society for these commodities, just as truly as the cause of the exer-

ing one or more cells to the battery, its power or energy may be made to equal that of the undivided arrangement.

A battery wholly composed of one metal, and fitted up on the principle of Grove's, with porous diaphragms, has been tried by M. Wohler, and an account of it has been published in the *Pharmaceutical Journal*. The metal used is iron; the solution strong nitric acid, and dilute sulphuric acid. The plate or cylinder that is used for the inner or porous vessel must be well polished, in which case the nitric acid has no effect upon it; the outer plate or cylinder which is immersed in the sulphuric acid does not require to be polished, as it stands in the place of the zinc in the common battery, or forms the positive pole,—the iron being gradually dissolved when the battery is in action.

The effects produced by this form of battery are very energetic when first excited; but it rapidly declines in effect, from the weakening of the nitric acid. The dense red fumes given off, are, moreover, very disagreeable and highly deleterious. It is also very expensive to work, owing to the high price of the nitric acid, as it is essential that the strongest be used.

RAILWAY TICKET PRINTING MACHINERY.

Illustrated by three Plates.

In the early days of any vast and sweeping improvements, we invariably find its promoters too much occupied in putting their general details into regular operation, to pay attention to the minute, though necessary points connected with the successful management of their venture. In how few cases do we discover any elegancies of manufacture, until years after the primary application of the principle. The railway system affords perhaps the best example of what we may term a rapidity of organization. It is true that a long period has elapsed since its first introduction; but since the fostering hand of the capitalist has been extended to it, how speedily has it extended its ramifications, and become part and parcel of our every day wants. As an illustration of the perfection of many of the minor details of this stupendous agent, we would refer the reader to the complicated and ingenious machinery invented by Mr Edmondson, for the simple operation of facilitating the printing and distribution of the fare tickets. So extraordinary is the demand for these passports, that, on most of our extensive lines, the ordinary manual operations formerly connected with their issue were found quite inadequate to the due management of this portion of their commercial details. Mr Edmondson, who has been long connected with railway matters, foresaw the difficulty, and as a remedy, has provided us with the machinery represented in the plates accompanying this article, for printing and numbering the tickets. Fig. 1 is a side elevation of the machine. Fig. 2 is a front view, and fig. 3 is a longitudinal section through the centre, showing the internal details. The whole of these figures are accurately drawn to a scale of one-third the original size. The frame work *A A*, is composed of two cast iron standards, bolted to a bottom plate, not shown in the view; this frame carries suitable supports for the attaching of the blank ticket case *B*. The tickets to be printed, are put in at the top of the case, which is surmounted by an ornamental cover; they are drawn away from the bottom, as shown at *C*. In order to understand how this is accomplished, we must refer the reader to the lever apparatus, worked by the handle *D*. This lever or handle works on a centre at *E*, attached to the standards of the frame, and carries the jointed printing table, being attached to the pendant lever of the table *F*. One end of the table, *G*, is used for imprinting the ordinary matter referring to regulations, &c., usually found on the tickets; the other extremity *H*, is employed solely for numbering. The types for imprinting the tabular matter are placed in the fixed box *I*, which is adjustable, by means of the hand screw *O*, immediately above it. A cloth band, *K K*, well

soaked in thick printing ink, is wound upon the roller, *L*, from whence it is passed round various guides, and runs beneath the case of types, *I*, being re-wound upon the roller, *M*. Each ticket is brought separately from the bottom of the case, *B*, by means of a sliding plate attached to the top of the vibrating lever, *N*, worked from the handle, *D*; this plate is recessed on its upper surface to the depth and size of a single ticket, so that at each vibration, it receives the lowest ticket from the series in the case, and transfers it to that portion of the table immediately beneath the types. By referring to the connections of the lever, *D*, it will be observed that each upward movement carries forward the ticket by means of the lever, *N*, whilst each downward one raises the impressing table, and forces it against that portion of the inked ribband or band, which is beneath the types, *I*. In this way the prominent portions, that is, the faces of the types only, are impressed upon the tickets through the ribband, thus imprinting upon it whatever matter may be set in the type box. The ribband, which is well soaked in ink previous to being put on the machine, affords a means of keeping up a constant supply of ink, in the most ingenious manner; after each impression, a new portion is presented to the types, being worked onwards by means of the ratchet rod, *O*, which is jointed to the motive lever, *D*. This rod carries a series of detents, connected with the ratchet wheels on the roller shafts *L* and *M*, so as wind up from the one, the same amount of ribband that it gives off from the other—the same rod also carries a detent gearing with a large ratchet wheel on the numbering wheel shafts *P*, which are moved the distance of a single number at each impression of the tickets. The last ticket detached from the case, pushes its predecessors before it, so that there are always several tickets in contact with each other on the table *G H*, the last one being pushed forward by those behind, at each stroke, and when numbered, drops into the box *Q*, at the front of the machine. The numbering wheels *P*, are arranged to number to 10,000, the first wheel carrying the figures 1 to 99, and the second from 01 to 00; at each whole revolution, one of the two is carried forward a division before the other, by an arrangement of pins, seen in fig. 2, in order to effect the requisite change at each 100. In fig. 2, the finished ticket case *Q*, is shown full of tickets, as they are thrown in from the table—there is an arrangement provided for conveying them straight down the tubular case, which is not shown in the drawing, in order to avoid confusion. This is a sliding spring block, similar to that shown in Plate 3rd, which is adjusted to support each ticket as it falls into the tube, preventing its turning over or getting into any position out of the horizontal.

After the process of printing and numbering, the tickets are transferred to a series of cases, each numbered to represent the particular station for which the tickets are intended, whence they are selected for distribution.

Plate 2nd represents the press used for dating the tickets, previous to their delivery to the passengers. Fig. 1 is a section through the centre of the machine; fig. 2 is a front view, showing the opening by which the ticket is introduced, and fig. 3 is a back elevation of the machinery detached from the external case. *A*, is the outer case of the machine, to the top of which, the type holder *B*, is jointed at *C*. *D*, is the roller upon which the inking ribband *E*, is coiled during the act of dating, being drawn upwards beneath the types, from the roller *F*, which works loosely in bearings in the lower portion of the impresser *G*. The types are seen at *H*; they are held in their exact position by means of the cross piece secured by the screw *I*, the whole being removable by unscrewing the screw *K*; the two portions of the impressers *L* and *G* are jointed together, as seen at *M*, so that when the ticket *N*, is introduced into the opening in front of the machinery, and pres-

sure applied upon the part marked *a*, the whole acts as a knee joint, and brings the types to bear upon the ribband, and through that, upon the ticket, as explained with reference to Plate 1st. The lower portion, *x*, of the piece *a*, is arranged to slide upon a fixed piece on the bottom plate of the machine, in order to permit of the proper action of the joint *L*. By this simple apparatus, the tickets are quickly dated in the order in which they may be required for the traffic of the lines. In order to simplify the checking and counting of the tickets issued to the different heads of the railway departments, Mr Edmondson has introduced the Counting Machine, represented in Plate 3rd. The drawings are here of the full size of the machines actually in use. Fig. 1 is a side elevation of the machine, showing the toothed gearing used to increase the speed of counting. Fig. 2 is an end view. *a*, *a*, is the case containing the tickets to be counted off, a few being shown by the dotted lines near the bottom; they are each detached one by one, from the case, by the slide *b*, which is worked by the crank, connecting-rod, and lever *c d f*; they are received into the tube *l*, on the top of the spring block, which must be moved gently down by the left hand as they are driven in. This tube is kept in its place by the small spring-catch on the tube. This is not shown in fig. 2, to prevent confusion; at each turn of the crank, the eccentric *g*, which is keyed fast upon it, gives motion to the ratchet-wheel *h*, by means of the bell crank and click *i k*; the ratchet wheels have each a hundred teeth, and likewise a brass ring fixed to each, divided into a like number of divisions; the unit wheel ring is numbered 01 up to 99 and 00, the hundred wheel is numbered 1 to 99, the other space remaining blank, which is at the sight, *o*, in the plate, *p*. At covering part of the wheels; the wheel *h* or unit wheel is supposed to have made one revolution, except the 100th, to show which the 100th wheel must be brought into action; this is done by the small detent that is fixed upon the unit wheel, and as it moves forward to the division with 00 upon it, the detent acting upon the bell crank and click, *r s*, moves the 100th wheel forward one division, which will show 100 at the sight *o*; the click *s*, when released will take its original position, so that it may be worked on without taking any further notice until the highest 9999 is arrived at. The wheel and pinion arrangement is merely for the purpose of increasing the speed of the machine; by causing the handle to revolve 170 times per minute, 500 tickets may be driven out in the same manner.

DOMESTIC MEDICINE.

CHAPTER III.

ON THE PHYSICAL CAUSES OF DISEASE.

In last chapter we drew attention to the powerful influence which *moral causes* have in the production of disease. We attempted to show that selfish and worldly motives alone, independent of religion, ought to induce us sedulously to avoid these causes; and that, in proportion to the intensity of our religious feeling, our conscience—that inward monitor—will the more effectually warn us to shun those slight deviations from the path of rectitude, that will lead us imperceptibly to the brink of the precipice of depravity, and will finally hurl us headlong into the gulfs of moral degradation, disease, and premature death.

The attention of the reader will now be directed to the influence of *physical causes* in originating and promoting disease; and as we may see that civilization tends to lessen the moral causes of disease, only in so far as it is based on religion, so will we see that its influence in diminishing the physical causes consists in its promoting a discovery of these causes; and as it is the duty of the clergyman to instil pure religious feelings into society, so is it the duty of the physician to pro-

mulgate a knowledge of the physical causes of disease among all classes of the community, thus fulfilling the noble aim and end of his profession—to *lessen the amount of human misery*.

The diseases which chiefly occur among *savage nations* are few and simple: fevers, fluxes, and rheumatisms may be said to complete the list. They arise mainly from exposure to vicissitudes of temperature.

Travellers are forcibly struck with the healthy appearance, the finely-shaped and athletic figures, and the power of endurance of hunger and fatigue, exhibited by the natives of newly-discovered countries. It is related in the life of Capt. Cook, that, while he was in New Zealand, he never saw a case of disease among the inhabitants; that, in all his visits to their towns and huts, he did not observe a single person who had any bodily complaint; that he observed with surprise the great number of old men with whom the country abounded, who, although they had lost their hair and teeth, were as cheerful, vivacious, and happy as their grandchildren. It is mentioned as another proof of the health of these people, that their wounds heal with extraordinary facility and rapidity. A man, by accident, got a musket ball shot through the fleshy part of his arm, and it healed so quickly and perfectly that, had not Capt. Cook been aware that no application whatever had been applied to it, he would have been led to think that the art of surgery existed in that country in a state of great perfection. "Water," adds the writer, "as far as our navigators could discover, is the universal and only liquor of the New Zealanders." "It is greatly to be wished," continues he, "that their happiness in this respect may never be destroyed by such a connection with European nations, as shall introduce that fondness for spirituous liquors which has been so fatal to the Indians of North America." On turning our eyes to the last-mentioned country, we see the once athletic, vigorous, and brave Red Indian falling powerless before the contaminating influence of the vices of civilization; and the day is probably not far distant, when the last of his race will sing his farewell hymn to the setting sun, on the top of one of the Rocky Mountains, before he breathes his last, and takes his departure to that happy country in the "far west," where he hopes to revel in all the pleasures of flood and field that would have enchanted him in this lower world. There is no great good in this sublunary scene but is alloyed with a great amount of evil: so it is with civilization. The benefits it confers on mankind are incalculable, but at first sight we are apt to think that the evil counterbalances the good. We see a rude tribe of savages, a brave, in some sense a virtuous, a healthy, and a happy race, brought within the sphere of civilization, and immediately fall a prey to its attendant train of vices. Drunkenness, dissipation, immorality, misery, and disease, will take the place of temperance, sobriety, morality, happiness, and health; and, without the precepts of religion to inculcate self-control, the influence of public opinion to produce moral restraint, or the light of science to warn them of their danger, these wild men of the woods will gradually become extinct.

Does civilization, then, diminish or increase man's liability to disease, or the number of diseases? Does it tend to shorten or prolong the span of human existence? The diseases almost peculiar to civilization are—scarlet fever, syphilis, scrofula, consumptions, cancer, gout, dropsy, palsy, apoplexy, mania, indigestion, hysteria, hypochondriasis, and, in general, all those diseases which have their seat in the brain and nervous system. According to the late Dr. Cullen, the number of diseases which belong to civilized nations amounts to 1,387; of this number, 612 are made up by the class of nervous diseases alone. To prove that *moral causes* greatly contribute to swell the number to this enormous amount, we have only to visit a lunatic asylum, and behold the effects of avarice, of pride, of vanity, of ambition, of disappointed love, of injustice, and inhumanity, in making up the number of its inmates. To show the influence of *physical causes* in promoting disease among civilized nations, we have merely to take into account the close and overheated nurseries among the rich, the crowded and filthy dwellings among the poor, the impro-

per diet and dress, and the premature development of the intellectual faculties, added to hereditary delicate constitutions, in producing the numberless diseases of infancy, childhood, and youth. Again, their pernicious and absurd fashions in dress, their overstimulating diet and cordials, their want of exercise, their eager pursuit after excitement, their indolence during pregnancy, their hot rooms and pampered appetites during childbirth, all open up so many avenues for the invasion of the various diseases incident to females in civilized life; while the effects of hard labour and poverty among the poor, of indolence and debauchery among the wealthy, of intemperance among all classes, and of different trades and professions, sufficiently account for the great increase in the number of diseases among the civilized portion of mankind. The first question, therefore, must be answered in the affirmative—that civilization, by promoting the moral and physical causes, greatly increases, not only the liability of man to disease, but the number of diseases. But, on the other hand, on comparing the past with the present condition of mankind—on comparing the longevity of the inhabitants of ancient and modern kingdoms with the different degrees of civilization enjoyed by each, we are forced to the conclusion, that the progress of civilization tends to lengthen the average of human life, and to promote the greatest happiness of the greatest number; and although a multitude of new diseases follow in its train, still, with the march of civilization, many become less prevalent and diminish in fatality, while others have entirely disappeared. Among the former may be mentioned small-pox, scurvy, rickets, dysentery, and intermittent fever or ague; among the latter, leprosy, the sweating sickness, and the plague. *Leprosy* was so general, and committed such ravages throughout Europe in the twelfth century, that hospitals were erected in many places exclusively for the relief of that disease: it disappeared about the beginning of the sixteenth century. The *sweating sickness* prevailed in England till the end of the sixteenth century; in some seasons, during a month or two in autumn, its mortality was nearly equal to that of the plague. Erasmus ascribes the prevalence and great mortality of these diseases to the "filthy and loathsome" condition of the inhabitants of the cities of Western Europe in those times. They were so dirty, and so poorly fed and clothed, that when any contagious disease made its appearance among them, the havoc it made was dreadful. "The floors of the houses (in the fifteenth century)," says Rankin, in his History of France, "being commonly of clay, and strewn with rushes and straw, it is loathsome to think of the filth collected in the hovels of the common people, and sometimes in the lodgings even of the superior ranks, from spilled milk, beer, grease, fragments of bread, flesh, bones, spittle, excrements of animals," &c.

The first accounts of the *plague* in English annals occur in the year 430. In 1349, it spread from the north-western parts of Asia over all Europe, and became epidemic in England. It swept off more than two-thirds of the inhabitants in some parts of the kingdom, and, on an average, one-half is said to have perished. In the city of London, which was then in a most filthy and crowded state, the streets very narrow, dirty, and unpaved, the houses low and badly ventilated, the sewerage and the supply of fresh water very deficient, 100,000 persons died in that year from this cause alone. In 1562, more than 20,000 died; in 1592, 36,000; in 1625, 35,000; in 1636, 10,000; and in 1665, 68,000. In 1666, the great fire took place. The greater part of London was reduced to ashes; a new city was built; the streets were widened, paved, and drained; the houses constructed on new and improved plans; a supply of pure water was obtained; sewers were formed: the plague thereafter began to languish, and, in 1679, it finally disappeared.

Any one in advanced life has merely to refer to his own observation, or to the recollection of the tales told him by his ancestors of the prevalence and mortality of *small-pox* in their days, to prove the great diminution of this disease by vaccination. The inestimable benefits of vaccination are checked by the neglect, and, in some instances, by the caprice, of the lower classes; so that, in countries where this

measure is not enforced by the government, a proportion of deaths still arise from small-pox. In London, about 1 in 40 die from this cause; in Prussia, about 1 in 12; while in Sweden, where vaccination is enforced by law, the following official return places the efficacy of the measure in the strongest possible light:—

In the year 1779 the small-pox destroyed 15,000 persons.

.....	1784	.....	.....	12,000	...
.....	1800	.....	.....	12,800	...
.....	1801	.....	.....	6,000	...
.....	1822	.....	.....	11	...
.....	1823	.....	.....	37	...

The London *Bills* of the seventeenth century, show that the mortality from *scurvy* was then considerable. By a continuous supply of *fresh* vegetable and animal food on land, and, failing these, of lemon juice on sea, combined with habits of cleanliness and sufficient clothing, this disease is now rarely seen.

That *rickets*, and other diseases of children, have greatly diminished with the progress of civilization, there can be no doubt whatever. The following table of the ratio of infant mortality in London for 100 years, shows that this mortality has been constantly on the decline:—

Periods.	Ratio of deaths per 100 births, under 5 years of age.
From 1730 to 1749,	74½ per cent.
... 1750 to 1769,	63
... 1770 to 1789,	51½
... 1790 to 1809,	41½
... 1810 to 1829,	31½

Accurate tables of the registration of deaths have been preserved at Geneva since 1560; from which we find, that in the middle of the sixteenth century, half the children born did not arrive at the age of six years; in the seventeenth century, the probability of life to a newly-born infant was about 11½ years; in the eighteenth century, it increased to above 27 years; while at the present day, according to the Carlisle tables of the laws of mortality, the probability of life to every newly-born infant in Britain is upwards of 38 years.

Many parts of Britain were subject, in olden times, to the yearly recurrence of *intermittent fever* or *ague*. In London it was very frequent and very fatal. James I. and Oliver Cromwell both died of ague contracted in London. The town of Portsmouth also, being built on the low marshy island of Portsea, was formerly very subject to fever and ague; but since it was paved and drained in 1769, the disease has disappeared, while Hilses, and other parts of the same island, continued to be affected till 1793, when the disease was visibly mitigated by the formation of a drain. In many parts of Scotland, also, the inhabitants were annually visited with an attack of fever and ague; but the improved sewerage of towns, the drainage and cultivation of bogs in the country, together with the application of lime, have all materially contributed to dispel the cause of the disease; and agues, unless in a few low-lying marshy districts in England, have all but disappeared from Britain. In London, about 180 years ago, according to Sydenham, 66 out of every 100 deaths arose from simple fevers alone; while, at the present day, the whole mortality from epidemic, endemic, and contagious diseases, does not amount to one-fourth of the total number of deaths from all causes.

Even the climates of different countries have changed and become more healthy by the progress of civilization. Two thousand years ago, England, France, and Germany possessed the hot short summers, and the long, cold, and stormy winters, which prevail in Canada and Chinese Tartary at the present day. Cæsar informs us that the vine could not be cultivated in Gaul, on account of the severity of the cold in winter. The reindeer, which cannot now exist in a more southern climate than Lapland, was then an inhabitant of the Pyrenees. The river Tiber was frequently frozen over at Rome, and the ground covered with snow for weeks together, which now scarcely ever happens. Fairs have been held on the Thames at London, so thick was its icy covering

in former times; such a circumstance would now be looked upon as a most remarkable occurrence. Countries become more salubrious by the increase of the population, and the prosperity and progress of agriculture; and it is only by continued industry that this salubrity is maintained. No sooner had the lands around Rome been allowed to go out of cultivation, than *ague* was immediately observed to increase; while in North America, the advance of agriculture, by draining, cutting down trees, and improving the soil, has produced such a marked effect in promoting the healthiness of the climate, that localities which were speedily fatal to the early settlers, have now become perfectly salubrious. There can be no doubt that the climate of Europe has undergone a great change, and it seems equally certain that America will partake of the same amelioration when the same amount of industry has been expended on her soil.

That the mean duration of life, then, has been lengthened in every civilized nation, can be no longer doubted. If we examine the data of Dr. Villermé, and compare the rates of mortality in France at different periods, we will find longevity increasing in proportion to civilization. In the fourteenth century, the annual mortality in Paris was 1 in 16 or 17; in the seventeenth century, it was 1 in 25 or 26; and it is now 1 in 32 or 33, while among the higher classes it is only 1 in 42. The increase of commercial and agricultural industry having greatly multiplied the comforts of the working classes, enabling them to procure larger dwellings, a more abundant supply of wholesome food, more comfortable and more frequent changes of clothing, together with a sufficient supply of fuel and pure water; the progress of medical and scientific knowledge having taught men the advantages of cleanliness and ventilation, of draining marshes, of constructing sewers, of widening and cleansing streets, and of bestowing a more enlightened care on infancy, and a more rational treatment of disease having been adopted—many diseases have been mitigated, others completely banished from the land, and, altogether, man's term of existence has been sensibly prolonged. A medical writer observes, "that the *causes* which shorten life are generally those which render it miserable; and that, wherever a people enjoys a higher degree of prosperity, of rational freedom, and of moral dignity, there also will a greater number of individuals reap the full harvest of their years," corroborating our remarks in a former chapter. It is therefore incumbent on every writer of a popular branch of medical science, to point out these causes, so as to contribute his mite towards lessening the amount of human misery, and conducting the feeble and unfortunate in safety to the natural boundaries of their present existence.

Medical writers are in the habit of dividing the causes of disease into *predisposing* and *exciting*. By a *predisposing* cause, they mean any cause acting on the constitution of an individual, rendering him more susceptible of actual disease, than if that cause had not been in operation. By an *exciting* cause, they mean whatever directly gives origin to a disease. For example, suppose a medical student to lead a life of dissipation, and weaken his constitution by vicious habits; and suppose him to visit the wards of an hospital, where he would be exposed to the contagion of typhus fever, in all probability he will become a victim to the disease; whereas, had his constitution been unimpaired, his chances of escape would have been increased sevenfold. The dissipated habits are the *predisposing* cause, the contagion of fever the *exciting* cause, in this by no means rare case.

The *predisposing* cause is that which renders the body more liable to become diseased on the application of an *exciting* cause.

The *exciting* cause is that which actually excites disease in the body.

A knowledge of these *exciting* and *predisposing* causes is of the utmost consequence in enabling us to escape the liability to disease. By carefully avoiding the *exciting* causes, we are enabled to preserve our health even with a strong hereditary predisposition; and, on the other hand, if we have a knowledge of, and can avoid the acquired, or mitigate the here-

ditary *predisposing* causes, disease may be averted, even exposed to the risk for a time of powerful *exciting* causes. A person may inherit that peculiar conformation of body, and that physical constitution, from his ancestors, which predisposes him to apoplexy; and though he cannot remodel the construction of his body, nor infuse new blood into his veins, still, by avoiding the exciting causes, by observing the strictest simplicity and regularity in his diet and regimen, and by guarding against that cause which, above all others, not only augments but originates a predisposition to the disease—*intemperance*,—he may not only escape falling a victim himself, but he may transmit to his children a far slighter hereditary taint than his own of that predisposition which he received from his progenitors. Again, we know that any influence which *debilitates* the constitution or vital powers, such as long fasting, excessive evacuations, fatigue, a last night's debauch, want of sufficient exercise in the open air, want of sufficient sleep—in fine, whatever wastes the bodily strength—is a powerful *predisposing* cause of fevers and other contagious diseases; by avoiding these predisposing causes, by a proper quantity of nutritious food, sleep, exercise, abstinence, by keeping up the bodily strength to a maximum of vigour, an individual may escape these noxious contagions. It is to these means chiefly that medical men trust to protect them from contagion in their professional intercourse with the sick, for they well know, that in proportion as the body is weakened and debilitated by exhausting influences, it yields the more readily to the exciting causes of disease, such as contagion, malaria, wet, cold, &c.; and that by strengthening the constitution, and avoiding all causes of debility, they can walk in comparative safety amidst the pestiferous influences by which they are surrounded.

In detailing the *physical causes* of disease, we shall first notice *atmospheric causes*, which may either be predisposing or exciting according to circumstances.

1.—*Extremes of heat and cold, and sudden vicissitudes of temperature.*

What are the effects of excessive heat and cold upon animal life? We know their effects upon vegetable life: in summer, the sap of plants circulates, and it circulates with more or less rapidity in proportion to the degree of heat; in winter, the circulation of the sap is slow in proportion to the degree of cold, till, in severe frost, it is almost in a state of stagnation. In summer, while the sap circulates, the plant is clothed with foliage—it grows; as this circulation becomes less vigorous in autumn, the leaves fall off—the growth is repressed. The warmer the climate, therefore, the more luxuriant the vegetation, and *vice versa*. There is a considerable analogy in this respect between plants and animals: as heat stimulates the circulation of the sap in plants, so does it stimulate the circulation of the blood and other organic functions in animals. In warm climates, with the temperature ranging from 80 to 100, and even 120 degrees of Fahrenheit's thermometer, we find, along with a luxuriant vegetation, a dense population, their organic functions energetically performed, their span of life abridged, they arrive quickly at maturity, and as quickly fall to decay: a female is a mother at 12, a grandmother at 25, and an old woman at 35; here animals and vegetables arrive at a large size. In arctic regions, on the contrary, the inhabitants are few and thinly scattered, animals and vegetables are stunted in growth, the stature of man is only 4 to 5 feet, the powers of life are languid, and he lives to a much greater age. But while heat stimulates the *organic* functions, such as the circulation of the blood, it at the same time depresses the *animal* functions of the body, producing deficiency of nervous energy, lassitude, and disinclination to bodily and mental exercise. Cold, on the other hand, depresses the *organic* functions of the body; and when very intense, and accompanied with fatigue, it depresses all the vital powers, producing effects similar in appearance to those of intoxication, a disposition to sleep, coma, and ultimately death. A moderate degree of cold, combined with exercise and sufficient clothing, has an invigorating and exhilarating effect on the mind and body; it gives a buoyancy, a cheerfulness, and an elasticity to the spirits, and a sensi-

bility, an energy, and acuteness to the intellectual faculties, which are totally unknown to the native of a relaxing climate within the tropics.

The most prominent diseases of tropical climates are—inflammation of the liver, dysentery, cholera, and yellow fever; and one peculiarity of these diseases is, that, as might be expected from the stimulating influence of heat on the vital functions, they run a very rapid course. It is, indeed, no unusual circumstance to see a friend in apparently good health early in the morning, to hear of him being attacked by cholera or acute dysentery during the day, and to be asked to attend his funeral the same evening. There is now, however, much less importance attached to the influence of climate in the production of disease than formerly; it being well known, that man is endowed with the peculiar power of accommodating himself to almost every climate where fortune may place him; and that his liability to, or immunity from, disease in a warm climate, will depend, in a great measure, on the prudence by which he is governed. A great proportion of the deaths among Europeans in warm climates, arises from their gross neglect in avoiding and guarding against the obvious causes of these diseases; they have not sufficient self-control to restrain themselves from a licentious mode of living, from diet the most unsuitable, from indulging in spirituous liquors, and from the grateful but dangerous exposure to the cold evening air, after the burning heat of a tropical sun.

Dogmatic rules, either for the preservation of health, or for our guidance in any of the common affairs of life, will never be borne in mind so easily, nor will they command obedience so strongly, as when we see clearly the propriety of these rules, from knowing the grounds upon which they are founded. To make the effects of heat and cold, therefore, and of sudden variations of temperature in promoting disease, thoroughly understood, it will be necessary to explain a few of the physiological peculiarities of the structures which are affected by their influence.

It is well known that the arteries are tubes leading from the heart, conveying the living fluid—the blood—to all parts of the machine, to nourish and sustain the different organs and tissues of which it is composed. When these arteries arrive at their destination, they become so infinitely subdivided, and their branches communicate so freely together, that every organ and texture of the body—heart, lungs, liver, kidney, brain, bone, muscle, skin, &c.—is permeated by an exceedingly close network of extremely small blood-vessels, called *capillaries*, from *capillus*, a hair. They are the terminations of the arteries and the beginnings of the veins, hence called also *intermediate vessels*.

These capillary or intermediate vessels are only $\frac{1}{3000}$ of an inch in diameter; they cannot be seen but through a microscope; and they are so closely packed together, that the point of the finest needle cannot be introduced through the skin without wounding several of them. From these capillaries, the veins carry the blood, now deprived of its nutritive ingredients and loaded with impurities, back to the heart, to be thence sent on to the lungs, there to be purified, before it be again transmitted through the system.

Besides this capillary network, there is another set of infinitely small tubes which must be taken into account in considering the effects of heat and cold on the surface of the body; these are the perspiratory pores, which perforate the skin in every part, enabling the perspiration to exude either in an invisible vapour, or a visible fluid. These pores are more numerous in some parts of the body than in others, but, on an average, the number of 2,800 is reckoned for every square inch of surface of the skin; and that the perspiration, either in a *visible* or *invisible* form, is incessantly poured forth from these, we can easily prove by holding a piece of very finely-polished metal near any part of the body, and observing it quickly covered with moisture. The amount of fluid exhaled from the skin in twenty-four hours is about 23 oz.; from the lungs, 10 oz.; in all, somewhat above 2 lbs. But the amount of fluid excreted from the skin and lungs, depends upon whatever stimulates the circulation of the blood; the

stronger the stimulus either to the general or capillary circulation, the more fluid is given off, and *vice versa*. Two purposes of infinite value to the safety of the system are fulfilled by the cutaneous and pulmonary exhalation: one, to remove from the system a quantity of ingredients which, if allowed to circulate in the blood, would very soon prove noxious to animal life; another, and a most important one, to regulate the temperature of the body. Chemistry tells us that water, at the ordinary temperature of 45°, requires 167 degrees of heat to make it boil, but that more than $5\frac{1}{2}$ times this amount must be expended before it can be converted into vapour or steam. We thus see how beautifully the perspiration is adapted to regulate the animal heat: the more the body perspires, the more does this perspiration, in passing from the fluid to the aeriform state, rob it of its superfluous heat, so as to keep it at a nearly uniform temperature. By this regulating power, man can remain for a considerable time, with perfect safety, in an oven heated far above the temperature of boiling water, while animals that do not possess this perspiratory apparatus would perish in a few minutes. By the same power, and with ordinary prudence, he can withstand the heat of a vertical sun for a lengthened period, and with less injury to his constitution than is generally imagined.

Bearing these things in mind, we can now understand why sudden variations of temperature are so productive of disease. Heat stimulates the capillary circulation of the skin, attracting a great amount of blood to the external parts, and increasing the perspiration from the surface of the body; the exhalation from the lungs, also, is increased or diminished according to the moisture or dryness of the air which is breathed. Now, if we could suddenly arrest these actions—if we could suddenly check the capillary circulation, stop the perspiration, and supply the lungs with moist air, what would be the result? The blood would be repelled upon the internal organs, producing inflammation or excessive action; the exhalation from the skin would be repelled upon the kidneys, that of the lungs upon the liver, or else these fluids would circulate in the system and promote disease; and these noxious effects would be the more powerful, in proportion to the suddenness of their occurrence, and the vigour of the actions of the different organs at the time. Cold causes the external parts to shrink, when very intense, even to the falling off of rings from the fingers, and shoes from the feet; thus arresting all the actions of the blood in the capillary vessels, checking the perspiration, and repelling the force of the circulating current upon the internal organs. In this manner, therefore, cold acts as an exciting cause of disease; and when we add to these effects, that a hot atmosphere becomes saturated with moisture during the day, which, by the evening's cold, falls profusely in the form of dew, thereby checking the exhalation from the lungs, and repelling it upon the liver, giving it a double amount of labour, we may cease to wonder that sudden vicissitudes of temperature should prove such powerful causes of disease.

It is absolutely necessary for the health of the body, that every organ shall perfectly and regularly perform the peculiar duty assigned to it: the liver must secrete its proper quantity of healthy bile, the kidneys their urine, the skin its perspiration, the bowels and the lungs their secretions; otherwise the equilibrium of the whole will be disturbed. But to enable them to perform these offices, they must be supplied with a proper quantity, and not more than a proper quantity, of blood. If the supply to any one of them be checked, and reduced below the natural standard, its secretion is immediately diminished, and either some other organ must take on additional work, or noxious matters, which ought to have been removed from the system, will remain in the blood, and act as a poison. If, on the other hand, the supply of blood to these organs be in too great quantity, they are called into excessive action, their secretions become increased in quantity and vitiated in quality, and inflammation of the organ is frequently the result. This is precisely the effect produced by sudden vicissitudes of temperature. An individual, after being exposed to a heated atmosphere, or to excessive exercise, is perspiring freely, and, in an exhausted state, throws

off part of his clothes, loosens another part, and sits down in the cool refreshing breeze at an open window; what happens? The capillary circulation is arrested, the blood is repelled upon the internal organs, the perspiration is also checked, and an additional demand is made upon some of these organs: if on the intestines, either inflammation is the result, if they refuse to act, or if they do act, there is an attack of diarrhoea, or dysentery; if upon the liver, here again we have inflammation, or an excessive flow of bile, which in its turn affects the bowels, producing a bilious attack, with vomiting or dysentery; if upon the lungs, we have inflammation, or an excessive secretion of mucus, which is denominated influenza, or catarrh; if on the brain, inflammation, apoplexy, or paralysis; if on the kidneys, also inflammation, or an excessive flow of urine; if on the joints, rheumatism; or perhaps the constitution may be so strong, and all the bodily organs may act with such harmony, that the extra duty may be shared between them, and no bad effect may ensue. In nine cases out of ten, however, the individual, from predisposing causes, has some one of his bodily organs weakened, and liable to be affected by so strong an exciting cause, and, in the instance we have supposed, it is certain to suffer. In India, for example, the extreme heat during the day raises into the atmosphere a great quantity of moisture, which, by the evening's cold, becomes condensed into dews and fogs: this cold moist air not only has a pernicious effect, by repelling the blood upon the internal organs, and thus becoming an exciting cause of disease, but also, from its being inhaled into the lungs, it prevents the proper quantity of watery exhalation from passing off from them; and from the sympathy of action which appears to exist between the lungs and the liver, the latter organ is habitually called into over-exertion—hence it is weakened, and predisposed to disease, and, on the occurrence of a sufficiently strong exciting cause, falls a victim to inflammation and its consequences. Again, if we add to these causes of disease which are peculiar to the climate, the well-known influence of stimulating food and drink as a powerful predisposing cause of disease in the liver, kidneys, and intestines, we need not be surprised that the prevailing complaints of Europeans in tropical climates should be diseases of these organs, or that a fatal attack of inflammation of the liver, of cholera, or of acute dysentery, should be the certain consequences of a moderately strong exciting cause.

But not only does cold act as a cause of disease, by contracting the superficial blood-vessels, and repelling the blood upon the internal organs, it tends also to depress the action of the heart, and paralyse the vital energy of the system. As long as the heart's action is kept up, either by the strength of the constitution, by exercise, or by the influence of stimulants, the pernicious effects of sudden changes of temperature are counteracted. The Russians leave their vapour baths, and roll themselves in the snow, or plunge into cold water; arctic voyagers leave their cabins, where the temperature is at 60° Fahr., and go into the open air at 10°, or at zero; others will leave ovens heated far above the temperature of boiling water, and go into the atmospheric air at 50° or even 40°; and in all these instances, with perfect impunity. In such cases, however, the constitution is vigorous, the vital energy is unexhausted, and, though the blood is repelled upon the internal parts, there is sufficient strength to produce reaction, and no bad effects ensue; but if the cold were prolonged beyond a certain point, or if the constitution be weakened by any predisposing cause, so as to be unable to produce reaction, and to return the blood to the surface of the body with sufficient energy, then would the case be totally altered, and the most disastrous consequences would be the result. From this we can understand the injurious effects of cold bathing, if the strength be too weak to produce reaction—which, of course, is the more certainly and quickly produced, the more vigorous and unexhausted the body is at the time; we can also understand why old people and infants, in whom the circulation is weak, are more liable to suffer from the effects of cold, than those in the prime and vigour of life.

THE ICE TRADE.

It is doubtless well known to our readers, that the commercial importance of Ice has of late been advancing with unwonted celerity, unsurpassed perhaps by any other article of trade, if we except that highly prized commodity, commonly called Guano. The Guano trade has been quite a commercial phenomenon; the rush of a caravan to a stream in the desert could hardly symbolize the eagerness with which that lucrative traffic has been pursued, when once the value of the prize became known. Ships, which lay inert and useless in their berths, gaping their wide holds for a wherewithal to trip it o'er the glassy wave, and ready to burst their well-tarred sides, one would think, with downright indolence—these ships got ready chartered for the famous Ichaboe, and once more was our shipping trade restored to activity. The days of the Guano trade, notwithstanding, are, we fear, numbered; we anticipate that ere long the trade will die a natural death—a death of sheer exhaustion, and that not a vestige of it will be left to posterity, always excepting the wonderful mummy that has been exhumed from the bed where it had lain so long and so comfortably.

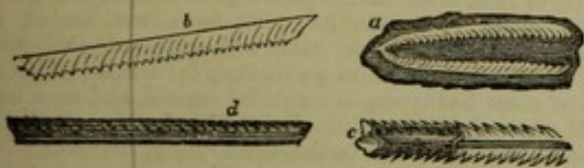
Not so is it with the trade in Ice. So long as the revolution of the seasons shall continue, we may expect the hundreds of thousands of tons annually derived from the surface of the globe. Ice is prepared from water, in Nature's laboratory, by the simplest of means, and, as usual, on a *gigantic and liberal* scale. The Ice merchants have only to prepare their instruments, and these of the simplest kind, for the cutting up and transporting of the raw material. Moreover, raw as that material is, it undergoes no preparatory and expensive process for fitting it for public use. Ice, as it is, unadulterated Ice, is used in the kitchen, in the butler's pantry, and on the table, as regularly as any other *necessary* luxury. It is not wonderful, then, that the obtaining and supplying of Ice has called into existence regularly organised *Ice Companies*, and furnished regular employment to a large amount of labouring population.

North America takes the lead in the cultivation of this branch of trade. This need not surprise us, when we recollect the natural facilities offered by the country, in conjunction with the genuine Yankee spirit of enterprise. There are in Boston, U.S., sixteen companies engaged in transporting thousands of tons of this arctic crystal to the East and West Indies, to South America, and other warmer climates, and even to our own country. The "Wenham-Lake Ice Company," in particular, have erected extensive Ice-houses in London and at Liverpool, and have engaged agents in all our principal cities and towns. The annual quantity of Ice shipped from Boston to distant ports amounts to about 50,000 tons, and from Charleston, about 30,000 tons. The expense to the shippers from Boston is about 12,340 dollars, or 1s. 1½d. per ton; the gross receipts 2,570,000 dollars. A few years back a cargo of Ice was sent to the East Indies, where it was exchanged for cotton, weight for weight; the cotton was taken to England, and sold there at a handsome profit. Formerly, Ice was sold in New Orleans for 6 cents (3d.) per pound; now it sells for 1 cent (½d.) per pound; at the same time, more money is made from the increased consumption encouraged by the reduction of price—an admirable instance of the salutary operation of a system of small profits and large returns.

It is a curious fact, that in the transportation of American Ice, even in the heat of summer, it is not sensibly reduced in bulk. This may be attributed to two circumstances—the magnitude and quality of the Ice, and the manner in which it is packed. Ice frozen upon very deep water is much more compact and solid than that which grows on the surface of shallow lakes and streams; and therefore, even when an equal surface is exposed to the atmosphere, the former melts more slowly than the latter. Now, the Ice in America is derived from lakes of great depth, sometimes as much as 200 feet; and the severity of the cold, which in winter falls several degrees below zero, combined with this fact, renders the Ice from the American lakes famous, not only for its solidity, but for its magnitude likewise, being allowed to grow till it attains 12 inches in thickness. Thus, the Ice being much thicker than any that is usually producible in this country, it exposes less amount of surface to the deliquescent action of the air. When the Ice is made up for transportation, it is employed in ships as ballast, for which purpose it is carefully cut up into blocks to fit the hold, and covered with saw-dust, straw, and charcoal dust, all non-conductors of heat, under cover of which it is conveyed on the voyage. When the Ice is regularly shipped as cargo, being cut into blocks, it is packed on board the vessel, in thin air-tight timber boxes, with straw and hay. In this manner it is conveyed, without loss, to the most distant quarters of the globe.

The Ice now imported to this country is obtained from the

on exposure to the weather, many zoophytes are found enveloped in an erect posture, having evidently become fossil on the spots where they grew at the bottom of the sea. Among others, the sea-pens (*graptolites*) are very abundant.



a, b, Graptolites from Christiania, Norway.
c, d, Graptolites from the south of Sweden.

The whole combined character of this member is indeed that of tranquil deposition; the sandstones are ripple marked, and the facility with which the shales are melted down by the weather, proves that notwithstanding their antiquity, they are simply the mud and slime slowly accumulated at the bottom of the ancient sea, hardened by compression.

This is a brief outline of the Silurian system. Its organic remains admirably illustrate the gradual manner in which it has pleased the Deity to introduce animal forms into our world. From a few obscure species found in the Cambrian or Slate Rocks, we gradually ascend in the scale of creation through the long period of sedimentary deposition, indicated by nearly 8000 feet of rocks, evincing little disturbance or violence in the agencies of deposit. We observe in each new period the introduction of new genera and species, confined, indeed, to the lower classes of animated existence—such as corals, and the inhabitants of shells and crustaceans; yet some of these organizations assume a very complicated structure, and evince an exercise of power and mechanical contrivance utterly at variance with the atheistical notions of all being the result of fortuitous causes, and merely the operations of the inherent capabilities of matter. To one acquainted with the anatomy of the Nautilus, a genus found in the Silurian rocks, and still extant in the Mediterranean and other seas, this will appear sufficiently obvious; and the conviction of the application of contrivance by the Architect of nature in the very earliest stages of the exercise of his creative power in this our planet, will be rendered still more obvious if we contemplate the structure of the extinct Trilobites, a family confined almost exclusively to the Silurian period, the rocks of which present us with 10 genera, comprising 38 species, or according to Dr Buckland, 52 species.

"In the comparison made," says Dr Buckland, "between the four different families of Crustaceans, for the purpose of illustrating the history of the long extinct Trilobites, by the analogies we find in the Serolis, Limulus, and Branchipus, we have a beautiful example taken from the extreme points of time of which geology takes cognizance, of that systematic and uniform arrangement of the animal kingdom, under which every family is nearly connected with adjacent and cognate families. Three of the families under consideration are among the present inhabitants of the waters, while the fourth occur only in a fossil state. When we see the most ancient Trilobites thus placed in immediate contact with our living Crustaceans, we cannot but recognise them as forming part and parcel of one great system of creation, connected through its whole extent by perfect unity of design, and sustained in its minutest parts by uninterrupted harmonies of organization.

"We have in the Trilobites an example of that peculiar, and, as it is sometimes called, rudimental development of the organ of locomotion in the Crustacean class, whereby the legs are made subservient to the double functions of paddles and lungs. The advocate for the theory of the derivation of more perfect species existing by successive changes from the more simple ancient forms, might imagine that he sees in the Trilobites the extinct parent stock from which, by a series of developments, consecutive forms of more perfect Crustaceans may, during the lapse of ages, have been derived; but according to this hypothesis, we ought no longer to find the same simple condition as that of the Trilobites, still retained in the living Branchipus, nor should the form of the Limulus have possessed such an intermediate character, or have remained unadvanced in the scale of organization from its first appearance in the carboniferous series, through the mid-way periods of secondary formations unto the present hour."

The Trilobites were animals possessed of a three-lobed shield or plate, the hinder part of which was divided into segments, like that of the lobster, and like it capable of being folded up. In the fore part of the shield, as in the Limulus, were placed compound eyes, adapted to produce vision through the medium of a number of lenses placed at the extremity of an equal number of conical tubes, or microscopes. "In the Asaphus Caudatus each eye contained at least 400 such lenses, fixed in separate apartments on the surface of the cornea." The form of the general cornea is peculiarly adapted to the uses of an animal destined to live at the bottom of the water, and, accordingly, such is the construction of Crustaceans of the class we are describing. The conformation of the eyes of the Trilobite and its cognate genera, not only demonstrates the most exquisite adaptation of the parts for the peculiar habits of the animals to which they belong, but the nature of the media in which they lived. To a creature, living at the bottom of the water, it was impossible to look downward, and therefore the eye of the Trilobite was constructed for horizontal and upward vision in every direction. "The form," says Dr Buckland, "of each eye is nearly that of the frustum of a cone, incomplete on that side only which is directly opposite to the corresponding side of the other eye, and on which if the facets were present, their chief range would be towards each other across the head, where no vision was required. The exterior of each eye, like a circular bastion, ranges nearly three-fourths of a circle, each commanding so much of the horizon, that where the distinct vision of one eye ceases, that of the other eye begins, so that in the horizontal direction the combined range of both eyes was panoramic." Eyes so distinctly constructed as those of the Trilobite, and so fitted for distant vision, instruct us as to the nature of the water in which they existed, and the conditions of light at the very earliest epoch of animal existence, conditions which must have been similar to those that now exist. In contemplating the list of Silurian fossils, furnished us by Murchison and Sedgwick, we are naturally struck with the entire absence of vertebrated animals in all the rocks older than the lower Ludlow, in which only one species, and that a fish, makes its appearance. The construction of the eyes of the Trilobite, and the identity of many of the Silurian genera, of both corals and shell-fish, with those now living, show that though the species differ, no great, if any, difference existed in the waters of that period from those of the present day. To suppose, therefore, that any power existed in that fluid beyond what it now possesses to produce the original types of organic forms, either by transmutation of species, or by some occult natural agency, resident in mere matter, is contrary to common sense, and seems averse to all the conclusions we can draw from the laws which regulate matter. Although organic nature is linked together by insensible gradations, yet such is the permanency of genera, if not of species, that no greater absurdity presents itself to the student of Nature than the idea of a Crustacean begetting a vertebrated fish, or an oyster merging into a lobster; and yet to greater absurdities than this does materialism lead. It is true, we can form no idea of the mode by which creation was performed—of the *modus operandi* of the Almighty Architect, in framing even the meanest of his productions; but it is our high privilege to investigate the structure, to admire the workmanship, and its adaptation for the purposes for which it exists. This is enough, and we must rest satisfied, that beyond this high commission we cannot proceed.

DOMESTIC MEDICINE.

CHAPTER IV

ON THE PHYSICAL CAUSES OF DISEASE—(CONTINUED.)

FOR the continuance of health, it is absolutely necessary, as we can now understand, that every organ of the body execute the office assigned to it with regularity and perfection. The human clockwork is so accurately balanced, and so intimately connected, that no part of the mechanism can be materially deranged without deranging the whole,—the main difference, indeed, between a strong constitution and a weak, consisting in the different degrees, which all the organs pos-

sess, of the power of resistance to the ordinary causes of derangements to which they are liable. The blood, as we have already seen, must be equally distributed over the whole system. If an organ be supplied in too great quantity, its healthy action will be immediately interfered with; and, by a continuance of this extra supply, disease will be produced. An overflow of blood, if directed upon the brain, will excite inflammation, apoplexy, or palsy; if upon the organs of respiration in the chest, it will excite catarrh, influenza, bronchitis, pneumonia, or pleurisy; if upon the stomach, liver, or other organs of digestion, the consequence will be inflammation of some of these organs, or diarrhoea, dysentery, or cholera; if upon the joints, it will excite rheumatism, &c. But how can we know when these irregularities in the circulation, and dangerous determinations of blood, are about to occur, so as to be able to provide against their injurious effects? Our remarks in last chapter show that one of the principal causes of irregular distributions of blood, and of consequent disease, is *exposure to cold*, and *to sudden vicissitudes of temperature*. "With the exception," says Dr. Bateman, "of a small number of diseases occasioned by unwholesome occupations, and by the contagions, the great mass of human malady in this metropolis is referable to the climate or state of the seasons, and to *intemperance*; but of these two causes, the *vicissitudes of the weather*, especially its *cold*, are by far the most prolific sources of mischief."* By a wise and beneficent provision of Providence, our bodies are so constituted as to serve us for natural *thermometers*, or measurers of the degrees of heat and cold, conveying to our minds, by our sensations, accurate information as to when we ought to take alarm, and secure ourselves against impending danger. If we were sufficiently careful to avail ourselves of these natural warnings—to look upon an abiding sensation of chilliness with the same dread as we look upon the contagion of fever—these irregular distributions of blood, and the diseases they produce, would be of much more rare occurrence.

The great counteracting influence possessed by the animal body against the pernicious effects of cold, is its inherent power of evolving animal heat; and according to the different degrees in which this power is possessed and preserved, will it be more or less able to resist the influence of sudden vicissitudes of temperature. But it is well known that the power of evolving animal heat depends on the strength and vigour of the circulation; and whatever tends, therefore, either temporarily or permanently, to increase the vigour of the circulation, such as exercise, good food, warm clothing, stimulants, &c., increases, either temporarily or permanently, the power of evolving animal heat; whatever, on the contrary, diminishes the strength of the circulation, such as want of exercise, long fasting, fatigue, debauchery, night-watching, disease, &c., diminishes the power of evolving animal heat, and greatly augments the liability of the body to be affected by those diseases which arise from exposure to cold. The truth of these remarks is frequently exemplified by the narrations of navigators in the polar seas. It is related in the "Narrative" of Sir John Franklin—to whose name such a painful interest has been attached for several years, and whose present situation and condition is involved in such impenetrable mystery—talking of one of his journeys in the polar regions, that, "During our march we experienced that no quantity of clothing could keep us warm while we fasted; but on those occasions on which we were obliged to go to bed with full stomachs, we passed the night in a warm and comfortable manner. Our good cheer (towards the close of their toils, when they had got a proper supply of food) gave such power of resisting the cold, that we could scarcely believe otherwise than that the season had become milder."

As long, therefore, as the vigour of the circulation is kept up by any means, a person is exposed to little risk from the pernicious effects of cold in whatever circumstances he may be placed. Is he a sportsman—habituated to the refinements of a city life and the delicacies of the drawing-room—drenched with rain on a Highland moor, or saturated with wet on the

river's side? As long as he continues his exercise, with his mind excited and eager after his sport, the strength of the circulation is kept up. Whenever his amusement for the day is over, he *walks* quickly home, changes his dress, takes a little of some stimulant, enjoys a good dinner, and no bad effects ensue; but were he to sit down wet, heated, and fatigued, on the hill-side, take a draught of cold water, and above all, were he to go to sleep for a little, inflammation of some bodily organ would be certain, and even death itself might be the result. Is he a pedestrian, bathed in perspiration, or, which is the same thing, overtaken by a heavy rain and thoroughly wet; and is he obliged to halt for a little, with no opportunity of shifting his clothes? Then he must have recourse to artificial means to keep up the vigour of his circulation, and to obviate the evil consequences which might ensue;—the best means for this purpose being a wine-glassful of brandy or whisky, or a bottle of warm ale or porter, followed as soon as possible by a hot meal. Is he a labourer, perspiring profusely by the severe exercise to which he is subjected on the harvest field, or at any other active employment? He must occasionally relax the constant tension of his muscular system by intervals of rest; but, ignorant of all the physical causes of disease, he sits down, half naked, on the damp ground, or perhaps on a cold stone, opens up his reeking chest to the cool breeze, and takes large draughts of cold water or beer; and thus are laid the foundation of the greater number of diseases with which a rural population are affected. During their intervals of rest, these labourers ought to take every means, particularly if there is a cool breeze blowing at the time, to prevent the body from cooling quickly, and the perspiration from being suddenly dried up. For this purpose they ought to put on their clothes, take whatever shelter they can get, and avoid cold drinks till a little *after* they have again commenced their labours. Habitual exposure to the open air certainly exerts a protecting influence in such cases: the system is strengthened, the circulation acquires a permanent force and vigour, the body becomes inured to the influence of cold, and less susceptible of sudden changes of temperature; and far fewer of those who pursue out-door occupations fall victims to the pernicious effects of cold, than of those whose employments or *inclinations* confine them to warm rooms, and prevent them from taking sufficient exercise in the open air.

The reason that wet or moisture, either from water or perspiration, has such a powerful effect in producing cold, is from the constant tendency which all fluids have to pass off into the atmosphere in the form of vapour; for, to enable them to pass into vapour, they require, as was already mentioned, a great amount of heat; consequently, they are continually robbing the surrounding air and all adjacent bodies of a portion of their heat. The evaporation of fluids is also much quicker accomplished, the stronger the current of dry or heated air which passes over them. On a dry and windy day, the evaporation from the wet ground goes on quickly; by this means the earth and atmosphere are cooled down, and the temperature reduced; whereas, if it be calm, the evaporation will go on slowly, and it will feel close and warm. On the same principle, the bad effects of cold are often produced by washing the floors, and drying wet clothes in rooms inhabited by delicate people and children, from the evaporation reducing the temperature. Dr. Alison, of Edinburgh, says he has frequently observed that, in the low parts of the town, children were seized with croup on *Saturday night*, this being the night on which the poorer classes wash their floors, and often dry their clothes in the rooms in which they live and sleep. On the same principle, also, does wet and moisture applied to the surface of the body, either from water or perspiration, operate in reducing the temperature by evaporation, and the sooner will the temperature be brought below the healthy standard and disease produced, the weaker the circulation, or, in other words, the less the power of evolving heat. As long as the circulation is vigorous—as long as a superabundance of animal heat is evolved, the perspiration has the salutary effect of keeping down the temperature of the body. A person may expose himself to the most sudden

* Observations on the Diseases of London.

alternations of temperature with impunity; he may plunge into the sea while bathed in perspiration; he may leave a vapour bath, and roll himself in snow; or he may go from a ship's cabin, where the temperature is at 50°, into an atmosphere 70° below the freezing point, without the slightest danger to his health; but the moment the strength of his circulation begins to flag—the moment a sufficiency of heat ceases to be evolved—the moment an *abiding sensation of chilliness* is produced, then is there real cause for alarm; and if the salutary warning which is given by the feelings be neglected, disease more or less severe will be sure to follow. The demand for a proper quantity of animal heat to counteract the influence of cold continues as great as ever, but the supply of fuel is stopped, the fire of the circulation is languishing, the evolution of heat is arrested, and unless exercise, cordials, additional clothing, or a warmer atmosphere be had recourse to, the occurrence of disease will be next to certain.

What we have to bear in mind, then, is, that whatever quickens the circulation, such as exercise, a heated atmosphere, &c., causes more heat to be evolved than is necessary for keeping up the temperature of the body, and this superfluous heat is got rid of by perspiration, which is poured forth in greater or less quantity, according to the increased activity of the circulation. If the external air be cold, if a strong breeze be blowing, and if the clothing be light, this perspiration is carried off, or evaporated, in an *insensible* form as soon as it breaks forth: if, on the other hand, the atmosphere be warm or calm, or if the body be covered by much clothing, the perspiration is not evaporated, but appears in a *sensible* form, and wets the under clothing. As long as the increased force of the circulation is kept up by exercise or any other means, the perspiration performs the important office of keeping down the temperature of the body to the healthy standard, enabling us to endure the most violent exercise, the burning heats of a tropical climate, or even to remain for some time in a heated oven, with the animal temperature increased but to a very slight degree. But when the cause of this increased circulation and perspiration ceases to operate, matters become totally changed: the perspiration then, instead of being beneficial, acts in exactly the same manner as wet from rain or any other cause; the superfluous heat has ceased to be evolved, still the wet or perspiration goes on evaporating and robbing the surface of the body of its heat till it be dried up; and by this means the blood is repelled upon the internal organs, and disease is produced. It is evident that the thinner the clothing, the colder the air, and the stronger the breeze, the quicker the evaporation goes on, and the sooner is the body robbed of its heat; hence the use of flannel or woollen next the skin, which absorbs the moisture and checks the rapidity of the evaporation. It is not, therefore, while the increased force of the circulation by whatever cause continues, although the surface of the body be wet or bathed in perspiration, that there is any danger; it is when the cause of the increased vigour of the circulation is suddenly stopped—when the body is cooling after being heated, that there is cause for alarm.

There are several ways by which the bad effects likely to result from such a cause can be obviated: either to prolong the exercise, gradually lessening its severity, till the wet or perspiration be dried up; to keep up the vigour of the circulation by some stimulant or cordial till the same thing occur; to diminish the cooling effect of the evaporation by removing to a warmer atmosphere, or putting on additional clothing; or to throw off the wet garments, dry the skin thoroughly, and put on warm and dry clothes. A combination of these measures is generally the most effectual: to take some cordial or stimulant, such as brandy, whisky, or porter, mixed up with hot water; to remove the wet clothing and put on dry, having first dried the skin well, and red-dened it with flesh brushes or a coarse towel; the friction will not only aid in stimulating the capillaries and perspiratory pores, but the exercise necessary in this operation will increase the vigour of the circulation, and produce a healthy reaction, by impelling the blood to the extremities and sur-

face of the body. It is very remarkable, that we see many of these measures adopted to prevent disease in horses, and quite neglected by the majority of human beings in their own persons. The skilful owner of a favourite horse, instead of sending him carelessly away to his stall after having overheated him by exercise, will order him to be walked about till he get somewhat cooled, to be then well rubbed down and covered up with a cloth, and afterwards to have a warm drink, well knowing that, if he neglected these precautions, colic, inflammation of the bowels, or some other disease, would in all probability supervene. Training-masters, also, whose object it is to develop the highest degree of muscular strength which the human body can attain, and who, in preparing their pupils for the "ring," must "sweat them down" by violent exertion, invariably make them change their dress after each exercise, cause them to wear flannel next their skin, and, even for their mid-day's repose, make them undress and go to bed. On being asked the reason of their scrupulous adherence to these rules, they say their object is "not to throw away a chance," but to avoid the smallest risk of rheumatism or cold.

From the preceding observations it may naturally be inferred, that those diseases which arise from exposure to severe cold would be more prevalent and more fatal in winter than in summer, and that the colder the winter the greater would be the mortality. Accordingly we find, from the valuable annual "Reports of the Registrar-General of Births, Deaths, and Marriages, in England and Wales," that the mortality from these diseases varies exactly with the temperature. In the third annual report it is stated, that "the causes of death which prove most fatal in the cold months belong principally to the pulmonary class, and the cerebral diseases of the aged: those which prove most fatal in summer belong to the diseases of the bowels."

From the ninth annual report we extract the following statistics regarding some of the special causes of death in London, in each of the four quarters of eight years, from 1840 to 1847 inclusive.

Deaths from Diseases of the Lungs and other Organs of Respiration, including Pneumonia, Bronchitis, Pleurisy, &c.

Years.	Winter Quarter, ending 31st March.	Spring Quarter, ending 30th June.	Summer Quarter, ending 30th Sept.	Autumn Quarter, ending 31st Dec.
1840	3,945	3,258	2,833	4,145
1841	4,604	3,441	3,001	3,367
1842	4,325	3,230	2,870	3,810
1843	4,048	3,442	2,750	4,440
1844	4,644	3,229	2,782	4,265
1845	4,923	3,478	2,669	3,567
1846	3,807	3,487	2,761	4,313
1847	5,981	3,226	2,652	6,101

Deaths from Old Age.

Years.	Winter Quarter.	Spring Quarter.	Summer Quarter.	Autumn Quarter.
1840	1,034	788	716	1,000
1841	1,274	708	667	798
1842	1,079	748	691	918
1843	1,111	839	619	980
1844	1,018	673	648	898
1845	1,127	744	569	519
1846	612	491	487	651
1847	971	664	540	957

Deaths from Diseases of the Stomach, Liver, and other Organs of Digestion, including Diarrhoea, Dysentery, Cholera, &c.

Years.	Winter Quarter.	Spring Quarter.	Summer Quarter.	Autumn Quarter.
1840	714	766	1,187	791
1841	883	758	982	825
1842	820	725	1,131	766
1843	781	825	1,146	1,002
1844	795	847	1,027	854
1845	981	860	1,099	875
1846	940	1,012	1,356	1,042
1847	1,030	1,067	1,284	1,235

Mean Temperature for Five Years.

Years.	Winter Quarter.	Spring Quarter.	Summer Quarter.	Autumn Quarter.
1842 ...	39°.6	47°.6	62°.8	48°.2
1843 ...	40°.0	47°.4	39°.8	50°.5
1844 ...	35°.8	48°.7	59°.9	50°.1
1845 ...	37°.6	43°.6	59°.3	49°.9
1846 ...	40°.3	48°.3	64°.3	52°.2

Nothing can place in a clearer light the effects of *temperature*, in regulating the number of cases of diseases and deaths, from special causes, than these tables, extending over a number of years, and compiled with such scrupulous care and accuracy. In proportion as the mean temperature of the day and night falls below a certain point in winter, the mortality from diseases of the lungs, and from diseases incident to old age, increases. Compare the years 1845 and 1846. The mean temperature for the three winter months of 1845 was 37 degrees, the mortality during the same period, from diseases of the organs of respiration, was 4,923; from old age, 1,127; while for the winter quarter of 1846, the mean temperature was above 40 degrees, and the deaths, from diseases of the chest and from old age, were respectively 3,807 and 612. These facts are a complete refutation of the commonly received opinion, that a mild winter is less favourable to health than a severe. It is related in one of these reports, in detailing the influence of cold as a cause of death, that "the rise in the mortality is immediate; but the effects of the low temperature go on accumulating, and continue to be felt thirty or forty days after the extremities of the cold have passed away. The cold destroys a certain number of persons rapidly; and in others occasions diseases which prove fatal in a month or six weeks. The practical lessons taught by these facts is obvious. A great number of the aged, and of those afflicted with difficulty of breathing, cannot resist cold sunk so low as 32 degrees. The temperature of the atmosphere in which they sleep can never safely descend lower than 40 degrees; for if the cold, which freezes water in their chamber, do not freeze their blood, it impedes respiration, and life ceases when the blood-heat has sunk a few degrees below the standard."

Again, deaths from diseases of the bowels increase in proportion as the mean temperature of the air rises above a certain point. On referring again to the tables, we find that the deaths from diseases of the stomach, liver, and other organs of digestion, in 1846, greatly exceeded those of 1845; and, in exact accordance with this result, we find that the mean temperature of the spring and summer months of 1846 exceeded that of 1845 by 5 degrees. It was mentioned in last chapter, that a high temperature of the external air gave rise to diseases of the liver, to cholera and dysentery, &c., and the prevailing diseases of tropical climates were adduced in illustration of the truth of our remarks; these tables prove, in a very satisfactory manner, that the same effects follow the same cause in our own temperate climate.

2. *Impurity of the air, from the admixture of dead or living animal or vegetable effluvia*, may be given as the second of the atmospheric causes of disease. Impurity of the air cannot, perhaps, be said to give rise to any specific disease, such as cholera, fever, &c.; but it exerts such a debilitating influence upon the human constitution, as thus to make it an easy prey to any contagious or other exciting cause of disease, which may come into operation. It should therefore be looked upon rather as a predisposing, than a directly exciting cause of disease. We have only to compare the pale and sickly appearance, and the puny and emaciated forms of the children in the low, densely-crowded, ill-ventilated, dark, and filthy districts of large towns, with the ruddy cheeks, the sparkling eyes, and the cheerful countenances of the very poorest children in rural districts, to be thoroughly convinced of the highly noxious effects of continually breathing an atmosphere loaded with impurities. It need excite no surprise, therefore, to find that diseases are far more frequent and fatal, and that the span of human life is considerably abridged, under these unfavourable circumstances. By referring again

to the valuable reports of the Registrar-General, we see that the deaths from consumption are 24 per cent., the deaths from typhus fever 55 per cent., and the deaths from child-birth 59 per cent., *greater* in cities than in rural districts; and in several other diseases the difference in the ratios of mortality in town and country is equally great. "The diseases incidental to childhood are twice as fatal in the town districts as they are in the country." How can it be otherwise among a class whose constitutions, hereditarily weak, are farther debilitated not only by breathing foul and contaminated air, but by being fed at breasts from which a sufficient supply of healthy, rich, and nutritious milk can never flow? "The mean duration of life in the two classes of districts differs nearly 17 years, being in the proportion of 55 years (in the country), to 38 years (in towns)." This high mortality in towns has been traced, among the wealthier classes, to want of sufficient exercise in the open air, overstimulating food and drink, late hours, &c.; among the poorer classes it has been traced to overcrowded and dirty dwellings, unhealthy occupations, personal uncleanness, putrid effluvia from narrow and filthy streets, a deficiency of fresh air, water, and sewers.

In the ninth annual report of the Registrar-General, we find the mortality in the low, crowded, and filthy habitations in the town districts of Manchester, for the seven years from 1838 to 1844, compared to that of the extra-metropolitan parts of Surrey, and is as follows:—

"In Surrey, from 35 to 45 years of age, 11 deaths per 1000 males.

"In Manchester, from 35 to 45 years of age, 21 deaths per "

		Deaths Registered in 7 Years, 1838-1844.	
"Population of the town sub-districts of Manchester in 1841,....."	163,856	...	39,922
"Population of the extra-metropolitan districts of Surrey in 1841,....."	187,868	...	23,777
Difference,.....			16,145

		No. of Children under 5 Years of Age.		Deaths in 7 Years.	
"In Surrey,....."	23,523	...	7,364		
"In Manchester,....."	21,152	...	20,726		

Difference,..... 13,362."

"How pitiful," says the report, "is the condition of many thousands of children born in this world! Here, in the most advanced nation of Europe (?)—in one of the largest towns of England—in the midst of a population unmatched for its energy, industry, manufacturing skill—in Manchester, the centre of a victorious agitation for commercial freedom— aspiring to literary culture—where Percival wrote, and Dalton lived—13,362 children perished in seven years, over and above the mortality natural to mankind. These 'little children,' brought up in unclean dwellings and impure streets, were left alone long days, by their mothers, to breathe the subtle, sickly vapours—soothed by opium, a more 'cursed' distillation than 'hebenon'—and when assailed by mortal diseases, their stomachs torn, their bodies convulsed, their brains bewildered, left to die without medical aid—which, like hope, should 'come to all,'—the skilled medical man never being called in at all, or only summoned to witness the death and sanction the funeral!"

Were we to ask where do cholera, typhus fever, malignant scarlet fever, and other virulent epidemics first break out, and where do they make most fatal havoc? The answer, in accordance with the vast amount of statistical evidence collected on this subject, would be, "almost always in dens of filth, and in low, damp, dark, and ill-ventilated places." The cholera made its first appearance in St. Petersburg, in Russia, among the boats, and in the parts of the town adjacent to the river. At Dantzic, the first cases occurred on two mud barges, on the harbour canal. In Berlin, it first appeared among the skippers in the boats, and in the district in the immediate neighbourhood of the river Spree. In Moscow, it committed the most fatal ravages in a low and

damp quarter of the town, included in a bend of the river Moskwa. At Breslau, it was by far the most fatal in the low, marshy part of the town, which is the constant seat of intermittent fever. At Warsaw, the condition of the houses in which it prevailed was little better than that of sewers. From the report of the Central Commission at Paris, it appears that its ravages were most fatal in the low, close, undrained, and uncleansed localities of that city. In its progress through Britain, it generally first appeared in the neighbourhood of rivers and marshes, and prevailed chiefly in low and damp localities, particularly where these were also the outlets of filth. In London, it first broke out on the river Thames, and was most prevalent and fatal in the adjacent districts of the town, and near ditches and the outlets of sewers. In other towns in England, it obeyed the same law. In Scotland, this tendency to prevail in low, damp, and filthy situations was strikingly exemplified in Easter Ross in 1832. It occurred during the fishing season, and its ravages among the low, damp, and filthy fishing villages on the shore of Tain was fearful, in some cases cutting off nearly one half of the inhabitants, while the town of Tain and the greater part of the rural districts escaped.

But there is abundant evidence to prove that Asiatic cholera obeys the same laws which regulate the propagation and mortality of ordinary epidemics: it attacks persons in the same circumstances, and breaks out in similar places; and it is attested by universal experience, that the same physical predisposing causes promote both the extension and virulence of all these disorders. These causes, as already mentioned, consists in whatever debilitates the constitution and weakens the powers of life, such as a deficiency of the means of protecting the body against cold, an insufficient supply of proper food, breathing an impure and humid atmosphere, intemperance, debauchery of all kinds, want of sleep and want of exercise, previous disease, &c. "It is now universally known," says the report of the Sanitary Commissioners, appointed by parliament to inquire into the means requisite for improving the health of London, "that in the metropolis, as in every town and city, the places in which typhus fever is to be found, from which it is rarely if ever absent, and which it occasionally decimates, are the neglected and filthy parts of it; the parts unvisited by the scavenger; the parts which are without sewers; or which, if provided with sewers, are without house-drains into them; or which, if they have both house-drains and sewers, are without a due and regulated supply of fresh water for washing away their filth, and for the purposes of surface cleansing and domestic use. The evidence that the track of typhus is everywhere marked by the extent of this domain of filth, has been so often adduced that it is needless to repeat it; but the evidence that, during the prevalence of cholera, this was also everywhere the precise track of this pestilence, is not so well known." The same remarks apply to the worst forms of scarlet fever and influenza, and the other contagious epidemics.

What a powerful appeal ought these facts to make to magistrates, commissioners of police, house-owners, and other influential inhabitants of towns, to enforce the strictest sanitary regulations wherever they have the power; and this not only from motives of benevolence and philanthropy, but from the more powerful motives of *self-protection*! Let not the more affluent inhabitants of towns and rural districts console themselves with the idea, that, in their more favourable circumstances, come what will, they are secure against all danger; once allow the demon of contagion to get a footing, and he will not be confined to his natural element of filth, wretchedness, and misery, but will overstep this bounds, and attack, often with equal virulence, the families of the middle and higher classes, scattering in his path the most dire destruction, desolation, and woe! Then will the bereaved and broken-hearted parent, the distressed and widowed mother, or the forlorn and fatherless child, have but too good cause to regret, and regret bitterly, that proper precautions were not had recourse to in time, against the inroads of the common enemy! "Difference of social grade," says the report

of the Commissioners above quoted, "less exempts the individual from the attack of cholera than of fever; and cholera more often, and apparently more capriciously, bursts its natural boundaries, and attacks the inhabitants of comparatively healthier districts—among whom it then proves little less mortal than when it ravages its accustomed haunts."

3. In close connection with impurity of air as a cause of disease, is a *deficient supply of pure air*. Chemists inform us that atmospheric air is composed of two gases—oxygen and nitrogen: a sufficient supply of oxygen to the lungs is absolutely necessary for the support of animal life; but as it would prove too strong and irritating for these organs in a pure and undiluted state, it is rendered mild by being mixed with nitrogen in the atmosphere. By every breath, then, which we *inhale*, the lungs absorb a certain quantity of oxygen from the air for the purposes of life; and by every breath we *exhale*, they give out a certain quantity of watery vapour and carbonic acid, which, if detained in the body, would soon prove fatal to the living being. If any breathing animal were confined in a certain quantity of atmospheric air, and all additional supplies cut off, it would sooner or later consume all the oxygen contained in that air, which would then become highly impregnated with carbonic acid from the lungs of the animal, and it would therefore die from a deficiency of oxygen, and the poisonous effects of the carbonic acid.

Ignorance of this law of nature has, in innumerable instances, been productive of the most fatal consequences to human life. Almost every one has heard of the terrible fate of 146 Englishmen who were confined in the Black Hole of Calcutta, and of whom, at the end of twelve hours' confinement, only 23 survived, all the others having been suffocated from a deficiency of oxygen, and an excess of carbonic acid in the air they breathed. The fearful mortality in slave-ships from the same cause is also well known; and, indeed, it was beginning to be thought that a knowledge of this physical cause of disease was universally known and understood, till public attention was aroused, about two years ago, by the shocking intelligence that an immense number of human beings were suffocated, or, in other words, *poisoned*, in a ship off the coast of Ireland, by the captain's nailing down the hatches in a storm, and depriving the passengers of a sufficient supply of pure air. Although the effects are not so obvious, and it operates more slowly and insidiously, the same cause of disease is in constant operation in close, ill-ventilated, and overcrowded rooms; it is exactly the same thing whether the room be too small, or large and overcrowded: the supply of oxygen to each person becomes exhausted—he breathes an atmosphere poisoned by carbonic acid, exhaled from his own or his companions' lungs, and the result is more pernicious in proportion to the deficiency of oxygen, the excess of the carbonic acid, and the length of time he is exposed to the noxious influence.

The effects of a deficient supply of pure air, combined with a deficiency of drainage and pure water, in raising the ratio of mortality from cholera, typhus fever, influenza, bronchitis, and consumption, to an enormous extent, are but too visible in some of the close and overcrowded parts of London. One thousand cubic feet of air is considered necessary for the health of a single prisoner in England; 800 cubic feet for a soldier in India; while in the wretched dwellings and lodging-houses in Church Lane, and the neighbouring streets and alleys, as well as in the crowded courts of Gray's Inn Lane, the average for each human being is only 175 cubic feet—the highest being 605, and the smallest 52! In many cases, from 18 to 24 human beings are crowded and stifled for a whole night in small apartments, of the dimensions of 10½ to 11½ feet long, by 8½ to 9½ feet wide, and 6 or 7 feet high; whilst the lion, hippopotamus, and other wild animals, in Regent's Park Zoological Gardens, are accommodated with apartments of immense size, duly warmed and ventilated, with abundance of pure water, and all the other necessities of life.

The results of this state of things are well exemplified by an extract from the eighth report of the Registrar-General:—

Mortality of Church Lane compared with other Districts of the Metropolis of London.

Of 100 children born, there die before arriving at 1 year old,	Of 100 children aged 1 year, there die before they arrive at 2 years,
In Church Lane, 31	In Church Lane, 46
In whole of St. Giles's, ... 28	In St. Giles's, 15
In Lambeth, 20	In Lambeth, 10
In City of London, 19	In City of London, 12
In Islington, 16	In Islington, 7

Any remark upon these facts would be superfluous; they speak for themselves, and show the immense amount of human misery and death which is caused by ignorance and inattention to the physical causes of disease. The lesson to be derived from the above remarks ought now to be taken advantage of, by every one who has his own welfare and that of his fellow-mortals at heart. Every inhabited apartment ought to be well ventilated *at least once* in the course of the twenty-four hours; bed-rooms ought to have their windows open during the greater part of the day, and the bed-clothes spread out, so as to be thoroughly freed from the effluvia of the body, with which they have been impregnated during the night. A room without a fire should be more carefully ventilated than a room with a fire, which of itself acts as a ventilator, by causing a current of heated air to pass up the chimney, and a current of external air to come into the apartment. It follows as a consequence, clearly obvious from these observations, that the larger and loftier the room, the more pure and salubrious the air.

4. *Deficiency of light* may be classed as another atmospheric cause of disease. The light of the sun is absolutely necessary as well to animals as to plants, to enable the living structure to acquire and maintain that vital energy which is so effective a barrier against the inroads of disease. If a plant be confined in a dark place, it will soon lose its fresh, green hue, and although supplied with all the other requisites of health, with the exception of light, it will become sickly and blanched: give a ray of the sun admission into its place of confinement, and immediately it will begin to grow in that direction, exerting a natural effort, as it were, to get to the light. Light is equally indispensable to the health of the human body; people who inhabit dark dwellings, and are prevented, by their occupation, from enjoying the benefit of the sun-light—even with a due regard to a supply of pure air, good food, exercise, cleanliness, &c.—have a sickly appearance, and would much sooner fall victims to surrounding causes of disease, than if they could have availed themselves more of the light of the sun. Dwelling-houses ought, therefore, to have a sufficient number of large windows; and now that the tax upon *sun-light* is removed, and the duty on glass abrogated, we have no excuse, but an antiquated taste, for adopting the small, prison-looking slits of the Elizabethan style of architecture. The principal rooms of houses should always, as near as possible, face the sun at mid-day; and for this reason, also, the north side of a street, which runs east and west, should, for the sake of health, be chosen in preference to the south.

In making choice of a site for building a family residence, four things ought, in a sanitary point of view, to be strictly attended to in the climate of Great Britain:—1st, That it be thoroughly *dry*; 2d, That it be as *high* as possible, compatible with shelter; 3d, That it be well *sheltered* from the north and east; 4th, That it be not *overshadowed* by other buildings, hills, or woods, so as to deprive it of the full light of the sun at all seasons of the year.

"Numerous facts," says Dr. Carpenter,* "collected from different sources, lead to the belief that the healthy development of the human body, and the rapidity of its recovery from disease, are greatly influenced by the amount of light to which it has been exposed. It has been observed, on the one hand, that a remarkable freedom from deformity exists among nations who wear very little clothing; whilst, on the

other, it appears certain that an unusual tendency to deformity is to be found among persons brought up in cellars, or mines, or in dark and narrow streets. Part of this difference is doubtless owing to the relative purity of the atmosphere in the former case, and the want of ventilation in the latter; but other instances might be quoted in which a marked variation presented itself under circumstances otherwise the same. Thus it has been stated by Sir A. Wylie (who was long at the head of the medical staff in the Russian army), that the cases of disease on the dark side of an extensive barrack at St. Petersburg, have been uniformly, for many years, in the proportion of three to one, to those on the side exposed to strong light. And in one of the London hospitals, with a long range of frontage, looking nearly due north and south, it has been observed that residence in the south wards is much more conducive to the welfare of the patients, than in those on the north side of the building."

ASTRONOMY.

CHAPTER III.

HISTORY AND PROGRESS OF ASTRONOMICAL DISCOVERY.

AMONG the many distinguished philosophers that render the 17th century remarkable in the history of literature, the name of KEPLER will ever stand pre-eminent. Without detracting from the acknowledged merits of others, it may be safely asserted, that he did more to place the science of astronomy on a solid foundation, and to pave the way for the brilliant discoveries of future observers, than any other individual. To an unrivalled depth of genius, and to an ardent and enthusiastic imagination, were joined in him the most consummate industry and perseverance—qualities which are very rarely united in the same person.

Few great discoveries were ever achieved for which their authors could claim absolute originality; to the vague theory of some speculative mind, to some obscure hint, to some accidental circumstance, are we indebted for most of the discoveries in science. It was totally different with Kepler. For the discovery of his three remarkable laws, he was indebted to no theory but his own—to no hints, but those of an ever-active originality of mind—to no chance circumstance, but the extraordinary combination of rare mental qualities: the imperishable honour was all his own, and will redound to his immortal fame, when the very names of many whom we now look upon as men of genius shall be blotted out by the hand of time.

He was born near Weil, in the duchy of Wurtemberg, in December, 1571. His father was of noble birth, but, by an unfortunate occurrence, was reduced to poverty, and young Kepler was employed at servile labour till he reached the age of twelve years. By the kindness of the Duke of Wurtemberg, he was admitted, at the age of fourteen, to the school attached to the monastery of Maulbronn. In 1589 he was sent to the university of Tübingen, where he studied mathematics under the celebrated Maestlin, from whom, it is supposed, he imbibed his Copernican views of astronomy; and having acquired the degree of master of philosophy, he entered on the course of study necessary to qualify him for the priesthood. He completed his theological education, and entered on an ecclesiastical office; but the astronomical lectureship of Grätz, in Styria, having become vacant in 1594, he was offered this situation; and although he assures us, that so far from having devoted his attention to astronomy, he actually had an aversion to the science, yet he was induced, by the advice and persuasion of his tutors in the university, who doubtless understood and appreciated his talents, to accept the offer.

No sooner had he entered on his astronomical labours, than the heat and fervour of his imagination carried him headlong into the whirlpool of speculative and fanciful theories; and in 1596 he published his "*Mysterium Cosmographicum*"—

* Manual of Physiology, page 55.

to have been steadily on the increase. Then the farmer's success depends sometimes upon his being able to foretell the weather. The prognostics of weather are far too empirical: yet still the science of meteorology has an existence, and is often turned to great practical use by the sailor, and might be by the farmer. A certain familiarity with the pathology and therapeutics of cattle, sheep, and horses, is frequently, especially in remote situations, of consequence to the agriculturist. To these we should, perhaps, add an acquaintance with mathematics, sufficiently extended as to enable its possessor to measure land, and draw plans of fields and barns.

DOMESTIC MEDICINE.

CHAPTER V.

PHYSICAL CAUSES OF DISEASE—(CONTINUED.)

5. PASSING over the influences of *electric conditions* of the air, and of *atmospheric pressure*, as causes of disease, with the single remark, that Professor Casper, of Berlin, has proved, by observation, that "in nearly all the seasons of the year a high atmospheric pressure increases, and a low pressure (*i. e.* when the mercury in the barometer sinks low) diminishes the rate of mortality;" and recording another of the conclusions of the same distinguished observer, which is in direct opposition to common opinion, "that a humid state of the atmosphere is more favourable to health and life than that which is dry, provided that that humid state be at the same time warm," and that "no state of the atmosphere is so prejudicial to health and life as that of dry cold;"—we come now to the consideration of a most important part of our subject—the effect of *contagion* or *infection*, and of *epidemic* and *endemic influences*, as causes of disease.

Contagion or infection arises from the human body in certain diseased conditions: *endemic influences* originate in poisonous exhalations from the earth's surface; and whether *epidemic influences* originate in the earth or air, or neither—all these noxious effluvia require the atmosphere as a medium of transmission, and may, therefore, be properly included under the head of "atmospheric causes" of disease.

When a disease breaks out suddenly amongst a mass of people, affecting at once a great number of individuals totally unconnected with each other, and when it is altogether impossible to trace its origin to infection, we call that disease an *epidemic*; and of this nature are influenza, catarrhs, &c.

When, on the other hand, a disease begins by affecting an individual here and there, who has, or may have, been exposed to infection; when others are similarly affected in proportion to the closeness of their intercourse with these individuals; when the disease proceeds from those primarily affected in any locality, as from so many centres; we are entitled to believe that that disease is communicable from person to person, and we call it *infectious* or *contagious*; and of this nature are typhus fever, scarlet fever, small-pox, &c.

Our remarks in the present chapter will be divided into three heads:—First, *Epidemic Influences*; secondly, *Fever*, as they appear in a temperate climate; and, thirdly, *Endemic Diseases*, or those arising from *Malaria*.

First, then, of *Epidemic Influences*; and, although the above distinction of epidemic and infectious diseases is closely adhered to by many writers, there cannot be a doubt that they are convertible terms; and that a disease may be both epidemic and infectious, or it may have an epidemic origin in the outset, and become infectious in its progress. If such were not the case, why should we have diseases which are undeniably infectious, such as scarlet fever, measles, hooping-cough, so extensively prevalent in some seasons, and not in others—in short, prevailing *epidemically*? Why should we see, as we have frequently done, all kinds of infectious diseases arising spontaneously, and at once, among a number of individuals having no communication between one an-

other, and living widely scattered from each other in rural districts?

Very erroneous and dangerous, although at the same time very plausible, opinions have been taken up and advocated by many eminent medical men regarding epidemic and infectious diseases; and, were it not that the propagation of such opinions is productive of a great amount of evil among the non-professional portion of the public, we would leave them to be embraced or rejected at pleasure. While one party denies the doctrine of infection *in toto*, and, contrary to the recognised principles of all true philosophy, first adopts a theory, and then searches for facts to support it, throwing aside the clearest contrary evidence or explaining it away; another party, taking also a contracted and one-sided view of the question, adheres to the doctrine of infection with the utmost pertinacity, maintaining that, if a disease be infectious, it *can* have no other origin than infection. Nothing can exemplify the truth of these remarks better than the medical evidence on Asiatic cholera, as it has appeared epidemically in this country and abroad. Some observers testify to its non-infectious nature, at the same time they admit that there are numerous instances where cholera has appeared in a place after the arrival of infected persons, and that there are some instances, well authenticated, in which those who came in contact with these newly-arrived and infected persons were the first, or indeed the only sufferers; and these cases indicate, certainly, something more than a mere coincidence. Others of equal ability assert that cholera is propagated solely by infection, although they cannot in any way account for its sudden appearance in many places, where the inhabitants had no communication, either directly or indirectly, with an affected locality. It appears clearly evident that cholera is an epidemic arising from an *unknown something* existing in, and transmitted by, the atmosphere in certain seasons; that it requires for its propagation peculiar concomitant circumstances, and is therefore, in a great measure, confined to localities where these circumstances exist; that the poison giving rise to it is also given off by the bodies of infected persons, existing in a more concentrated form in the air immediately surrounding their bodies, especially if thorough ventilation of the sick-room and the utmost cleanliness be not observed, and thus, although in a limited degree, it becomes a contagious disease.

Typhus fever, scarlet fever, small-pox, erysipelas, measles, hooping-cough, mumps, and Asiatic cholera, yellow fever and plague, all occur epidemically; that is, they break out in certain seasons, and affect large masses of people, without its being possible to trace their origin to contagion; and that they are also all contagious or infectious diseases is equally certain. It was observed, as long ago as the days of Livy, the Roman historian, that even an *endemic* disease, that is, a disease confined to a particular locality, may become contagious. He informs us, that while Marcellus laid siege to Syracuse, B.C. 213 years, the soldiers were placed in a very unhealthy situation, and a pestilence broke out in both armies. "At first," he says, "the unhealthy locality produced sickness and a number of deaths; but afterwards the disease spread by infection, so that those who became affected were neglected or abandoned, and died; or their attendants contracted the disease."* "You can never infer," says Dr. Watson, "that any febrile disorder is not *contagious*, merely because it prevails *epidemically*. Many epidemic diseases are not contagious (?). But the two properties may and do meet in the same malady. They are not to be set in opposition to each other, or regarded as incompatible properties, as they have been by some ingenious writers."†

If the diseases above enumerated were merely propagated by infection, we would naturally expect that they would assume the same form, under similar circumstances, in different seasons; whereas, it is a fact known alike to medical practitioners and to other intelligent observers, that not only does the same disease vary in different epidemics, but that it

* T. Livii Histor. lib. xxv. 26.

† Principles of Medicine, Vol. II., page 660.

is scarcely twice exactly alike. It varies in its symptoms, in its mortality; and the very same disease, as it occurs in different seasons, requires totally different treatment. "Continued fever," observes Dr. Watson, "as it appeared in London during the ten years previous to 1838, required and bore far less depletion than it did for the preceding ten years, or more."

Small-pox often assumes the form of an epidemic, spreading much more rapidly and extensively than it could do if it were only propagated by contagion; this fact, however, is not now so obvious, from the blessing conferred on mankind by vaccination. But Dr. Gregory, physician to the Small-Pox Hospital in London, affirms that not one in twenty cases of small-pox which are sent to him can be traced to any known source of infection. Nay, even a prisoner, shut up in solitary confinement in the Millbank Penitentiary, has been known to be seized with small-pox.

Scarlet fever occurs undoubtedly as an epidemic, and is also, as well as small-pox, highly infectious.

Erysipelas, called also "St. Anthony's fire," and "Rose," was observed even by Hippocrates, the father of medicine, to be epidemic in spring; and from his age downwards, most writers on the subject have mentioned its occasional appearance in an epidemic form. It is often so highly infectious, when it rages epidemically in hospitals, from impure air and other causes, that the surgeons are afraid to perform any operation, on account of the risk of erysipelas attacking the fresh wound.

Measles, hooping-cough and mumps, occur obviously as epidemics, and are also very infectious.

Cholera is almost universally admitted to be an epidemic, but many deny its contagious property. If any one, however, take a calm survey of the facts on both sides of the question, without any infectious or non-infectious theory to obscure his mind and dim his vision, it is next to impossible for him to arrive at any other conclusion than that, although Asiatic cholera be an epidemic, and not very communicable from one person to another, unless that other be placed under unfavourable circumstances, or be predisposed to the disease; still, instances do occur in which, without doubt, cholera is communicated by infection.

What the real cause of epidemics may be, it is impossible, with our present amount of knowledge, to ascertain. Some ascribe them to certain poisonous exhalations arising from the surface of the earth, which, meeting with other concurring causes of disease—such as, peculiar states of the weather, famine, scarcity, unwholesome food, the crowding of a number of persons together, the putrefaction of animal and vegetable substances—thus breed pestilential epidemics. Others ascribe them solely to the influence of the weather, from the circumstance of certain diseases occurring chiefly at particular seasons—thus, we have diseases of the respiratory organs, measles, scarlet fever, &c., in spring; bowel complaints, fevers, small-pox, &c., in summer; cholera, dysentery, &c., in autumn; and inflammations of the chest, rheumatisms, &c., in winter. Others ascribe them to unwholesome and deficient food. Moses relates in Numbers, chap. xi., that the Israelites were seized with pestilence from eating a great quantity of the flesh of quails, which had fallen in immense numbers around their camp, after having been long destitute of animal food. Other writers attribute their origin to animalculæ, or to vegetable germs or fungi, floating in the air; others to a peculiar fluid which escapes from the deep parts of the earth; others to certain electrical conditions of the earth and atmosphere; while some connect their appearance with volcanoes, earthquakes, and comets.

But neither can they be accounted for by poisonous exhalations from the earth's surface; favourable concomitant circumstances are often occurring, and why should these exhalations produce such marked effects at one time and not at another? Nor by the influence of the weather, for cholera and influenza, &c., occur in seasons the most opposite; nor by unwholesome and deficient food; for although, as in the unfortunate case of Ireland a few years ago, this cause will contribute in a most powerful degree to render any

fever or epidemic more malignant and fatal, yet it has never been known to originate Asiatic cholera, plague, or even scarlet fever; nor can epidemics be accounted for by the putrefaction of animal substances; for if so, the neighbourhoods of badly kept burial-grounds in large cities would soon be depopulated. As for the other theories above mentioned, they are not only incapable of proof, but they are all deficient in one essential quality of a good philosophical theory—they do not account for the whole of the phenomena.

Breathing an atmosphere vitiated by poisonous exhalations from the earth's surface, from dead and decaying animal or vegetable substances, or from filth and overcrowding; exposure to sudden vicissitudes of weather, to cold and wet; insufficient clothing; famine, and unwholesome food; mental depression; want of sleep; and, above all, debauchery and intemperance—each and all debilitate the system, lower the vital powers, and contribute in a most powerful degree to render the human body not only unable to resist epidemic influences, but the infection of fever, and, in short, every disease to which it is liable. Let any one look around him and see what class of persons are first affected by any virulent epidemic or infectious disease, what class are most severely affected, and where are its most numerous victims—among the starving poor, among the dissipated, and in dens and hovels of filth and iniquity. No predisposing cause of epidemic disease, particularly of cholera, has been rendered so apparent as intemperance, or the habitual indulgence in drinking spirituous liquors. In every town and district where that disease made its appearance, it was observed that the *drunkard* was invariably first affected, and that his chance of recovery was least.

Dr. Watson, in his valuable Lectures on the Principles of Medicine, already quoted, after enumerating several predisposing causes of Asiatic cholera, says—"But to intemperance, more than to any other single cause, may the proclivity to be affected by this species of cholera be ascribed; and especially to the intemperate and habitual use of distilled spirits. This fact was particularly manifested in the selection, by the disease, of its victims in this country, and it has been remarked almost everywhere else."

The following facts have been ascertained with regard to epidemic diseases generally:—

1st, They gradually extend themselves over the surface of the globe, and they have been observed to travel generally in a westward direction: winds retard and aid the passage of the epidemic virus; a strong adverse wind has been noticed to delay the progress of cholera, but not to prevent it.*

2d, They suddenly attack a few of the most predisposed individuals in a city or district, then rapidly reach the height of their virulence; by-and-by they gradually decline; and, in a few weeks or months, they finally disappear.

3d, Although they grow gradually milder in one locality, still, on their first breaking out in another, they assume all their original virulence, if occurring under similar circumstances.

4th, They are generally preceded by a continuance of easterly winds; and are also accompanied or preceded by great extremes of weather.

5th, The lower, the damper, the more confined and filthy the situation, the greater is the virulence of epidemic disease. The choleraic virus has not been observed to ascend to an altitude higher than 6000 feet above the sea level.

6th, It is generally considered that a damp, foggy state of the atmosphere, is indispensable to the transmission of epidemics.

7th, They are frequently preceded by a great amount of disease among the lower animals, as cattle, sheep, &c.

It may appear unprofitable to theorize on "epidemic influences," or to speculate on a subject so obscure as to be incapable of proof; still, the temptation to hazard a conjecture, which seems to account for all the phenomena, is more

* The choleraic virus has been sometimes noticed in India to pass slowly in the teeth of the wind; at other times, by the aid of the wind, to acquire a greatly increased velocity.

than we can resist. It may easily be supposed that the globe, as well as the other planets composing the solar system, in their progress through space, must traverse different media. That portion of space through which our earth and atmosphere pass about the middle of November, has been long considered to be filled with substances which, on coming in contact with our atmosphere, explode, and constitute the numerous meteors so frequently observed at that season of the year. The fact of the periodical occurrence of meteoric showers has been observed from the earliest ages downwards; and it is utterly impossible to account for these showers of "falling stars" on any other supposition, than that they are substances floating in space, and explode on coming in contact with our atmosphere. May we not, therefore, suppose it probable that our earth, in traversing space, occasionally comes in contact with substances, not visible meteors, but which can chemically combine with, and invest a portion of the atmosphere, with qualities noxious both to animal and vegetable health and life—causing a fermentation, as it were, as yeast does when added to a warm infusion of malt; that such substances are attracted to certain parts of the earth's surface by their density; and meeting with media favourable for their farther development and propagation—such as the vapour of low and damp localities, filth, putrid animal and vegetable substances—first affect the inferior animals, and give rise to cases here and there of malignant disease amongst human beings; and subsequently, from the continued influence, affect large masses of people with a similar disease, which then gets the name of an *epidemic*. By means of atmospheric currents, such a poison would spread in various directions where it could find circumstances favourable for its transmission; but, in general, by the daily revolution of the earth, its course would be westward; and it would also, by its weight, be most virulent in low, level tracts of country, and become less so the higher the district rose above the level of the sea. This supposition would also account for the gradual extension of epidemics over the surface of the earth; for their decline and disappearance in one district, and their subsequent appearance with equal virulence in another; it might also account for certain epidemics which occasionally appear among the lower animals; and even for the late mysterious disease of the *potato* plant, one remarkable feature of which was, that it occurred for several years in succession, at almost exactly the same period of the year, and is now gradually disappearing.

Whatever truth may exist in the above conjecture, in support of which the want of space prevents us from adducing several additional arguments, it is certain that all pestilential epidemics are preceded by violent commotions in the atmosphere, by great extremes of weather, which has also been observed to follow meteoric showers: this, of course, would likewise affect the quantity and the wholesomeness of food, and account for the fact, that famine and pestilence have, from the earliest ages, been always associated together.

In finishing the subject of epidemic influences by a few practical remarks, it is highly deserving of notice, that the most pestilential epidemic which ever appeared in a temperate climate—the plague—has now been absent for nearly two centuries from those cities of Western Europe which have adopted enlightened sanitary measures. In London and Paris, and several other cities, the good effects of widening and paving streets, of constructing sewers, of introducing a proper supply of fresh water, of draining bogs, of building more airy and better ventilated houses, were immediately visible; while those cities that neglect these means of preservation and self-defence, are still devastated by that fearful malady.

During the occurrence of any epidemic visitation, such as Asiatic cholera, the following preservative measures will be found of the utmost consequence:—

1st, It has been recommended that, to prevent its spreading among the poorer classes, they ought, if possible, to be removed from the close, filthy, and vitiated atmosphere of their habitations to pure air. This would be a very good

rule if it were practicable to carry it out. But philanthropy would be much better employed in the gradual elevation of the lower orders in the social scale; in their education, religious and secular; in opening their eyes to the evils of the dram-shop; and in awakening them to a sense of the positive state of misery in which they struggle through a wretched existence, only a few degrees above, if not below, the inferior animals.

2d. During virulent epidemics, the food ought to be carefully attended to, as to quantity and quality; it should neither be too poor, nor too rich and stimulating. A moderate supply of good fresh butcher-meat once a-day, followed (by those who can afford it) by two wine-glassfuls of *genuine* port, is an excellent precaution. During the plague which raged with such violence in London in the seventeenth century, butchers were observed to be remarkably exempt from the disease.

3d. The state of the digestive organs ought to be particularly watched: if the bowels be obstructed, recourse must be had to a dose of castor-oil or of compound rhubarb powder; if relaxed, a dose of tincture of rhubarb, with ten or fifteen drops of laudanum. During the prevalence of cholera, a looseness must be checked *at once* by an astringent mixture.

4th. All the before-mentioned predisposing causes of epidemic disease must be strictly avoided; and to aid in keeping up the vigour of the system, every one ought to wash his whole body once a-day with soap and water, or use the shower-bath, and have a proper supply of clean and warm clothing.

Secondly, we come to the consideration of FEVERS.—The general symptoms of an attack of fever from any cause are, first, a cold shivering, great languor and depression of spirits, the person feeling as if some unaccountable load were pressing down his whole body; to these, sooner or later, succeed headache, thirst, heat of skin, pains in the back and limbs, all more or less severe in proportion to the severity of the attack. But as these symptoms are also those of influenza, an attack of inflammation in some important organ, and many other diseases, and as it is impossible for a non-professional person to distinguish the complaint, recourse must be had to competent medical skill.

Fevers, as they exist in this country, may be divided into four classes:—1st, Eruptive fevers; 2d, Common simple fevers; 3d, Symptomatic fevers; and 4th, Typhus fevers.

1st. *Eruptive fevers* are those whose distinguishing feature is a red flush or eruption on the skin, as scarlet fever, measles, &c. Under this head, also, many include our 2d and 4th classes.

2d. *Common simple fever* is that fever which frequently arises in this country from exposure to great vicissitudes of the weather—cold, wet, fatigue, violent mental emotions, &c. It is neither very severe nor very fatal, unless it occur in persons of bad constitutions, and in those highly predisposed to disease. In such cases, it sets up inflammation in some weak internal organ—lungs, bowels, or brain—and is thus very often fatal. If proper precautions be not taken, and if a person be strongly predisposed, it may become infectious, and this in proportion to the malignancy of the case.

3d. *Symptomatic fever* is a fever lighted up in the system by some other disease. In any severe bodily injury, such as fracture of the skull, compound fracture of the limbs—in inflammation of the bowels, lungs, kidney, or other important bodily organ, the system *sympathizes*, as it were, with the diseased organ or texture, fever is excited, and this is called "symptomatic, or sympathetic fever," as being merely a symptom of the primary malady. Of this nature is rheumatic fever and hectic fever, arising from inflammation of certain textures of the body. Symptomatic fever may present all the appearances of simple, or even of typhus fever. In severe cases it frequently affects the patient's brain, producing either a low muttering or a high and furious delirium. Death frequently occurs; and the only differences between this and those other fevers are, that it arises generally from a different cause, and it is *never* infectious.

4th. *Typhus fever* occurs generally as an epidemic, and, in

addition to the symptoms of fevers in general, is peculiarly characterised by sudden and extreme prostration of strength and all the vital powers. The brain is very soon affected, and the mind gets confused and delirious. But perhaps the distinction between common simple fever and typhus fever is more arbitrary than real. Many consider simple fever a mild species of typhus; and simple fever may take on a typhoid form, when it occurs in a bad subject, or under circumstances favourable for the development of typhus, such as in close, confined, and vitiated air, amongst filth, the exhalations from decaying animal or vegetable substances, damp, nakedness, squallor, intemperance, and poverty. In such cases, simple fever assumes all the malignant characters of typhus—is very infectious and fatal.

Some diseases are much more obviously infectious than others; scarlet fever, small-pox, and measles are very infectious. The infection of scarlet fever will lurk among the clothes and furniture of a room for a long time; indeed, unless very efficient means of purifying be resorted to, it is impossible to say at what time there is no danger from infection. Small-pox is so infectious, that instances have occurred in which it, as well as typhus fever, has been caught from the dead body.

Other diseases are not so visibly infectious; such as erysipelas, which, nevertheless, has infectious properties. A direct proof of this once fell under the notice of the writer. An old woman, suffering from some trivial ailment, wrapped a piece of flannel around her head; very soon afterwards she felt a hot prickly sensation in one of her cheeks, which shortly became red and swollen; the redness and swelling extended and increased, and became indeed a very severe attack of erysipelas, or "rose," as she called it. It turned out, on inquiry, that the piece of flannel which she had used had lain in a drawer for six or eight months, and that it had been used before that period by her son-in-law in an hospital, where he suffered a very dangerous attack of erysipelas. No one, who has any sore or abrasure of the skin about the head and face, or who is given to intemperance, ought to have too free intercourse with a person suffering from erysipelas.

Most of the eruptive diseases, and some others, such as whooping-cough and mumps, occur only *once*, as a general rule, in the course of a person's life. But to this rule there are many exceptions, and they have been often known to affect a person a second time, and, in a few instances, even a third time.

The question is often asked, Does an attack of simple fever or of typhus render a person less liable to a second attack? and the answer is, that, although in a much less degree, and for a far shorter time, than after such diseases as measles, scarlet fever, and small-pox, still, a person who has undergone an attack of simple or typhus fever is less liable to a second attack, and it is uncommon for him to be affected a second time for a considerable number of years, unless he be highly predisposed to infection, or exposed to its influence in a very concentrated form.

Predisposing Causes of Fever.—It has been asserted by some, that unless a predisposition exist on the part of a person exposed to infection—unless the system be in such a state of derangement as to render it unable to resist the morbid influence—that individual is exempt from all danger of the infection of fever. Now, although it is well known that when a person is in full and robust health; when all the bodily organs perform their functions with the utmost perfection and harmony; when he is neither too fat nor too lean; when he is not addicted to ardent spirits, to debauchery, or the depressing passions; when he takes a sufficient amount of exercise in the open air; when the mind is conscious of rectitude and a faithful performance of duty; when the soul is steeled with fortitude and equanimity; then will the vital powers of such a person be enabled to withstand a very powerful morbid impression: still, there are cases in which persons have taken fever in robust and vigorous health, without a single *known* predisposing cause in operation, but where they have been exposed to infection for a long time,

or for a short time in a very concentrated form. Predisposing causes, however, have a most powerful influence in rendering a person liable to attacks of fever, as well as to almost every other species of disease; and, as we have frequently remarked, *whatever*, either directly or indirectly, *debilitates* the body, will also impair the health, lower the vital energies, and act as a predisposing cause of disease.

Among these debilitating causes may be enumerated, *deficiency of food*. In all ages, famine and disease have been connected like cause and effect. The epidemic and contagious fevers which have so often devastated Ireland, and by which its inhabitants were lately decimated, had their mortality increased to an enormous extent by the inadequate supply, and the unwholesomeness of the food, on which that unfortunate people endeavoured to subsist. Dr. Alison of Edinburgh has proved, that the prevalence and mortality of infectious fevers among the poor, are in direct proportion to their destitution.

Exposure to the *effluvia of overcrowded, filthy, and ill-ventilated dwellings*, and to that arising from the *putrefaction* of dead animal and vegetable substances, are very powerful debilitating causes.

Grief, anxiety, disappointment, exposure to vicissitudes of weather, fatigue, previous illness, excessive purging, or other secretions or discharges, want of sleep, long-continued watching on a sick bed, intense study, and, above all, sensual excesses and intemperance, will each sap the strength, depress the vital powers, and, as we have before remarked, render the body an easy prey to the infection of fever, or any epidemic influence.

Nothing, perhaps, has a more powerful effect in predisposing the body to be affected by fever, than the *fear of being affected*; and nothing is found to be so effectual a preservative against the infection of fevers and pestilential epidemics, by medical men and others who are obliged to have intercourse with the sick, as a strong confidence in the protection of a higher Power, a strict adherence to duty, and the banishing from the mind as much as possible all thoughts of danger. This is well exemplified in the case of the "Sisters of Charity," and others imbued with a strong sense of religion, who minister to the sick, and who are very seldom affected by any contagious disease.

Age fortifies the system against infection. Both below and above a certain age the risk is much less, and the chance of escape much greater, as will be seen from the following table, which gives the ages of the patients admitted into the London Fever Hospital for one year:—

Under 10 years,	18 admissions.
Between 10 and 15.....	68 "
" 15 and 20.....	130 "
" 20 and 25.....	178 "
" 25 and 30.....	100 "
" 30 and 35.....	44 "
" 35 and 40.....	44 "
" 40 and 45.....	31 "
" 45 and 50.....	14 "
" 50 and 55.....	10 "
" 55 and 60.....	8 "
" 60 and 65.....	8 "
" 65 and 70.....	2 "
" 70 and 75.....	3 "
" 75 and 80.....	1 "
Ages not ascertained,	17 "

Total,..... 676 admissions.

Male,324 | Female,352

Precautions to be taken to prevent infection, and to prevent the fever from spreading.—As a general rule, whenever a case of fever occurs among the poor, the patient ought to be sent at once to a fever hospital, *if possible*, where he will have much better attendance, have a greater chance of recovery, and the fever will be prevented from spreading. This being done, the house ought to be thoroughly ventilated, fumi-

gated,* and whitewashed. If not sent to an hospital, or if the case occur in a family where every convenience for the patient's comfort can be obtained, the following rules ought to be strictly adhered to, both for the safety of the patient and his friends:—

1st. Place the patient in as large an apartment as possible, and, to insure thorough ventilation, have a fire in the room, and a window always open; but if the weather be warm, the fire must be dispensed with, and both the window and door kept open; the air of the room ought to be pure and dry, of an equable temperature, and the patient should be out of the way of currents of wind.

2d. Have dark-coloured blinds upon the windows, and remove the window and bed curtains, carpet, hearth-rug, and all possible articles of furniture from the room, as these would act as nuclei for retaining the infection, and rendering communication with the patient dangerous.

3d. Have the most scrupulous regard to the cleanliness of the patient and that of his apartment. Let him have his body frequently sponged with soap and water; let all his discharges be immediately removed from the room; let his sheets and body linen be frequently changed, and let these soiled clothes be instantly immersed in water.

4th. Let no more people visit him than is *absolutely* necessary, a direction not only useful for the safety of others, but essential for the safety of the patient himself.

5th. Those who attend the patient, ought, if possible, to be upwards of forty years of age; they ought to be very careful to avoid all the above-mentioned predisposing causes; to have good nourishing food, with a moderate supply of butcher-meat daily; to keep their bowels open by *mild* laxatives if necessary, such as rhubarb pills or powder, or castor-oil; to avoid entering the sick-room fasting; not to inhale the effluvia from the patient's breath or his body; and to have a quiet cheerful demeanour in their intercourse with the patient.

The sprinkling of solution of chloride of lime about the room, carrying camphor, &c., are excellent preservatives against infection. But numerous experiments, made for the purpose, prove that, in general, the infectious air only extends but a few feet from the bodies of persons labouring under contagious diseases, *provided* the apartment be *thoroughly ventilated*; that is, at a few feet distant from the patient, the infection is so diluted with atmospheric air as to be almost innocuous, unless a strong predisposition exist. The preservative, therefore, in which we have by far the most confidence, is "FRESH AIR."

It is told of the late Dr. Gregory of Edinburgh, that, on being sent for to fever patients in poor, close, ill-ventilated apartments, with immoveable windows, the first thing he did on entering the room was to smash a pane of glass to pieces with his stick; those who were unacquainted with the Doctor's "*ways*," stared in mute amazement, till he told them that it was to give both them and the patient the incalculable benefit of fresh air, and that this was his first prescription.

In the third and last place, we have to consider ENDEMIC INFLUENCES.—When a disease is confined to a certain locality, solely affecting the individuals who reside there, and more especially strangers who frequent that locality, that disease is called *endemic*, from its originating in a local cause; and of this nature is ague, or intermittent fever, arising from *malaria*, or poisonous exhalations from the earth's surface. Nothing whatever is known of the intimate nature of this effluvia; the water and air of affected localities have been examined by all the means which science can suggest, but it still remains one of "nature's secrets." It was long believed to arise solely from marshes, and was called "*marsh miasmata*:" it was also believed to arise from the decay and putrefaction of animal and vegetable substances; but Spain, the driest country of Europe, and the

low and sandy coast of Holland, are much affected with malaria, unconnected with marshes, or a vestige of animal or vegetable decay.

Malaria chiefly exists in low-lying and flat grounds, such as are periodically covered with rains, and afterwards dried up by the heat of the sun; and in proportion to the intensity of this heat, and the rapidity with which the water is dried up, the malaria is the more virulent. It is so virulent in some parts of India, that in certain seasons of the year, during the intense heat after the periodical rains, every living creature must abandon those woods and jungles where malaria abounds. Not so much as a single bird is to be seen till the rains recommence, when man and beast can return with safety. Under the burning sun of the East and West Indies, the fever arising from malaria assumes the character of malignant typhus; in Spain and Italy, it is of the remittent form; while, in the more temperate climate of England, and even in Holland, it is simple ague.

The following facts have been ascertained with regard to malaria and its effects, all of which ought to be carefully borne in mind, and attended to by those living in malarious districts, and by those who may frequent a malarious country:—

1st. With the solitary exception of the African negro, none are exempt from the effects of malaria. Strangers, however, in a malarious district, are much more liable to be affected than natives, or than those who have been some time habituated to the poison. Still, its injurious influence upon the natives is very marked: the race deteriorates; their bodies and minds suffer; they become by degrees smaller in stature, get prematurely old and wrinkled; their spirits get languid, and their intellects become feeble and incapable of mental exertion. Hence the deterioration of the once powerful mental energy of the Spaniards and Portuguese, from the effects of a poisoned atmosphere operating for ages on the human constitution.

2d. Malarious places are always most dangerous after the sun goes down at night, and before he rises in the morning, when the dew is falling. On a ship touching a malarious coast, those of the crew who sleep on shore are sure to be attacked, while those who return to the ship at night escape.

3d. The poison creeps along the surface of the earth, and does not reach high grounds unless blown upwards by the wind. In the soldiers' barracks in Jamaica, three are seized of those who sleep on the ground floor for one on the second, and in Barbadoes two for one.

4th. The malarious poison attaches itself to, and is intercepted by, wood and water; hence the great use of these being placed between affected localities and human habitations.

5th. The production of malaria is prevented by draining and cultivation. Ague was at one time a very prevalent disease in Scotland, where it is now unheard of, and much more common in England than it is at the present day; and there are ample proofs that this circumstance is solely owing to the drainage of bogs, and the improved cultivation of the soil.

Those who have once had ague, ought, wherever they are, to avoid exhaustion and overfatigue, exposure to cold and wet, and to sharp east winds; and they ought to be very careful to change their clothes or shoes when damp or wet. Those who visit a malarious district or country, ought never to go out late at night or early in the morning, or, when obliged to do so, not to go out fasting; they ought to have their dwellings as highly situate as possible, and not built, as many of the West Indian towns are, on the *lee side* of a malarious district; they should sleep in attic rooms, and not near the ground; they ought carefully to avoid all the above-mentioned predisposing causes of fever and epidemic disease, adopting a generous diet, with fermented liquors in moderate quantity. Strangers, on their first visiting a malarious country, are recommended to take small doses of quinine—the great specific medicine for intermittent fever—by way of prevention.

* An apartment is fumigated by placing several saucers, or shallow vessels, filled with common salt moistened with water, in different parts of it, and pouring dilute oil of vitriol upon the salt; the gas which is given off is *chlorine*, and is a very good disinfectant.

THE SCIENCE OF PHRENOLOGY.

CHAPTER I.

Objections stated and met—Brain the Organ of the Mind—Duality of the Brain—Congeries of Organs in the Brain—Size of Brain an Index of Power—Comparative Estimate of the Size of Brain in the several Counties of England—Gall's Account of his Discovery—Rules for determining Character by the Shape of the Head—Advantages attending the Study.

IN calling the attention of the reader to the science of phrenology, we are not insensible to the difficulties which present themselves at the outset; and we are aware of the odium which some persons may imagine will attach itself to the individual who attempts to lift the veil of antiquity, and to show that the speculations of the schoolmen did not always evince superhuman wisdom. Time has thrown around the classic authors of antiquity the venerable robe of sanctity, and it is almost considered impious to propound any doctrine which carries not with it the stamp of their authority. A little reflection will, however, convince us, that even among the sages of antiquity, new doctrines have ever met with persevering hostility; and the propounders of them have, in some instances, suffered ignominious deaths, or been incarcerated in dungeons, or banished from their country, kindred, and friends. In all ages, the antipathy to what is termed new has displayed itself, and those who have laboured the most disinterestedly and the most zealously to instruct mankind, have been those who have suffered most from ignorance. A few illustrations will suffice to prove this.

The intelligence and the virtue of Socrates was punished with death! Anaxagoras, when he attempted to propagate a just notion of the Supreme Being, was dragged to prison! Aristotle, after a long series of persecution, swallowed poison! Virgilius, bishop of Salzburg, having asserted that there existed Antipodes, the Archbishop of Mentz declared him a heretic! The Abbot Trithemius, who was fond of stenography, having published several curious works on this subject, they were condemned as full of diabolical mysteries: and Frederick II., Elector Palatine, ordered Trithemius's original work, which was in his library, to be publicly burnt. Galileo was condemned at Rome publicly to disavow his sentiments! Cornelius Agrippa was compelled to fly his country, merely for having exhibited a few philosophical experiments, which now every schoolboy can perform! Des Cartes was cruelly persecuted in Holland, where he first published his opinions; while the great geometricians and chemists, Gerbert and Roger Bacon, were abhorred as magicians, and looked upon as objects of horror! This persecution of that which is new, has lost but very little of its virulence in our own time; for, although phrenology is received with much more complacency now than formerly, yet the reader can form but a very imperfect estimate of the obloquy which attached itself to its first promulgation; and the writer can safely say, he has, perhaps, suffered as much as any. Not only was it difficult to obtain an audience to lecture to, but even a room to lecture in; and when the late Dr. Spurzheim, by great interest, procured a hall at the University of Cambridge, he found himself, at the commencement of his lecture, with but one solitary hearer. At present, no such difficulties present themselves to a man of average ability; but still the advocates of the science are often assailed with the epithets of infidels and materialists; and the staple objections to the science now rest principally on these terms. It is contended that the science is hostile to religion; that it is a system of materialism and fatalism; and that the philosophical infidel is its most potent champion. We feel it necessary to examine each of these objections:—

OBJECTION I. It is hostile to Religion.—It is true, clergymen have written against it; but, it is presumed, they have done so from a misapprehension of its principles, and, in consequence of such misapprehension, which has generally originated in hearsay, they have not gone into the investigation sufficiently single-minded; and many have condemned it altogether without reading a single volume of the works of its great discoverers. But the objection of a clergyman against

the science is no proof of its fallacy. Many clergymen have been warm advocates of its principles. The late Rev. Dr. Welch, professor of Church History in the University of Edinburgh, was the founder of the first Phrenological Society in Great Britain. That society, in the metropolis of Scotland (Edinburgh), still exists, has a large museum and library, and has produced some of the most eminent phrenologists,—the late lamented and amiable Dr. Combe, and his brother, the justly-celebrated George Combe, one of the most profound philosophers of the present day; Robert Cox, Esq., the editor of the *Phrenological Journal*; James Simpson, Esq., the celebrated educationist; Sir G. S. Mackenzie, Bart.; and many others of equal note. Dr. Welch has left a valuable testimony in favour of the science; his own words are:—"I think it right to declare that I have found the greatest benefit from the science, as a minister of the gospel. I have been led to study the evidences of Christianity anew, in connection with phrenology, and I feel my confidence in the truths of our religion increased by this new examination; and, in dealing with my people, in the ordinary duties of my calling, the practical benefit I have derived from phrenology is incalculable."—Further, the present Archbishop of Dublin, Dr. Whateley, one of the most profound scholars, and the most eminent logician of the present day, has declared that the objection brought against phrenology, on the ground of its opposition to religion, is utterly futile, and unworthy any rational mind. Thus, if clergymen have written against the science, eminent and dignified clergymen have written in its favour. But, if phrenology is opposed to religion, how does it happen that the best describes special religious faculties?—and these, by phrenologists, are absolutely declared to be among the most important powers of the mind. If phrenologists were anxious to overthrow religion (a thing utterly impossible), would they take so much pains to cultivate those sentiments which, by all, are admitted equally indispensable to the well-being of society as well as to the individual man? Why take so much pains to prove that there is a sentiment of Benevolence, or Charity; of Faith, or Marvellousness, which induces a belief in a Supreme Being; of Hope of futurity; of Veneration, or a reverence for the Great Supreme; of Conscientiousness, or a love of integrity and truth; of Ideality, or a love of excellence; and of Firmness, or perseverance in well-doing?—They might at once blot out all these faculties from their authenticated and well-drawn map of the mind, if they were the opponents of religion. But it is well known that the contrary is the case; and phrenology has among its advocates clergymen of talent, and of all religious denominations.

OBJECTION II. Phrenology leads to Materialism, nay, say its opponents, is Materialism.—It cannot be denied that there are some phrenologists who so contend, but there are enough of us who protest against it. It is scarcely possible to conceive how such a charge can be sustained. The mind may easily be proved to act by material organs, but this does not prove the mind itself to be material. Phrenologists do not deny that the mind communicates in some mysterious way with the brain; they only say they cannot tell how. Will our opponents enlighten our darkness by informing us? if they cannot, why do they blame us for that for which they have no solution themselves? Matter, whether in its more gross or etherealised form, is matter still; and if it could possess any of the attributes of spirit, it would cease to be matter. The brain itself does not think, and phrenologists—at least the majority of them—have never contended that it does. They have never pretended to show in what manner spirit becomes united with matter; nor is it necessary they should. To those who believe in Divine Revelation, it is quite easy to prove that spirit can and does exist without matter; but as this is a question pertaining to theology, of course it cannot be discussed here.

OBJECTION III. Phrenology leads to Fatalism.—Now, fatalism literally implies that man is a passive being; that he has no will of his own, but is acted upon by a power he is incapable of resisting.

Phrenology has no such tendency. If one organ is in excess, there are others which may be brought to bear upon it, to restrain it and keep it in order. If one organ is defi-

As this watery-looking, whitish, blue, green, copperas, is, according to Bandsdorf, crystallized from an acid solution, it is probable that the extra proportion of acid which is found in it is owing to a portion of the mother liquor being mechanically combined with the crystals, but not forming an essential ingredient in the composition of the salt.

It may be observed that the experiments we have detailed favour the idea of the bad copperas being a bisulphate of iron, seeing that a given weight of the one has less iron and more acid than the same weight of the other. But, it has been already noticed that sulphate of iron crystallizes with seven atoms of water. Is this quantity of water, we would ask, invariable? The green colour of the salt depends upon the presence of water, for when deprived of its water it is white; now the colours of the two kinds of copperas referred to are decidedly different, as already described. May it not, therefore, be inferred that the difference of colour depends upon different proportions of water present in the crystals, which, if this be the case, will account for the different proportions of iron found in the same weight of the salt? It has been already noticed, that of the seven proportions of water which copperas contains, it loses six at 238° , but it retains one even at 535° . We took 20 grains of each of the good and bad qualities of copperas, reduced them to coarse powder, and submitted them to a heat of between 350 and 400° , for fifteen minutes; and taking the mean of three experiments, the bad copperas lost $1\frac{1}{2}$ grains more than the other. Although these results were very satisfactory, in so far as they agree very nearly with our other experiments, and exactly coincide with our practical experience, yet, as the results have not been noticed so far as we are aware by chemists who have written upon the subject, it is with some diffidence that we give them publicity, and for the same reason refrain from offering any other remarks on the subject than will already be inferred; namely, that the whitish blue copperas ought to be avoided in dying blues by means of the blue vat. We will probably recur to this subject in another paper, and, meanwhile, will point out some impurities which occasionally exist in copperas, and which are very hurtful in the blue vat. A very common impurity in sulphate of iron, is sulphate of alumina. The deleterious nature of this salt does not consist in its action upon the indigo, but it introduces to the vat a good portion of sulphuric acid; and as it forms a double salt with the sulphate of iron—which double salt combines with 24 equivalents of water—its presence may account for the various results obtained in the experiments detailed above, with bad copperas, and its evil effects in the vat. It is, no doubt, the presence of sulphate of alumina that renders our Scotch copperas so much inferior to the English. The presence of alumina may be detected by its giving the peroxide of iron, when precipitated, as already described, by ammonia and filtered, a very bulky and clayey appearance. If this precipitate be dissolved in muriatic acid, and the iron again precipitated by caustic, potash, added in excess, and filtered; the alumina being now in solution passes through the filter, and may be again precipitated by adding ammonia. It is a bulky white precipitate. The presence of sulphate of zinc and copper, may be detected by a similar process—the iron being peroxidised and precipitated by ammonia. If copper be present the supernatant liquor has a blue colour; it may also be detected by putting a piece of clean iron in the copperas—the copper is deposited in the metallic state on the iron. If zinc be present, and a stream of sulphuretted hydrogen gas passed through the clear filtered liquor, a white precipitate is obtained. This latter substance is very seldom present in copperas. The deleterious effects of these two substances are of the same nature; they hold their oxygen by a comparatively feeble attraction, so that when any deoxidising substance comes in contact with them they yield their oxygen to it, consequently their presence in the blue vat neutralizes the effects of the sulphate of iron. It is from this property that these salts are used in resist-work, which is conducted in the following manner:—A certain preparation, the best we believe, is the sulphate of copper or zinc, is mixed either with flour paste, with gum, or with pipe-clay and gum, is printed on the calico, of any pattern that may be desired; when this is sufficiently dry, the goods are then dyed in the blue vat, those parts of the piece which are printed with the copper or zinc will not be dyed blue, because the deoxidised indigo becomes oxygenated the moment it touches the copper, by its yielding its oxygen to the indigo, and occasions

it to become insoluble, and consequently incapable of forming a dye. According to Dumas' theory, the hydrogen, in combination with the indigo, unites with the oxygen of the copper and forms water, and both results are alike.

Before concluding this article, we may inform the general reader that, in print-works and dye-houses, where piece-goods are dyed blue, the vats are necessarily large, being generally about 3 feet wide by 5 feet long, and 8 feet deep, made of iron, but sometimes of stone—these are sunk into the ground about half their depth. The goods to be dyed are stretched upon a frame, when the whole is lowered into the vat. Sometimes these frames are furnished with rollers, when, instead of fixing the piece on hooks, it is passed over these rollers while in the vat, by which means long pieces are dyed perfectly even in colour.

The vats for yarn or skein are small, being generally old wine or oil pipes; these are also sunk about half their depth into the ground. Wooden pins are put through the skein, and rest upon the edge of the vat, the skein is then turned over, the one half dipping in the liquor, the other half over the pins. The time of this operation varies according to the strength of the vat. The operation being continued some time, the skein is taken out, wrung, and exposed to the air, dipped again, and so on, by alternately dipping and exposing, till the requisite shade is obtained.

To prepare the vat, it is filled to within a few inches of the mouth with water, the dyeing ingredients are then added—the proportions given in most chemical books, are 1 part (by weight) indigo, 2 parts sulphate of iron, and 3 lime, but this proportion of lime is too much; the practical dyer does not consider his vats in good condition when this proportion is used. The following proportions are considered good for preparing one of these small vats: assuming all the ingredients good, 8 pounds of indigo, 14 pounds of copperas, and from 18 to 20 (not above 20,) of lime. If the copperas be bad, a pound or even 2 pounds more of it may be required along with 2 or 3 additional pounds of lime, to have the same results. These ingredients being put in, the whole is well stirred every 2 or 3 hours during the day, and, after settling for 12 hours, it is ready for use. We have been somewhat brief with this description, as we will probably have to give a chapter upon the manipulations of the dye-house in another part of the series.

DOMESTIC MEDICINE.

CHAPTER VI.

ON THE EFFECTS OF PARTICULAR TRADES AND PROFESSIONS AS CAUSES OF DISEASE.

IT is well known that particular trades and professions—from subjecting those engaged in them to the injurious effects of exposure to the inclemency of the weather, to impure air, to want of sufficient exercise, or to over-exertion—exert an influence in the production of disease, in the shortening of life, and in the deterioration of the human race. It is also very obvious that these effects are the more or less certain and striking, in proportion as the individuals exposed to their causes have, or have not, arrived at mature age and strength.

Take, for example, the young and immature horse or ox, and, instead of allowing him to roam idly over the green fields till he has arrived at full maturity—till his muscular system be sufficiently developed,—confine him to the impure air of a stable, train him and subject him to constant hard work, feed him upon dry food, such as is fit for mature animals, and what is the result? An animal treated in such a manner will never arrive at his natural growth and strength. He will become more or less deformed; his value and his usefulness as a working animal will be greatly diminished, and his life will be much shortened: it is proved, indeed, both by experiment and observation, that horses, in this and several other countries of Europe, from bad treatment, and from being too early and too hard worked, scarcely ever arrive at half the term of their natural lives.

In this respect there is a close analogy between the inferior animals and man. Manual labour is the result of muscular exertion; and strong or continued muscular exertion

can only be accomplished with ease, and without either temporary or permanent injury, when the muscular system has become maturely developed, and as long as it is properly nourished and continues in full health and vigour. In the muscular or fleshy part of the body lies the strength of the individual; and as reasonably might we expect a bunch of green flax, while bursting into flower in the open field, to equal the ship's cable in strength, as that the weak muscles and slender sinews of a raw, growing youth could endure, without injury, that continued and powerful exertion which is required of mature age.

To the young of all animals (and man is no exception), not merely exercise, but a great deal of exercise, is certainly indispensable; but this exercise must be without any sort of constraint—it must be absolute liberty to run or to walk, to sit or to stand, to lie down or to rise up at pleasure. Based on a very insecure foundation, therefore, is that system of social life, which renders it necessary that boys and girls of tender age should be immured from morning to night in the school-room or factory prison—should be compelled to debilitate their constitutions, deform their bodies, and shorten their lives, by confinement in a constrained position, and in the impure atmosphere of schools or workshops for six or eight hours a-day. In manufactories, at least, the result of such a state of things must be,—from over-exertion, from breathing air saturated with animal and vegetable particles, and from the moral contamination which surrounds them,—a race of human beings gradually sinking in the scale of intellectuality, of virtue, and of physical strength. Instead of benefiting by parental example—instead of having their bodies and minds invigorated by exercise in the open air, young children are sent to factories and workshops, where, properly speaking, they have no moral restraint—where they generally grow up slaves to the worst passions, and where the self-denial imposed by the rules of civilized society are utterly unknown. In such a community, the benign empire of reason and of religion gives way by degrees to the tyrannical sway of passion, brutality, and vice! If those who have the power in this country do not exert themselves more to have moral principle and instruction instilled into the minds of the rising generation, and if they do not, by the influence of example and every other means, endeavour to rescue the masses from that state of vice, misery, crime, and irreligion into which they are rapidly falling, the melancholy truths stare us in the face, that our nation has passed the meridian of its glory—that civilization is only another name for a refinement in moral depravity—that individual dishonesty, general corruption, and religious hypocrisy, are the means by which the great end of self-aggrandizement is to be accomplished—and that the virtues of self-restraint, Christian charity, honest and honourable dealing, are so rarely to be met with, as to show clearly that the truths of Christianity have lost their hold upon the public mind, and that, practically, the nation is steeped in infidelity.

The mass of evidence, collected by Parliament on various occasions, abundantly proves, that children employed in manufactories become deformed, stunted in growth, and totally incapable of such mental exertion as to make even a fair progress in the rudiments of education. The evidence of the late celebrated surgeon, Sir Astley Cooper, before a Parliamentary committee, is supported by the statements of the late Sir Gilbert Blane and Sir Anthony Carlisle, both eminent authorities: it is in complete accordance with the views above expressed, and does not even allow such latitude as the late Dr. Baillie, who says, "that seven years old is perhaps the earliest age at which children should be employed in factories; and, for the first year, they should not be employed more than four or five hours a-day; for the two succeeding years, six or seven hours a-day; afterwards, they might be employed ten hours a-day; and beyond that, in my opinion, there ought to be no increase of labour."

The objections here urged against the confinement of children in factories and workshops are equally valid against over-confinement in school. Children in school have not

over-exertion of the body, but they have over-exertion of the mind, which is even worse; and when to this are added, the constrained position in which they must sit, the noxious influence of an impure and over-heated atmosphere, and the want of sufficient exercise in the open air, a strong constitution is thus very generally impaired, and children of weak constitutions are extremely liable to curvature of the spine, scrofula, or consumption, and various other maladies, which wither in the bud the most tender and choice flowers of our species, and hurry them to an early grave.

But supposing the period of mature age and strength to have been reached, particular trades and professions are more or less liable to induce peculiar diseases, although, as already stated, not nearly so speedily, so obviously, nor so fatally, as before that period.

These diseases arise, as above-mentioned, from four different causes:—

I.—From exposure to the inclemency of the weather.

II.—From breathing an impure and confined atmosphere.

III.—From want of sufficient exercise in the open air.

IV.—From over-exertion of the body or mind.

First. We have already treated the subject of the vicissitudes of temperature, as a cause of disease, so fully, that it is merely necessary here to enumerate a few of those trades which suffer most from this agency. Those whose employment is, in a great measure, out of doors, such as day-labourers, farm-servants, gardeners, fishermen, shepherds, coachmen, railway-guards, &c., are, of course, much exposed to the inclemency of the weather; and were it not that their vital powers are greatly fortified by habit, by exercise in the open air, and by constantly breathing a pure atmosphere, they would be infinitely more liable than they are, to be affected by those diseases to which atmospheric vicissitudes give rise; while blacksmiths, glass-blowers, brass and iron-founders, firemen of steam-engines, bakers, cooks, brewers, &c., are all, from the peculiar nature of their occupations, deprived of those counteracting influences, and as well from imprudent exposure to cold air, as from using cold drinks while their bodies are cooling after being greatly over-heated, they frequently suffer from inflammation of some of the internal organs, and from rheumatism, catarrhs, asthma, dropsy, &c.

To guard against the dangers arising from sudden changes of the weather, those whose occupations compel them to expose themselves, ought all to wear flannel next the skin; to have it changed when drenched with wet or perspiration, so as to prevent the effects of cold, and, for the sake of health and cleanliness, to have it renewed at least weekly. They ought, moreover, to have oil-cloth or water-proof cloaks or great-coats, not for the purpose of wearing constantly (being injurious to the health, by preventing the insensible perspiration from passing off from the body), but always ready at hand to protect them from rain. Those who must expose themselves to high temperatures, ought also to wear flannel; to have it renewed, if possible, twice a-week; to avoid cold drinks or sudden exposure to cold, unless the bodily heat be kept up by active exercise or additional clothing.

Secondly. Allusion has been often made already to the noxious effects upon individuals generally, arising from breathing an atmosphere contaminated with animal or vegetable effluvia, resulting from overcrowding, and living in small, filthy, and ill-ventilated apartments; and, in reference to this cause of disease, we have only now to mention, that those confined in the over-heated and impure atmosphere of factories and workshops are peculiarly liable to the hurtful influence which it exerts upon the human constitution. To dispel every doubt as to the truth of our assertion, we need merely point to a comparison between the strong, muscular, fresh, and healthy-looking farmer, farm-servant, day-labourer, shepherd, or sailor, and the slender, diminutive, and sickly-looking factory-lad, weaver, shoemaker, tailor, or any other tradesman exposed to the debilitating influence of impure air. These effects, however, must not be entirely ascribed to this cause. Other, and even more powerful causes must be taken into account: the chief of which are over-stimu-

lating food and the want of proper exercise. But by far the most potent of all causes is *intemperance*, in its widest signification, by which is meant not merely the abuse of ardent spirits, but indulgence in all the animal passions.

The bad effects of impure air in manufactories and workshops might be very much mitigated, if not entirely removed, by proper attention on the part of the masters to have their rooms large, lofty, and well lighted; by paying particular attention to the laws of ventilation,—remembering that impure and heated air always ascends to the top of the apartment, and gradually accumulates in the room, while the fresh air is partly consumed and partly displaced and sent up the chimney, that the opening of windows will never completely remedy the evil, for in this case fresh air rushes in, falls down to the bottom of the room, and is then carried up the vent, with but very partial benefit to the inmates. No room, in which pure air is quickly consumed, can be thoroughly ventilated without an opening for the exit of the impure and heated air; and this is most effectually accomplished by the use of a ventilator, with a delicate valve, introduced into a hole made into the chimney near the roof of the apartment, by which a current of vitiated air from the top of the room is carried up the flue with the smoke from the fire. In a room in which there is no fire, nor even a chimney, there is the more necessity for a ventilator near the roof of the apartment, communicating with the external air.

In addition to the bad effects of impure air, some artisans, from the peculiar nature of their occupations, suffer more or less severely from breathing air filled with metallic, mineral, or earthy particles, and this cause of disease is more difficult to obviate.

The workers in quicksilver mines, glass-platers, gilders of buttons, toys, &c., are affected by inhaling the fumes of *mercury*, and are liable to mercurial palsy, ulcerations of the mouth and throat, eruptions on the skin, and painful rheumatic affections of the joints and limbs, after exposure to cold. These injurious effects are fearfully aggravated by the intemperate habits of those exposed to such a cause; they often find temporary relief from their ailments in a glass of ardent spirits, and, without thinking that these evils will, on that very account, return with redoubled violence, they indulge in a remedy which becomes their ruin,—thus aggravating their primary malady, and either rendering themselves unable to follow their occupations, or hurrying themselves to a premature grave. By frequent ablutions, particularly before meals; by frequent changes of clothing; by avoiding to touch the metal with the naked hand; by carefully guarding against inhaling the fumes; by having stoves placed in such a manner as to carry them up the flue in a brisk current of air; by strict *temperance*; and by having recourse to medical aid before it be too late, the diseases arising from this cause may be in a great measure prevented.

The workmen employed in lead mines, plumbers, glaziers, painters, colour-grinders, type-founders, printers, and all those whose occupations require them to handle lead, or any of its preparations, or to inhale its fumes, suffer severely from colic—known by the name of *painter's* or *lead colic*,—from a peculiar species of palsy, and from other diseases which are thus induced, so as frequently to lead to fatal results. Dr. Fothergill attributes many of the diseases of children to their being permitted to play with painted toys, thus swallowing the lead which enters into the composition of paint; young artists are also liable to suffer from the same cause, from sucking their pencils. The means of preventing the bad effects arising from lead, are very similar to those above recommended to those exposed to the fumes and to the handling of mercury. The strictest attention to personal cleanliness—frequent changes of clothing and frequent ablution—avoiding going to work with an empty stomach—never using sour beer or other acid drinks—using fat meat—and, on the occurrence of any symptoms of colic, leaving off work and taking laxative medicine,—are all directions which are absolutely necessary to be attended to by those who wish to preserve their health unaffected by the hurtful influences to which they are exposed by their employment.

Dry-grinders and needle-pointers—edge-tool, gun-barrel, and other grinders—iron, brass, and other metal filers,—all suffer to a great degree; but particularly the class first-mentioned, from inhaling into the lungs and air-passages, the fine particles of metal which are so apt to give rise to inflammation and ulceration of these parts. This class of artisans are, for the most part, short-lived: they generally fall victims to consumption at from thirty-five to forty years of age. Many different plans were formerly adopted to mitigate the evil effects arising from this cause, among which the wearing of a veil of damp crape over the face was the best. But none of the expedients resorted to were of much use, till the invention of Mr. Abrahams of Sheffield was put in practice, in which the principle of magnetic attraction is taken advantage of to remove the small particles of metal from the air, thus rendering it innocuous to the respiratory organs. This invention is of the greatest consequence, and answers the purpose admirably.

Flax-dressers, pearl and horn button-makers; millers and stone-cutters; wool-carders, feather-dressers, and quill-manufacturers; sawyers, turners, weavers, and starch-makers; maltsters and bakers,—all suffer more or less from the air which they breathe being filled with vegetable, animal, mineral, or earthy particles. They are, consequently, very liable to slow inflammatory affections of the lungs, air-passages, and stomach, producing coughs, asthma, and indigestion; they are pale and sickly-looking; and, if addicted to intemperate habits, they are generally short-lived—dying of consumption, or some other disease of the lungs. For the prevention of these effects, a respirator or damp crape has been recommended, and probably with advantage, if these tradespeople were at the trouble to wear it. Wet or moistened woollen curtains, suspended over the heads of the workmen in such a way as to be agitated through the air of the place, have also been mentioned as of use; but the most effectual means, if practicable, would be to have a current of air passing through the apartment, and entering the flue near the ceiling, by which means all the fine particles floating in the air would be carried off. In addition to these measures, strict personal cleanliness, temperance, nourishing diet, and as much exercise in the open air as possible, ought, if these individuals have any regard for their health and comfort, to be carefully and assiduously observed.

Thirdly. Want of sufficient exercise is generally so inseparable from the other causes of disease peculiarly affecting various trades and professions, that it is difficult to know what share of the evil we ought to attribute to this cause. We know, however, for certain, that deficient exercise exerts a powerful influence in predisposing an individual to very many diseases, by inducing weakness of the muscular powers and depression of the vital energies, and by being the primary source of indigestion and all its train of woes.

“By the sweat of thy brow shalt thou eat thy bread,” was part of the original curse which man brought upon himself by his fall. A law was thus imposed upon his physical constitution, which was to compel him, in all time coming, either to obey the injunction implied in this primary curse, or to suffer the pains and penalties attached to its infringement. How beautifully in this, as in everything else, does the sacred record harmonise with true science and philosophy! The scriptures tell us that we are doomed to labour for our daily bread, and science and philosophy prove that unless we do submit to bodily labour, or *exercise*, which is the same thing, we must suffer pain and disease both in body and mind, which are the penalties attached to the infringement of this great law. Exercise is indispensable, not only to preserve the body in health, but equally necessary for our comfort and happiness, and for the preservation of an active and vigorous condition of the mental faculties. Is the body or mind weakened after any illness? Gentle exercise in the open air is immediately recommended. Does a person of sedentary habits complain of languor, headache, indigestion, loss of appetite, stomach-ache, &c.? More exercise is seen to be necessary, and is prescribed with the utmost confidence even by those who have no pretensions to medical skill.

Literary men, in particular, who have no occupation to induce them to take exercise, suffer severely from this cause, and many, no doubt, would impart a little more freshness and vigour to their compositions, if they paid more attention to their bodily health; they ought to remember, that strength and vivacity of intellect are incompatible with bodily languor and debility.

Writers, clerks, and all those tradesmen whose occupations oblige them to lead sedentary lives, such as tailors, seamstresses, shoemakers, watchmakers, jewellers, weavers, &c., are all more or less subject to indigestion, accompanied with headache, pain in the stomach, bad taste in the mouth, particularly in the morning, nervous palpitations of the heart, constipation, piles, &c.—symptoms which may end in diseases of the bladder or kidneys, consumption of the lungs, diseases of the heart, stomach, or liver. When, in addition to the long-continued sitting posture, the body is bent forward and the legs squeezed into the most unnatural position, so as to obstruct the circulation of the blood, as in the case of tailors, or pressure is made upon the chest and pit of the stomach, as in the case of shoemakers and weavers; and when to these injurious influences we add the bad effects of impure air, of too stimulating food on the one hand, and deficiency of food on the other, and of *intemperance*, we need be at no loss to account for the weak constitutions, the premature old age, and the multifarious diseases to which the majority of these individuals are liable; our only difficulty is in ascribing to each particular cause its proper share of the mischief. A strict investigation of this question leads to the conclusion, that impure air and deficient exercise, as causes of disease, are thrown into the shade when they are compared to the overwhelming influence of habitual excesses of any kind, but particularly in the abuse of ardent spirits.

For invalids, and persons of weakly constitutions, whose strength is unequal to walking a sufficient distance, equestrian exercise is peculiarly adapted; for the aged and debilitated, riding in a carriage must be resorted to by those who can afford the means; but for a person of ordinary strength, even although aged, *walking* is unquestionably the best of all the different kinds of exercise which can be tried by people of sedentary occupations. Walking sets the whole muscular system in action, stimulates the circulation of the blood, thus promoting digestion, nutrition, and respiration; and it not only rouses the dormant faculties of the body, but, by the change of scene which it occasions, it also invigorates the mind; it imparts to the cold extremities of the dyspeptic the warm glow of health, and to the desponding mind of the hypochondriac, especially if combined with cheerful conversation, the buoyancy and elasticity of youth. Not a day should pass without a certain amount of exercise in the open air, be the weather of what sort it may. If cold, exercise will produce an agreeable warmth over the whole body; if wet, recourse must be had to waterproof clothing. A walk of four miles is the minimum amount of daily exercise which should be taken by every individual in a state of health.—“I consider it an indispensable law of longevity,” says Hufeland, “that one should exercise at least an hour every day in the open air. The most healthful time is before meals, or from three to four hours after.”

“By walking four miles,” says one, “I am so completely exhausted, as to be perfectly useless for the rest of the day. I return drenched with perspiration, and when I sit down I feel cold and shivering, so that, instead of receiving benefit, I am much worse for my pains and loss of time.” “I could never afford the loss of an hour a-day for exercise,” says another, “business, household or professional duties, must be attended to; besides, I have quite enough of exercise at these, so that I don’t require to take additional exercise.” “I have no inducement to walk,” says a third; “unless the mind go along with the body, exercise is of no use: it is the dulllest thing in the world to go out and walk for the sake of walking.”

To the first we answer—*take it by degrees*. Hercules old could never have carried the bull, had he not commenced his labour by carrying the calf: walk a mile daily

for the first week, two miles a-day for the second, three for the third, and so on. The limbs will thus become gradually invigorated and habituated to the exercise, and in the course of a few months an individual will not feel half so exhausted and fatigued by walking six miles at a stretch, as he would have previously done by a walk of a couple of miles. To any one possessed of the least knowledge of physiology, it will by no means appear strange that a small amount of a kind of exercise to which a person is unaccustomed should be followed by fatigue. A set of muscles is thus brought into play, the use of which has been in a manner lost by long disuse; and if this new action be continued for any length of time, the same effect will be produced as if these muscles had all received a strain more or less severe; the individual will feel for a few days as if he had been crushed under a heavy weight, from the effects of which he will take some time to recover. This is well exemplified in a person who betakes himself to manual labour quite unaccustomed to this sort of exercise; an hour’s hard digging in a garden, for instance, will make him feel the effects in his arms and body for several days. Why be surprised, then, that the limbs, &c., should at first suffer in the same manner in those unaccustomed to walking? *Exercise strengthens the body only by degrees.*

To the second objection we answer, that neither professional, friendly, nor business visits, nor household duties, can be called *exercise*, in the proper sense of the term. They are all more or less irksome and anxious; they are attended with fatigue and exhaustion of both body and mind, but totally wanting in that change of thought, change of scene, and exhilarating muscular action, which is derived from proper exercise in the open air. Besides, to spend the necessary time in exercise, is actually a *gain* instead of a *loss* of time. Although tolerable health may be enjoyed by some without exercise, the number of years in which a man can attend to business, by abstaining from exercise and confining himself too closely, is undoubtedly diminished. The bodily machine is fabricated to endure a certain amount of the “tear and wear” of life. If this machine be kept constantly going—if it be not kept in good repair—if the wheels be not oiled—it cannot be expected to last so long as it would do with proper care. *Exercise*, then, is the *oil* to the wheels by which the human mechanism is kept in good working order, by which undue friction is prevented, and by which the machine is enabled to run more smoothly, and to continue running for a much longer period.

To the last objection we would reply, that it is very true, that if the *mind* be left behind, and be engrossed in the duties and cares of the “world at home,” it is a useless waste of time for the body to walk. What enables the sportsman, unaccustomed to exercise, and habituated to ease and luxury, to rise with the sun, and undergo the most laborious exercise, without the least fatigue? What makes the great difference between the exercise enjoyed by a pleasant excursion in the country, and the labour undergone by a necessary and monotonous round of professional or business visits in town? What makes a child endure an amount of exercise at his plays, which would overpower him with fatigue by walking half the distance on a public road? It is *mind*, in which lies the great secret of beneficial exercise. Take a cheerful, intelligent, and congenial friend to accompany you in your exercise, or study some pleasing branch of natural science, as botany or mineralogy, and go and collect specimens; have some pleasant object in view by your walking, such as paying a visit to a friend at some distance; or, finally, if you can do no better, have your residence some way off from your place of business, so as to force you to walk: in short, every one ought to contrive by some means to interest and occupy the mind, so as to abstract it from the anxieties of business and the turmoils of life; and in our opinion this can be best accomplished by the choice of a suitable companion in our walks—for man is a social animal.

The last remark we have to make on this subject is, that unless the weather be very cold, or the individual very weak,

no one ought to put on additional clothing before setting out; indeed, fewer clothes should be worn, to make walking exercise fulfil the end intended, than is necessary in-doors; and, above all, every one ought to be free and untrammelled by tight dress (such as tight stays, tight shoes, and all other abominations), and the animal temperature should be kept up by as brisk walking as the individual can endure without injury—for, to *saunter along* is no exercise.

Fourthly. Over-exertion of the mind and of the body is the only remaining cause of disease which we have to notice, as affecting individuals of particular professions and trades. It is well known to physicians, that an excess of mental exercise is a much more powerful cause of disease than over-exertion of the body; that literary men, and all who indulge in too severe study, are subject to melancholy or hypochondriasis, paralysis, apoplexy, inflammation of the brain and its membranes, mania or softening of the brain. No doubt the causes to which we have already alluded—want of exercise in the open air, exposure to the impure atmosphere of their apartments, and the constrained position of their bodies—contribute their share to the production of the evil; but over-exertion of the brain, producing a determination of blood to the head, is the chief cause. To all these causes put together, may be ascribed the ruined constitution or the death of many a promising student, who, aspiring with ardent zeal to academical or literary distinction, wastes his bodily and his mental energies over the midnight lamp, and blasts the hopes of fond friends and admiring companions. We can, in the same way, account for the melancholy wrecks which now and then occur of the finest and most powerful minds that ever adorned the literature of a country; the cords of the intellect, from long-continued over-stretching, become paralysed—in a fatal hour the tension is increased—they burst asunder, never to be reunited!

Over-exertion of the body is productive of disease among labourers and certain classes of tradesmen, such as porters, coal-heavers, draymen, blacksmiths, miners, &c.; and it tends very much not only to shorten life, by gradually exhausting all the vital powers, but may immediately give rise to hernia or rupture, disease of the heart and blood-vessels, spitting and vomiting of blood, bleeding from the nose, sprains, &c.; and, if the bodily strength be not kept up to the maximum of vigour by a sufficient supply of good nourishing food, the bad effects arising from this cause will, of course, be proportionally increased. Over-exertion of any particular part of the body, independently of its injurious action on the general frame, is certain, sooner or later, to produce disease in that part. For example, over-exertion of the vocal organs, as in the case of singers or public speakers, gives rise to disease of these organs, and of the windpipe, lungs, and heart. Engravers, watchmakers, embroiderers, painters, tailors, workers at iron forges and furnaces, &c., are all liable, from over-exertion of the eyes, to short-sightedness, inflammation of some of the structures of the eye-ball, and even total loss of sight.

Some workmen, again, are obliged, from the peculiar nature of their occupation, to keep their bodies in a confined position, as tailors and shoemakers, and particularly miners and colliers, who are, moreover, much excluded from light and air; they are, consequently, from defective nutrition, generally spare men, with curvature of the spine and bow-legs; they have a sallow and unhealthy complexion, and seldom live beyond middle age. By proper attention, however, to the great laws of health—sufficient exercise in the open air, great personal cleanliness, nourishing diet, temperance, the careful ventilation of their workshops, &c.—most of these bad effects are capable of being greatly mitigated, if not completely removed.

Thus we see that the very means by which millions of our fellow-creatures are obliged to earn their daily bread, are so many causes of disease—that the cup which contains the balm of life, also conveys the secret poison—contributing to shorten the natural period of man's existence, and to fill even that diminished period with misery and pain! How is this? Is it a sin for a man to be poor, and to be obliged to

adopt a trade or a profession with which health, happiness, and long life are incompatible? And is he, for this poverty, to be punished with misery, suffering, and affliction, for no fault of his own, but for a condition of life in which Providence has placed him? And is the millionaire, who inherits the wealthy possessions of his ancestors, to enjoy, without any merit on his part, those blessings of health and happiness, and that freedom from bodily pain and mental sorrow, which is denied to his poorer brother? Repine not, nor mourn thy lot, thou son of toil! That share of pain and misery and sorrow, which is allotted to man in this world, neither arises from his trade, nor from his profession, nor from any external circumstances over which he has no control. Man's happiness by no means depends on his amount of worldly possessions—the peasant may be happier than the prince—an increase of wealth is generally accompanied with an increase of care, annoyance, and vexation. Do not suppose that the occupants of yonder carriage, which rolls along attended by a retinue of servants in livery, are any happier than that humble pedestrian who must run out of their way to save himself from being ridden over. True happiness is neither to be found in carriages, nor in lands, nor in wealthy possessions, nor in a retinue of servants, nor in stores of gold; but is alone to be found in a *contented mind, conscious of rectitude, at peace with its God, with itself, and with the world.* The experience of thirty centuries proves that Solomon's golden mean—"neither poverty nor riches"—is the most compatible with, and the most conducive to, *this heaven upon earth.* It is in perfect accordance with the experience and observation of philosophers in every age and country, that the happiest condition of life is that in which both body and mind *must* be rationally occupied for a certain number of hours every day. Does the professional man, the mercantile man, or the tradesman, amass or acquire wealth sufficient to enable him to retire from the duties of active life, to spend the rest of his days apart from the turmoil and troubles of his profession, and to live in comfort, happiness, and ease, in the bosom of his family, in some choice and secluded rural locality? Is such an individual happier than when his mind was absorbed in business? If he choose to expose the state of his feelings, and (unless he have merely exchanged his former profession for some other rational employment which equally occupies his thoughts) if you gain his confidence, he will tell you that he has recourse to all sorts of expedients to kill time, but that still it hangs heavy on his hands—that from morning to night, and from night to morning, he is *dying with the disease of having nothing to do.*

The man of wealth—the idle man—the man of no profession—is exposed to innumerable temptations, to which the poor man, the professional man, and the tradesman are complete strangers. He is either afflicted with the cares, the anxieties, and the vexations which are almost the invariable concomitants of wealth; or, unless he be possessed of a refined and cultivated intellect, he is led to indulge in the frivolities, the vanities, the extravagances, and the debaucheries of fashionable life. Such an individual is compelled to adopt every kind of foolish substitute for rational employment; to resort to hunting, fishing, attending theatres, club-houses, assemblies; and—if a female of religious habits—to an endless round of prayer-meetings, in the vain attempt to participate in that pleasurable exercise and excitement of the body and mind, which the professional man and the labourer enjoy at their special avocations. The wealthy man is not even happy in his friendships, for he rarely discriminates between the flattering parasite and the man of sterling merit.

Mark the contrast between the above picture and the case of the professional man, the artisan, or the labourer, whose hours must be rationally occupied to enable him to support himself and his family, and whose spare hours will be devoted to his bodily and mental improvement: his time does not hang heavy on his hands—he feels no *ennui*—labour is to him a blessing; and although he may occasionally meet with annoyances connected with his business or his profession, he will rise above all such petty vexations—he will

look on the bright side of human nature; and, if misfortune overtake him, he will have the satisfaction to think that it has arisen from no fault of his own, but is merely one of the contingencies of life. If the world treat him with ingratitude, with coldness, and with neglect, he will enjoy the sweet consolation that his friends "*at home*" will never look cold: in prosperity, in adversity—in grief or gladness—in pleasure or pain—they will always share his feelings: no duplicity there; no hypocrisy, no affectation; but every look, every thought, every word, is the genuine expression of heartfelt affection. The friendship he experiences cannot be assumed for a purpose, for his friends can have no object to serve by making false pretences; they can gain nothing but a return of that true friendship which is far more sterling than gold.

In fine, the working man obeys that great law of nature, which commands him to "eat his bread by the sweat of his brow;" and, unless he break other laws equally binding, his reward shall be, health and happiness for the term of his natural life. His enjoyments are rational; those of the idle man irrational. The labour of the former, if not too severe, invigorates both his body and mind; the excesses of the latter, exhaust his vital energies and debase his intellect. Upon the labours of the former depend not only his own comfort and support, but the wealth and prosperity of a nation; while the latter contributes more, by the influence of bad example and other failings, to retard than advance both national prosperity and the civilization of mankind.

DIAL OF THE SEASONS.

CHAPTER II.

A DAY—THE DIURNAL REVOLUTION OF THE EARTH ON ITS AXIS.

We are living upon the earth, one of the eleven planets which revolve round our sun. Although the earth is very small in comparison with some others of the planets, being, as we have noticed in the preceding chapter, only $\frac{1}{1100}$ of the bulk of Jupiter, and is such a mere speck in comparison with the spaces of the solar system, as to be receiving only about one twenty-two hundred and fifty-six millionth of the whole sun's light; yet, compared with our feeble means of observing and exploring it, it is an orb of immense magnitude, whose parts have not yet been entirely explored, and whose varied productions seem almost infinite, so as to afford a field of investigation exhaustless to human industry. Even if, for the sake of better observation, an observer direct his especial attention to one department of nature—vegetation for instance—he could expect, during a long life, to see but a part of the variety of trees, and plants, and flowers, and mosses, which flourish in all parts of the earth.

Our notions of distance and extent are gradually acquired. The streets of a town, the fields of our father's farm, the adjoining farms, the encircling hills of our native valley, are the world which dawns upon childhood. The path to the school-house, or to a neighbour's, is perhaps the first geographical acquisition. A ride of a few miles, a day's journey, maps, books, numbers, aid in forming our earliest impressions of extent and distance. On maps, the position of our home is pointed out to us, and the divisions, rivers, and outlines of our own country. At length we begin to notice, in connection, the positions of countries and continents, and to form some idea of the globe itself. The present chapter is designed to aid us in forming a mental picture of the extent, and of the diurnal motion of the earth.

The earth is a globe about twenty-five thousand miles in circumference. One half of it is always in sunlight, the other half is not in sunlight, but in starlight. All parts of it are in starlight, but those persons who are in the sunlight do not see

the stars. It is only when that part of the earth on which we are, turns into its own shadow that we can see the stars. But they are always there, and shining in the daytime, though the strong light of the sun obscures them to our vision.

The sunlight is falling vertically from the zenith but at one place, or, as mathematicians would say, one point. From this point it falls more and more obliquely on all sides till you approach the edge, where it is horizontal.

At the distance of about six thousand miles, one-fourth of the earth's circumference from the vertical point west, the sun is rising; six thousand east, the sun is setting. Also, six thousand miles north or south from this vertical ray, the sunlight is falling parallel with the earth's surface, both in the Arctic and Antarctic latitudes.

The angle at which the sunlight is falling, is the primary cause of the seasons and climates in all their varieties and vicissitudes. Its more vertical rays are constantly maintaining the glowing splendour, the exuberant vegetation, and the swarming life of the tropics, while its oblique rays are diffusing a feeble fading light on the dreary and frozen regions of the poles.

Our position at London is such, that about 3,580 miles south of us is the equator, which is the centre of the sun's influence midway between the cold poles. A similar distance north of us takes us far beyond all human habitations, and beyond all animal and vegetable life, far upon the polar ice. Our latitude is on the middle ground between the extreme heat of the vertical sun, which is always existing south of us, and the extreme cold which is present at the north. South of us, towards the equator, the forests are characterized by several hundred species of palm-trees, on which are at all times nestling thousands of species of birds of brilliant plumage. Around us are the oak-tree forests, and the scenery of the temperate latitudes. North of us are the fir-trees, the reindeer, and the Esquimaux; and beyond these, deserts of unexplored and unexplorable ice.

Every one has heard of the earth's turning round on its axis every day. The fact is universally admitted, but very few persons have an adequate idea of so vast a truth.

The earth, as it rolls round from west to east, is continually sweeping its eastern landscapes into the sunlight, while its western landscapes are proportionally receding into sunset and shadow. Thus an eternal evening and an eternal morning are perpetually present.

For the purpose of illustrating in some degree the extent, scenery, and daily motion of our earth, I shall ask you carefully to follow a very simple narrative of my own course of thought as it actually occurred.

It was the evening of a delightful midsummer day. Before me was an American landscape, familiar to my childhood's recollections.

The sun's last effulgence was lighting in tints of gold and purple the western horizon, when this simple reflection occurred to me:—He is leaving our hemisphere in darkness, but his bright rays are at this moment dawning on the other side of the earth, and illumining the landscapes of the eastern continent; the bland light of morning is breaking on the mosques of the Ottoman; the worshippers of Allah, the devotees of Mahomet, are performing their orisons; the Arabian herdsman and the Persian caravan-driver are hailing in prostrate reverence his rising beams, in worship to the god of their fathers; at this moment he is shining in meridian splendour on the vast expanse of the Pacific ocean; yet at this same moment the inhabitants of Europe are buried in the unconscious slumbers of midnight. While on this side of our revolving planet, the shadows of evening are inviting us to repose; on the opposite side the blessed light of morning is breaking the slumbers of all nature, refreshed for the renewed enjoyment of existence. Thus, morning and evening are perpetually present, and chasing each other over earth and ocean, with the astonishing velocity of a thousand miles an hour, and completing the earth's circumference in what we call a day, or in each complete revolution of the planet on its axis.

Let us gaze for a moment on the setting sun. Let us now imagine ourselves to be elevated a short convenient distance

been a domesticated animal. Of British sheep, we may enumerate—

a The Shetland Sheep.—This is a very small animal, half-wild in its habits, and yielding a fleece of very fine and soft wool, which, however, contains a considerable admixture of hair. The wool is much used for making flannels and hose, for wearing next the skin.

b The Welsh Sheep.—Welsh sheep are small, very hardy, semi-wild animals. Their wool is considered particularly suitable for making flannels, and their mutton constitutes one of the finest varieties that we possess.

c The Blackfaced Scotch.—This is a small breed, not exceeding, perhaps, fifteen or sixteen pounds to the quarter. But of all sheep, its mutton is the most delicate. There is, however, an opinion, perhaps not well founded, that blackfaced mutton is not good until the animal to which it appertained is three, five, or even six years old. The fleece weighs about three pounds, and is not in request.

d The Cheviot Sheep.—This is a northern mountain breed, in much estimation, and the members of which are considered to excel the last mentioned, in being earlier ready for the butcher, in their larger size, in the superior fineness of the wool, and in being, in virtue of having their instincts more highly developed, more easily managed in wild pastoral districts.

e The Southdown Sheep.—This breed, one of the best that we have, was originally produced upon the Suffolk-downs; but it has succeeded, and been liked, wherever it has been introduced. These Southdown sheep are distinguished by their docility, their excellent mutton, which weighs nearly twenty pounds a quarter, and their wool, which is in great estimation.

f The Leicester Sheep.—This is an entirely artificial breed, produced in comparatively modern times. Of all sheep, the members composing it become fit for the butcher in the shortest time. At fifteen months old, a Leicester sheep will weigh from 25 to 30 lbs. the quarter; and its fleece at that age will amount to six or seven lbs. It is, however, tender in its constitution, and of late its mutton has not fetched so good a price as that of the other kinds mentioned above.

2. Ox.—The cattle at Hamilton Park, and at Lord Tankerville's, are believed to be the descendants of the, or at any rate an, ancient wild indigenous race of cattle. Of the many varieties now known in the British islands, we may mention—

a The Shetland Ox.—This breed is of Scandinavian origin, and was probably introduced into the Shetland islands when they were under the rule of the Norwegians. Shetland oxen are very small, and remarkably ill-proportioned, yet their flesh is, perhaps, the finest of any, and many of the cows are good milkers. They are extremely hardy. We have noticed some in our own possession, however, to be extremely nice about their food, and to reject, or eat but sparingly, both turnips and cabbages, which were apparently much relished by the other cows in the same byre.

b The Alderney Ox.—This breed is probably identical with the previous one. Its increased size is, perhaps, to be attributed to its having inhabited, for so many centuries, the fertile Channel islands. It has the want of symmetry characteristic of its Scandinavian origin. The milk of the Alderney cow is particularly rich in cream, and hence this kind of cow is much kept by private families. It is to this reason, probably, that we must ascribe the fact, that Alderney cows almost invariably sell for more than their real value.

c The West Highland Ox.—This is the breed found to answer best in the gneiss districts of the West Highlands. The members of it are small, with horns turning upwards at the points, the muzzle is black, they have short legs, are profusely covered with hair, usually of a black, but also of a brown colour, and they have a very distinct mane. The cows are extremely bad milkers, but the beef of this breed is in very high repute.

d The Welsh Ox.—This is another small breed, very analogous to the foregoing, and found to answer well over the Silurian system of Wales. Their flesh is in great esteem, and the cows are better milkers than the West Highlanders.

e The Polled Angus Ox.—This is a breed inhabiting the fer-

tile red sandstone of Forfar. It is not easy to determine its origin; but by living many generations in this rich country, it has become a large and much-esteemed kind. As its name indicates, the Angus ox is without horns. Although the Angus is essentially a beef-producing animal, and valued as such, the females are very good milkers.

f The Galloway Ox.—This is the kind that seems to be adapted for living over graywacke. It is a hornless breed, the members of which are generally black in colour, with long hair, suited to the humidity of the climate, and attain a pretty considerable weight. The carcass is known in the London meat markets by the great length of its sides, and the "Galloway rib," as it is called, is a favourite. The cows are bad milkers.

g The Polled Aberdeenshire Ox.—This variety belongs to the same subdivision as the two previous ones, all of which are, perhaps, descended from a common stock. But the properties that are adapted to a granite country are developed in it. Members of it are not usually fat until four years of age, and are much liked in the London and other English markets.

h The Suffolk Ox.—This is a hornless variety. The members of it are long in reaching maturity, and take a much longer period to become ripe fat than any of the three previous ones. Consequently, for the purpose of the farmer fattening cattle, they are next to useless. But the quantity of milk the females yield is very great, and for dairy purposes they are justly esteemed.

i The Ayrshire Ox.—This breed has been produced in comparatively recent times, is of medium size, is rarely kept as a fattening stock, the young he-calves being sold for veal. The cows are remarkable for their milk-yielding qualities. When examining the animals of this variety, it is easy to trace a strong resemblance to those of the Alderney breed, from some members of which they are, in all probability, partially or entirely descended.

k The Devon Ox.—This, or, to speak more accurately, the North Devon (for, in the higher parts of the country, a breed resembling the Welsh is found), is a variety held in very great estimation in England. Females belonging to it are indeed very bad milch cows, and the ox does not fatten well, even with superior food, and a somewhat favourable climate; but the docility and strength of the latter particularly qualify them for being used as beasts of burden. As there is a possibility of this kind of oxen being more or less adapted in districts where hitherto horses only have been employed to do farm labour, this breed claims particular attention. The members of it are of a deep blood-red colour.

l The Herefordshire Ox.—This is a large breed, much esteemed by the graziers in Herefordshire. The cows are indifferent milkers.

m The Long-horned Ox.—This is an artificial variety, produced by the famous Bakewell of Dishley, who likewise produced the Leicester sheep. Upon what principles he acted is not known, inasmuch as all his operations were conducted with profound secrecy. His object was to raise a breed with as little superfluous offal and bone as possible, and with the greatest attainable facility of laying on fat. He succeeded in part but too well, for animals of his long-horned breed deposited so much fat underneath the skin, and mixed so little with the muscles, that people got tired of them, just as they are now beginning to get tired of the very fat Leicester sheep. And the once famous long-horned cattle of Dishley are now almost extinct.

n The Short-horned Ox.—This is another artificial breed, produced by Messrs. Colling, principally out of the old Teeswater. Of all oxen, the short-horned fatten earliest; and as, in addition to this, the cows are pretty good milkers, they are esteemed the best breed of any for general purposes and general localities, and are very extensively used, both pure, and for the purpose of crossing with some one of the above-mentioned breeds.

FIG.—The prolific nature of the pig, the early age at which it may be fattened, the small proportion of offal, and the wide variety of food that it can subsist upon, are very great recom-

mendations. Too often the pig is only regarded by the farmer as a consumer of waste matter; but there can be no doubt that, under suitable management, pigs may be made to pay very well, either fed upon the produce of the farm, or upon purchased food. A good many varieties of the pig exist. We may enumerate—

a The Old English Pig.—This is known by its long pendulous ears and its large size. It is long of coming to maturity, but attains a great weight. It is generally white, or white spotted with black. The sow is remarkably prolific. This is the breed that used to exist in Ireland.

b The Western Highland Pig.—This variety is little known, and, perhaps, little appreciated. It is a very small animal, with pendulous ears, of a dusky-brown colour, and is furnished with a great many bristles along the neck and spine. It is remarkably hardy, and indeed generally gets leave to find its own food.

c The Chinese Pig.—This is a small, short, and erect-eared, short-legged, hollow-backed animal, not prolific, and not hardy, but coming to maturity at a very early age. The tenderness of Chinese pigs disqualifies them for this country; but they produce a most excellent cross with the old English pig.

d The Neapolitan Pig.—This a small black-coloured pig, not hardy, and not prolific, but coming very early to maturity. Hence it has been much used in this country for crossing with the old English.

e The Berkshire Pig.—This is an improved variety of the old English, apparently crossed by the wild boar, and held in great estimation.

Other breeds of pigs are known by different names in different parts of the country; but they are all probably crosses between improved varieties of the true old English and either Chinese or Neapolitan.

POULTRY.—1. *Fowls.*—We may enumerate the barnyard, the Dorking, the Poland, the Malay, and the black Spanish.

2. *Turkeys.*—There are two kinds—one dark-coloured, and the other light-coloured.

3. *Ducks.*—There is a dark-coloured, but small breed; a white, which is larger; and the Muscovy.

In practice, at least in this country, there can scarcely be said to exist more than one kind of geese, Guinea-fowls, or peacocks.

DOMESTIC MEDICINE.

CHAPTER VII.

ON THE CAUSES, THE PREVENTION, AND THE DOMESTIC TREATMENT OF THE DISEASES OF INFANCY.

A FEMALE, on acquiring possession of any rare and beautiful greenhouse plant, if she values her acquisition, and is at all interested in its health and preservation, is sure to make the most careful and minute inquiry at a gardener or florist, qualified to give the necessary advice, regarding the proper treatment required to preserve it in health, beauty, and vigour. She will ask how often it ought to be watered, how much heat and how much air is necessary, when it will need shifting into a larger flower-pot, what sort of soil is required for its healthy nutriment, and how the treatment must be varied for the different seasons—for summer, winter, &c. Nor, whenever she perceives her favourite plant beginning to droop, to part with its leaves, or in any way to assume an unhealthy appearance, will she rest satisfied with the advice of her first female visitor regarding the proper treatment for its restoration; if she has common sense, and if she values the life and health of her plant, nothing less than the professional skill of a properly qualified florist will secure her confidence; he alone it is who must know the cause of the ailment, and he alone, therefore, is capable of removing the evil, and of placing the plant in a position favourable for the recovery of its health, and for the restoration of its former beauty and bloom. Our female's lady-friends and old-women visitors pride themselves on their skill and experience in tending and treating their

own greenhouse plants, and in the present instance are quite offended because their eagerly proffered advice is disregarded; but she very well knows that *their* plants are of that hardy and common sort which require very little attention or treatment; that the rare and delicate plants which have come into their possession have invariably become diseased, and most of them have died, all through ignorance and mismanagement; and that it is only those whose hardy constitutions enable them to live and thrive in spite of bad treatment, that ever arrive at maturity and continue in health.

The rarest, the most valuable, and the most beautiful plants have almost invariably the most tender and delicate constitutions when young, and are consequently the most difficult to rear; and the constitution of every individual species of plant is different from that of another species, requiring different soil for its food, a different amount of water, of heat, of air, &c.; and if our supposed female be a sensible and well-educated person, she will know that an individual uninstructed in floral science, ignorant of vegetable physiology, cannot, by any amount of experience, prescribe the proper treatment for each member of all the innumerable species of plants, from a knowledge of the different causes of disease to which each one is exposed; she will, therefore, very properly consign the care of her plant to the judgment and skill of a man who has made floral science the study of his life, and who can preserve, in luxuriant health and beauty, plants of the most different species, and of the most tender and opposite constitutions.

In the above instance, we have given a female credit for possessing an amount of common sense sufficient to point out the course she ought to pursue in regard to the management and treatment of a delicate greenhouse plant; but how rarely does it happen that common sense is sufficiently strong to cause the adoption of the same proper and praiseworthy course, when a female becomes possessed of a *certain plant* of a much more complex structure, vastly more difficult to understand, infinitely more tender, more liable to disease, to decay, to become stunted, and otherwise to suffer, and often to die, from mismanagement—we mean a human being!

No sooner is an infant born into the world than it is consigned to the care, in most instances, of some ignorant, and, on that account, conceited old woman, who knows no more of its proper treatment—who indeed treats it much more irrationally—than the most illiterate savage. Her experience, instead of being based on sound principles, has been derived from the absurd, barbarous, and mischievous practices of her ancestors, who considered themselves skilful managers of infants if they could bring to maturity three out of every ten—setting down the deaths of the other seven, with the utmost complacency, not to their own mismanagement, but to the inscrutable decrees of Providence!

Most people follow the dictates of nature and reason in their treatment of the young of the lower animals, from the fact that, in this instance, their religious opinions do not blind their common sense, and prevent them from availing themselves of experience and observation. Farmers, for example, carefully avoid giving their calves, their lambs, or their sucking pigs, any solid food till they arrive at a certain age, well knowing that disease, and generally death, result from the use of any other food than milk, the sole sustenance provided by nature for the young of all the mammalia. But it is not enough that a human being, generally a few minutes after birth, tells in the plainest language, by sucking instinctively at everything which is brought near its mouth, that it ought to be applied to the breast without delay;—it is not enough that the mother's breasts become turgid, painful, and frequently inflame and suppurate, from delaying the application of the child;—nor is it enough that almost every one is aware that the young of all animals whose food is milk, must be fed upon milk, and upon milk *alone*, for a certain period after birth,—in many parts of Britain the mothers and nurses of children are *still* so ignorant, so prejudiced, so misled by conceited old women, and so inattentive to proper medical advice, that, instead of applying the child to the breast a few hours after birth, as they ought to do, they persist in having it fed

for a day, for two days, and in some instances even longer, with bread, biscuit, or oatmeal, soaked or boiled in milk or water. And even after the child is applied to its mother's breast, these model-managers of infancy display an amount of ignorance scarcely credible, in not being satisfied with the abundant supply of that rich and nutritious food which a wise Providence has provided as the child's sole and sufficient support; they cannot be made to understand and to believe that milk—the most nutritious food in nature—is food at all; they look upon it, because it is liquid, as nothing but drink, and little better than cold water! They therefore continue giving their pap, their oatmeal gruel or pottage, although the mother's breasts are so full to overflowing that the child cannot sufficiently empty and relieve their turgidity; so that, if the milk does not run out of itself, it must be drawn off for the comfort and safety of the mother!

The consequences of such mismanagement are very soon apparent to the eye of the most superficial observer. Both the mother and child suffer. The secretion of milk, from not being thoroughly drained off, becomes diminished in quantity, and from the health of the mother being affected by its reabsorption into her system, it becomes deteriorated in quality.

The pernicious effect of such a state of things on the health of the infant, can neither be overstated nor painted in too strong colours. The very structure, size, and form of the child's stomach at this early stage of its existence, show clearly that it was never intended to contain a particle of solid food, much less to digest it. As soon as the child is fed with solid food, or anything else hurtful to its delicate and sensitive stomach, it either rejects such food by vomiting, if the stomach is strong enough to expel its obnoxious contents, or it sinks into an overpowering and unrefreshing sleep, during the continuance of which it often starts from evident pain. So well aware are many mothers and nurses of the soporific effect of solid food, that when their children are irritable and restless, annoyed with pain in the bowels, &c.—suffering from the effects of previous mismanagement—they frequently fill their stomachs with such food, for the purpose of quieting the little sufferer, of producing temporary sleep, and of ridding themselves for a time of their troublesome charge—thus aggravating the evil, and laying the sure foundation of diseases which will either hurry the victim to a premature grave, or, what is even a greater calamity, will render a prolonged life miserable.

The effect of either solid food, of improper liquid food, or even of the deteriorated milk of the mother upon the stomach of the infant, is first to produce costiveness, flatulence in the stomach and bowels, and consequent pain and griping; by-and-by the tongue becomes covered with a whitish fur, to which thirst, heat of skin, restlessness, and other symptoms of a feverish state of the system supervene; and if such improper management be persevered in without having recourse to remedies, the child will pine away and die. More frequently, however, castor-oil, manna, rhubarb, calomel, or some other medicine, is stuffed down the infant's throat soon after its health begins to be affected by the mismanagement to which it is subjected; this probably relieves it for the time, but by persevering in such a course of treatment—continuing the improper food, administering laxatives, purgatives, Godfrey's cordial, Dalby's carminative, or some other equally noxious stuff, by turns—six children out of every ten are literally killed during the first year of their existence; and in the constitutions of most of those who survive this period, the foundation of scrofula, of indigestion, of disease of the lungs or of the brain is laid, and when the seeds of these diseases are once sown, they are ever ready, on the application of any exciting cause, to start into the full vigour of active disease; so that a comparatively small proportion of mankind arrive at mature age. The correctness of this statement regarding the high mortality of children in towns, is abundantly proved by the "Registrar-General's Returns." In the country, and even in the less crowded, more cleanly, and airy parts of towns, the infant constitution is better able to resist the pernicious influences of mismanagement than in the close,

filthy, and densely-populated parts of cities. A perusal of the "Annual Reports" of the Registrar-General for England and Wales places the fact in a very strong light, that the ratio of infant mortality is in exact proportion to the impurity of the air which the child breathes, to the want of proper cleanliness and out-door exercise, to improper food and clothing, and to several other circumstances, all of which operate directly and indirectly on the infant constitution. They operate directly, by actual exposure to these different causes of disease; and indirectly, through the influence of the mother's milk. It is well known to every medical practitioner, that want of sufficient exercise in the open air, improper food, breathing a close and impure atmosphere, dirty habits, &c., have so powerful an effect in diminishing the quantity, but more particularly in deteriorating the quality, of the human milk, as to be no less surprising than unaccountable to non-professional persons. How then can the health of a child be maintained, its growth matured, and its constitution invigorated by an insufficient supply of food, and that food also of bad quality? As well might we expect to fatten a bullock on stunted heath, as to expect to rear a strong and healthy human being on food derived from a vitiated source.

The age of infancy may be divided into two epochs:—

The first epoch includes the period of suckling, or that in which the child is fed at the breast of the mother.

The second epoch includes the period from the weaning of the child to the completion of the first dentition.

FIRST EPOCH.—The period during which the child is fed at the mother's breast is one of the most important, if not the most important of its whole existence, in so far as the future health of the infant depends more upon its management in this epoch than in any other of the same duration. During this period, the fate of the child as to its prolonged existence, the strength or weakness of its constitution, its predisposition to disease, and even as to the term of its natural life, is generally sealed. On its treatment during this period will depend either the liability of the infant to become a prey to the first severe attack of illness, induced by mismanagement, teething, exposure to cold, or any common epidemic; or it will acquire, by proper management, the power of resisting all these causes of disease, and sufficient strength of constitution to enable it to complete the full development of its bodily faculties; it will enter on the second epoch—the period of dentition—with comparatively little to fear, and will become the fat, plump, happy-tempered, and rosy-looking little cherub, whose round, dimpled, smiling face is a pleasure to behold.

GENERAL MANAGEMENT OF FIRST EPOCH.—*Food.*—During the first four or five months of infant life, the stomach, as above stated, is totally unfitted for digesting any sort of food whatever but the mother's milk. So much is this the case, and so inappropriate for the healthy nourishment of the child is even the milk of animals, the quality of which most nearly resembles human milk, that scarcely one child in seven who is necessarily deprived of its natural food—the mother's milk—during this period, ever arrives at an advanced age; and probably four of that seven die in infancy. No child, then, for whose life and health we have the least regard, ought to receive one particle of food for the first four or five months of its life at least, except what it derives from the mother's breast, or, failing that, from a proper milk-nurse. By a wise provision of Providence, who evidently intended the lengthened dependence of the child upon the mother to be the means of cultivating and maturing both the parental and filial affections, healthy human milk contains the whole of the ingredients necessary for the growth and full development of all the bodily tissues and organs up to a certain period of the infant's life. At the end of this period, not only has the stomach acquired the power of digesting other food, but additional means are provided, by the growth of teeth, for chewing and preparing that food for digestion and healthy nutriment.

The above remarks are made on the supposition that the mother, or, failing her, the nurse, has a sufficient supply of milk for the child, as otherwise recourse must be had to some auxiliary; and, according to the dictates of reason and expe-

rience, this auxiliary ought to be the nearest possible in its nature and quality to the mother's milk. Asses' milk is the nearest in chemical composition to human; but good freshly-drawn cow's milk, with the addition of about one-sixth part of warm water, and a very small quantity of sugar, is the most easily procured, and perhaps as good as any.

It is of the utmost consequence, for the health and growth of the child, to feed it at the breast *only* at fixed and regular intervals from the very first. As soon as the child fills its stomach, and is raised up to enable it to expel the air which has been carried into the stomach along with the milk, it should go to sleep, and it ought not to be fed again in less than *three* hours. The usual plan is to apply the child to the breast as often as the mother's time and convenience will allow—observing no regular periods for feeding—and particularly to stuff the nipple into the infant's mouth whenever it cries, or is at all difficult to manage, although probably an interval of five minutes has not elapsed since the previous application. The consequences of this mode of treatment are, that before the digestion of the first stomachful of milk is nearly completed a second is poured in, then a third, a fourth, and so on; so that the stomach is kept constantly at work; it has no time to recover from the fatigue of digestion, and to rest; it soon, therefore, becomes overworked and weakened, and by-and-by refuses to digest at all; the child is then often and greatly pained by the griping caused by the flatulence or wind in the stomach which arises from the undigested food. It by-and-by becomes feverish, and sucks from thirst, and not from natural hunger: matters have now arrived at such a pitch, that unless the infant get a dose or two of laxative medicine it will very likely pine away and die; whereas, had it been properly managed—had it been fed at the regular and necessary intervals, and, when griping, furred tongue, and other symptoms of disordered stomach pointed out that the food is given either in improper quantity or quality, or at improper times—had its supply of milk been restricted, and had it been allowed a little cold water or barley water to drink,—we would hear of fewer drugs and nostrums for children's maladies, and of far fewer diseases and deaths in infancy and childhood.

Clothing.—It has been proved by experiment, that the bodily temperature of man, as well as of all the inferior animals, is much more easily reduced in the young than in those of mature age. A few hours' exposure would kill an infant, when no bad effect would be produced in a youth of ten or twelve. Young children, then, ought to be well protected by clothing, at least in a climate subject to such vicissitudes as that of Britain; they certainly ought not to be overloaded with clothes—a habit well known to be most pernicious and weakening both in young and grown-up persons—but their clothing ought to combine *warmth* with *lightness*, to consist chiefly of fine flannel, and especially to cover all parts of the body equally. The fashionable mode of dressing infants, and which many think on that account the best, is most pernicious and absurd. The upper part of the chest—the spot where the seeds of consumption first commence their ravages—is left nearly naked, while two or three yards of flannel are dangling uselessly far beyond the feet. Infants are very liable to inflammation of the lungs, arising from exposure to cold and insufficient clothing; it is often during the period of infancy also, that the germ of consumption is first laid in the constitution, to lurk there, ready to bud forth into fatal activity on the occurrence of a sufficiently powerful exciting cause: children, therefore, ought to have all parts of the body properly protected from the influence of cold. Although the practice is fortunately dying away, yet in many parts of Britain the head is still too much covered up, encouraging an undue determination of blood to that part; so that, when any other special cause is in operation, such as teething, &c., it is apt to produce inflammation of the brain and its membranes, ending in the disease popularly termed “water in the head.”

A discrepancy of opinion exists with regard to the propriety of children wearing flannel next the skin; but there can be no doubt that, by the healthy amount of friction which it produces, causing a determination of blood to the

skin, and thus relieving the internal organs—by its absorbing the sensible perspiration and all other moisture from the surface of the body—and by its agreeable warmth, flannel ought to be worn next the skin.*

Cleanliness.—For the sake of cleanliness, and to promote the healthy action of the skin, every infant ought to have its whole body sponged with soap and water twice every day—in the morning, at first with lukewarm water, gradually reducing the temperature as the age advances, till the child has sufficient strength to bear it cold; and at night with tepid water, without reducing the temperature. The operation of sponging should be performed in a warm room, as expeditiously as possible, after which the child should be dried quickly, and then well rubbed over with a coarse towel or a soft fleshglove, followed by friction over all the body with the palm of the hand. Nothing can be more beneficial for the health, and bracing for the constitution, than cold sponging in the morning, if quickly and properly done, and if it is succeeded by sufficient friction to produce reaction. The great object is to give the body such a sudden shock of cold as to be followed by a perceptible warm glow of heat, from the rapid determination of blood to the external surface of the body. By this means an equal distribution of blood over the whole frame is maintained, and inflammations of internal organs, consumption, colds, &c., are thereby prevented.

Sleep.—The hour of going to sleep should be as regular and fixed as the hour of giving the breast. The children of the poor, who are, and in some cases must be, irregularly fed, and made to sleep a great deal too much, labour under very great disadvantages. The mother has her work to do, and if there are other children, she has them also to attend to; she has therefore the greatest difficulty, even were she so inclined, in fixing regular hours for feeding her infant and putting it to sleep. A great deal, however, might be done even by the very poorest, if they could be made to understand the urgent necessity of adhering to fixed rules; and were they to begin, from the very birth of the infant, by feeding it and putting it to sleep at regular intervals of three hours, they would soon find not only that their *time* would be greatly economised, but that their own comfort and that of their children would be materially increased.

Every mother ought to have her attention pressingly called to the fact, that irregularity in feeding her infant and putting it to sleep very soon brings on indigestion, griping in the bowels, wasting of body, fretfulness of disposition, and, in short, all the diseases incident to children, in a markedly aggravated form.

Air and Exercise.—Unless it is wished to make human beings resemble hothouse plants, to have them blanched, drawn up, and fragile, and to have the age of decrepitude brought on at a time when they should be still in the prime and vigour of life, children ought not only to have dry, well-aired, and, if possible, large and lofty rooms for nurseries, but they should also, at a very early age, be gradually inured to bear the cold air out of doors. The larger, more cool, and better aired the nursery, the less will be the risk of the child suffering from exposure to cold, the stronger will be the constitution, and the less subject to those diseases which arise from the effects of cold. An infant ought to be accustomed to the open air from the age of two, three, or four weeks, according to the constitution of the child and the season of the year; at first only for a few minutes, but, unless the weather be very bad, it ought to be well wrapped up, and carried out for a short time every day, as much to benefit by the benign influence of the rays of the sun, which is so essential to the growth and health of both plants and animals, as to participate in the bracing effects of pure atmospheric air. Children who are properly managed, who undergo systematic sponging with cold water every morning, followed by friction, and who are properly wrapped up when carried out, rarely suffer from the bad effects of cold, unless the exposure be protracted beyond the proper time.

* It is a well-ascertained fact, that before the use of flax or cotton, consumption was proportionally a much more rare disease among our forefathers than it is now.

Indispensable, however, as the fresh open air is to the infant, it is so to the mother or wet nurse in a *tenfold degree*. If it were wished to produce milk of the worst quality, deficient in nutritive properties, and otherwise hurtful to the stomach and infant constitution, no more effectual plan could be adopted for such a purpose than to debar a wet nurse from taking daily exercise in the open air, to confine her to small ill-ventilated rooms, and to attempt to keep up her strength by wine, porter, and other such stimulants, instead of keeping her health up to a maximum of vigour by sufficient exercise in the open air in all sorts of weather, good nourishing food, proper attention to the state of the bowels, to cleanliness, proper clothing, &c.

If a child is in a healthy thriving state, it will begin, in the course of two or three months, or even less, to show symptoms of a desire for bodily exercise—of a wish to use its arms and legs; and that female deserves the name of an indolent, slothful, ignorant, and even *cruel* nurse, who refuses to gratify this desire. In a healthy state of the system, the quicker the blood circulates the more rapidly does the growth proceed. Exercise sets the blood in quick circulation, and the Creator has therefore implanted in the young of all animals an irresistible desire to exercise their whole muscular systems—exhibiting itself in the playful gambols of the kitten, the frisking and frolicking of the puppy, the racing and leaping of the lamb, the graceful gallop of the colt, and the merry dance of the infant on its mother's knee. To restrain a child, therefore, in its cheerful plays, its artless tricks, and its restless activity, is to give way to laziness or ignorance, and to counteract one of the wisest and most indispensable provisions of the Deity for the health and growth of the infant frame.

DISEASES INCIDENT TO THE FIRST EPOCH.—*Costiveness.*—If the child has been applied to the breast sufficiently early, and no other food but its mother's milk has been administered, the new milk, being of a different quality, and having different properties from milk a few days old, has a laxative effect upon the bowels, and medicine, which ought, if possible, to be avoided, is rarely necessary. But if, from any unavoidable cause, the child's bowels are obstructed after birth, so as to retain a portion of the *meconium*, or dark tarry-looking stuff which collects in the intestines before the child is born, a little powdered rhubarb or a teaspoonful of castor-oil must be given, probably oftener than once, till the *faeces* assume a natural yellow colour. If the bowels become costive afterwards, we may rest assured that there is some error in the management either of the child or of the mother. This ought to be discovered and rectified; and, till then, a little castor-oil or compound rhubarb powder ought to be administered every day, or every alternate day, till the bowels get into proper order.

Gripping.—This is a name given to fits or paroxysms of pain in the stomach or bowels, and always arises from mismanagement—generally either from improper food, from the mother's milk being deteriorated in quality, from irregularity in the times of giving the breast, or from exposure to cold. The proper cure, in every case of disease, is first to remove the cause, and if the cause of gripping be removed, nothing but a little of the above-mentioned laxative medicine will be found necessary.

Redness and Inflammation of the Eyes.—This arises either from carelessness in washing and bathing the eyes immediately after birth, or from exposure to the strong light of a candle, gas, or the heat of a fire. By these strong lights acting as powerful stimuli on the delicate eyes of new-born infants, inflammation and loss of vision are frequent consequences. After the child's body has been thoroughly washed with soap and warm water, as soon as possible after birth, and the clothes put on, the face, and particularly the eyes, ought to be well bathed with clean warm water, without soap, by means of a very soft sponge, or piece of fine linen.

Red Gum, or Red Gown, called also, when it appears in children during teething, *Tooth Rash.*—This is an eruption of small reddish pimples on the skin, often appearing over the greater part of the body in children a few days old. It is so common in many parts of Scotland, where it is called

the *Red or Yellow Gum*, according to the colour of the skin, that nurses look for it as something indispensable to the health of the child; so ignorant are they as to its real nature and cause, or that it is a disease of their own creating. It is always accompanied with furred tongue, more or less feverishness, and other symptoms of disordered stomach; it arises solely from mismanagement, from loading the stomach with indigestible and improper food, producing irritation in the bowels, looseness, vomiting, &c.

This complaint seldom requires much treatment, farther than rectifying the error of management, stopping the supply of every sort of food except the mother's milk, giving even that in restricted quantity, till the stomach recover its tone, and administering a little of the above-mentioned laxative medicine.

Inflammation of the Chest.—Under this head we comprehend what is technically called *pneumonia*, or inflammation of the substance of the lungs; *pleurisy*, or inflammation of the membrane in which the lungs are imbedded; and *bronchitis*, or inflammation of the air-tubes leading to the lungs. These inflammations are far more common in infancy, are more frequently either immediately fatal, or—by impairing the efficacy of the respiratory organs for life, and by leaving them an easy prey to future attacks of disease—leave indelible traces of their ravages to a much greater extent than non-professional persons can imagine, or than even most medical men are aware of. Inflammations of the chest cut off nearly a third of all the children who die within the first year of their life; and are the remote causes of death in many more who die afterwards, from their baneful effects in causing the supervention of other diseases, but who survive, perhaps for a year or two, the first acute attack of the inflammation.

These inflammations are ushered in by a smart attack of fever. They begin by a cold shivering all over the child's body—the skin becomes pale—the countenance changeable, but generally pale and sunken—the lips purplish—and a total disinclination to food. To these symptoms, in a few hours, succeed burning heat of skin, flushed countenance, incessant thirst, the pulse very quick, a peculiar brightness of the eyes, and the breathing hurried and anxious, sometimes accompanied by a short dry cough, but not so much as to attract particular notice. In such a state of things, no time should be lost in giving the child a warm-water or steam bath; the whole body of the child, except the head and face, ought to be covered with water as warm as the skin can comfortably bear, for about ten minutes. It should then be well dried, and rubbed over with a warm towel, rolled up in a large piece of hot flannel, and put to bed. A powder, composed of half a grain of calomel and two grains of James's powder, should then be immediately administered, to be followed in four hours by a smart dose of senna infusion. If the symptoms of fever and inflammation do not subside after the operation of the purgative medicine, a medical practitioner ought to be immediately sent for.

Teething.—If an infant is at all properly managed—if it derives a sufficient supply of healthy milk from its mother or nurse—if its hours of feeding and sleep are fixed and regular—if its clothing, cleanliness, air and exercise are adapted to the age of the child and the season of the year—and if all the principles already laid down regarding its general management are punctually attended to, the complaints of children are generally very few and very simple till the period of teething commences. And although this period be looked upon by mothers as one of peculiar anxiety and solicitude on behalf of their offspring, yet, if they have been guided by these principles of management, there is seldom much to dread. If, on the other hand, the child, as is but too often the case, has been mismanaged in regard to diet, sleep, clothing, cleanliness, air and exercise, the mother is not anxious without reason, nor solicitous without ample grounds.

A month or two before any of the teeth make their appearance, the child often exhibits symptoms of slight feverishness; it has some degree of thirst, heat of skin, and restlessness, particularly during the night; the saliva runs from its mouth; costiveness, but more frequently looseness,

prevails; the happy, cheerful, and contented expression of the child gives place to irritability of temper, to fretfulness, and an appearance of dissatisfaction quite new to it; the plumpness and firmness of its flesh are exchanged for paleness, softness, and flabbiness; and altogether the infant assumes an unhealthy aspect. The irritation produced in the gums by teething, gives rise, in unhealthy and ill-managed children, to a morbid excitability in the brain and its membranes, originating a predisposition to inflammation, which, in its turn, induces convulsions, high fever, delirium, water in the head, &c.; and, unless actively treated in the commencement, death is the general termination of such a case.

The treatment of all the serious disorders connected with teething, ought to be entirely consigned to the care of the family medical attendant; the great duty of mothers not being to cure their children when they become really ill, but, by attentive, enlightened, and skilful management, to ward off disease, and to endeavour, by every means in their power, to prevent its occurrence. It must be carefully borne in mind, that *costiveness*, during teething, must be very scrupulously guarded against, from its being the cause of inducing many serious disorders; whereas *looseness* is often an effort of nature, established to relieve the system of some irritating matter, and to carry off that tendency to plethora and over-fullness of blood, and that disposition to fever and inflammatory disease, which, at that period, is so markedly present. Looseness, then, if not too severe and too long protracted, has a salutary effect on the system, prevents many worse evils, and ought not to be rashly checked or interfered with, unless by the express orders and under the superintendence of a medical man.

If the child loses its appetite, becomes languid, dejected, and wasted in flesh, with a feverish state of the system at night, it ought to be bathed in warm water every alternate night at bedtime; to have a powder, composed of two grains of Dover's powder and three grains of grey powder, every night, followed next morning by such a quantity of compound rhubarb powder, or rhubarb mixture, as will be sufficient to act two or three times on the bowels.

The complaints most to be dreaded during teething, are inflammatory affections of the brain and its membranes; the symptoms of which are, convulsions, vomiting of everything liquid or solid which is taken into the stomach, loss of appetite, thirst, heat of skin, particularly of the head, and other signs of fever, accompanied with an unnatural throbbing or pulsating at the opening of the bones of the head, called technically the *anterior fontanelle*. These symptoms point to the brain as the seat of disease, and absolutely demand instant medical treatment.

For the prevention of inflammatory affections of the brain, which are popularly termed *water in the head*, all the rules of management above laid down must be carefully attended to, more especially with children living in towns, where these diseases are far more common than in the country. The head ought to be kept cool, and be frequently sponged with cold water; the feet and legs should be kept warm; the state of the stomach and bowels should be sedulously watched, and costiveness, in particular, ought never to be allowed to continue; the whole body should be sponged every morning with cold, and every night with tepid water, using a little soap; but if the bowels are in a relaxed state, and loose stools passed five or six times during the twenty-four hours, cold water must on no account be applied to the skin. The times of feeding the child at the breast, and of putting it to sleep, must be fixed and regular; both it and the mother ought to be exposed to the open air, by taking a regular walk every day; the room in which they live ought to be large and airy, and, above all, be kept perfectly clean and thoroughly ventilated.

It is often of great consequence, in preventing many of the disorders arising from teething, and in relieving the pain and irritation attending that process, to have the gums frequently and well scarified, when the rounded swelling, heat, and tenderness of the parts show that the teeth are approaching

the surface. Scarification of the gums ought never to be objected to, as it very often is by ignorant mothers, since it very generally affords the child great relief, and, when properly done by a medical man, can never be productive of harm.

Many children are annoyed by eruptions and rashes on the skin during teething, constituting what was already mentioned as the *tooth rash*; these eruptions are produced by derangements of the stomach and bowels, to the state of which, and not external applications to these disorders, all remedial treatment ought to be directed. Eruptions at this period, although unsightly and somewhat troublesome in themselves, are rather salutary than otherwise, having a tendency, by way of counter-irritation, to relieve the internal organs from the many complaints to which they are liable.

THE ELECTROTYPE.

CHAPTER V.

DIFFERENT FORMS OF BATTERY—BEST POSITION OF MEDAL.

In an elementary treatise on electro-metallurgy, it is unnecessary to describe every form of battery that has from time to time been brought before the public; and as several of these have already been described in this work (vol. i., pp. 189, 277), we shall notice those only which are most commonly used in the processes of electro-metallurgy.

In last article, we alluded to the most elementary form of a galvanic battery, namely, the immersion in acidulated water of a piece of zinc and a piece of copper in contact. It is not necessary, however, that the two metals be those which we have specified; nearly any two metals, under similar circumstances, will excite a current of electricity, though the current will be of variable strength, according to the nature and properties of the two metals employed. To have any effective electrical power, it is necessary that one of the metals employed be capable of combining easily with the elements of the solution in which they are placed, while the other does not; and the power obtained, under proper circumstances, has an intimate relation with these two properties in contrast. The metal which undergoes solution is termed the positive metal, the other the negative metal. Metals are not considered to possess any intrinsic negative or positive principle; their relations in this respect are governed solely by the circumstances in which they may be placed. For instance, if we connect a piece of copper and a piece of iron, and immerse them in acidulated water, the iron is dissolved, and is positive in relation to the copper; but if the same metals are immersed into a solution of yellow hydro-sulphuret of potassium, the copper is dissolved, and is positive relatively to the iron. Hence, to obtain a galvanic battery, the conditions are simply to provide two metals, and immerse them in contact in a solution capable of acting upon the one, and not upon the other. The following table shows the order in which the common metals stand to each other, in respect of their relative negative and positive properties, when immersed in water acidulated with sulphuric or muriatic acid, the most intensely negative metal standing highest, and the metal which acts most positively standing lowest:—

Platinum.	Nickel.	Iron.
Gold.	Bismuth.	Tin.
Antimony.	Copper.	Cadmium.
Silver.	Lead.	Zinc.

According to this arrangement, each metal is positive with respect to all that stand before it, and the electrical conditions of any pair become the more contrasted the further apart they stand in the scale. Thus, a battery composed of zinc and platinum is much more powerful than one composed of zinc and copper; and again, copper and iron make a very weak battery.

A battery may also be formed by having one metal and two kinds of solutions, separated by a porous diaphragm. For

are composed of round bars of iron, $\frac{1}{8}$ ths of an inch in diameter, in links 6 feet 4 inches long. There are fifteen of these links, and two of the oblique suspending bars resting on the towers, which gives ten inches sectional area at each point of suspension. From this the chains decrease, by reducing one link at each joint, so that at the centre of the bridge the section of the chains is but equal to a single bar, $\frac{1}{8}$ " in diameter, or '601" sectional area. The suspending bars that attach the road-way to the chains are inclined to the horizon in the manner shown in the elevation, fig. 1. They are $\frac{1}{8}$ ths of an inch in diameter, and connected to the road-way, as represented by fig. 2, which is a section of the elevation to a larger scale, where *g* is one of the main beams of the road-way; *dd*, oblique suspending bars; *ee*, circular castings bolted to the beam, *g*, through which the oblique bars pass, and are by this means connected to the road-way. The distance on the horizontal line between every two points of the connection of the oblique bars, *dd*, is 5 feet 6 inches.

The road-way is formed of, first, two wrought-iron beams, *g g*, 5 inches deep by $\frac{1}{8}$ ths of an inch thick, to which the oblique suspending bars, as above described, are connected. There is one of these beams on each side of the bridge, and extending the whole length of it. The transverse joists are also of wrought-iron, and fixed at right angles to the beams, *g g*. They go across underneath, and immediately support the planking of the road-way (which is laid longitudinally with the bridge). These joists are placed 1 foot 10 inches apart. They are 11 feet long, which is equal to the width of the road-way, and are 4 inches deep by $\frac{1}{8}$ ths of an inch thick. They are curved slightly upwards, which raises the road in the centre about 2 inches. Fig. 3 is a transverse section of the platform; *g g*, the main side-beams; *r r*, transverse joists; *b b*, truss-rods, supporting every third joist in the centre by the cast-box, or prop, *m*. In order that all the joists throughout the bridge may have the advantage of this truss, there is a beam, *n*, seen in transverse section, fig. 3, and in longitudinal section, fig. 2, passing through the cast-box, *m*, and parallel to the beams, *g g*; and by this means each of the intervening joists between those that have the truss-rods applied are supported, and consequently, the lengths of all are reduced from 11 feet between the support to 5 feet 6 inches, and the transverse strength and stiffness of the road-way proportionably increased.

The plan of the railing is seen on a large scale, figs. 2 and 3. It is made entirely of wrought-iron, having standards attached to every joist.

The rear-chains of the bridge are constructed precisely as those over the stream, and the oblique rods are carried from it in the same manner, but instead of being attached to a beam similar to *g*, are taken below the abutments, and firmly fixed in the blocks of stone, *b b*, &c., which constitute the moorings of the chains.

The quantity of iron used is,

	Tons.	cwt.	qr.	lbs.
In the chains, &c.,	9	18	0	5
Roadway,	10	7	3	14
Railing,	3	9	1	7
Cast-iron,	2	19	2	14
	26	14	3	12

the tension in *cf* is induced by the action of the weight supported at *f*, and the horizontal force generated by that weight, being resisted in an angle of less than 90°, and as the point, *f*, to which the various forces tend, is in the horizontal line, the horizontal force acting there must be resisted by the platform, and cannot produce any effect in the chain beyond the point, *c*, and so on for the remaining bars, *b g*, *a h*, the weight suspended at the points, *g* and *h*, generating no horizontal force in the chains beyond the points, *b* and *a*, the truth of which may be demonstrated in the same way as the bars just instanced. Therefore it follows, that though with the use of the vertical suspending-rods, the variation of tension, and, of course, the required proportionate variations of sections of iron in the chain, is so very inconsiderable as to be hardly worth notice; yet, when the oblique rods are applied, the tension in the chain is reduced rapidly from the base to the centre of the bridge, and, of course, in the same proportion may the section of iron in them vary also.

From this it appears that the action of the oblique rods is to throw into the platform or horizontal line the whole of the horizontal force, when it is as essentially serviceable in the support of the bridge as the chains themselves; for the heavy trussing which is usually used in the platform of suspension bridges on the old plan, is intended to keep the platform rigid; in short, to compensate for the horizontal force that should exist there, and which is beautifully maintained in that line by the action of the oblique rods.

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The estimated strength of the bridge for transit purposes is 120 tons on the central span, and 30 tons on each of the out-side openings; that is, 180 tons, as the weight which the bridge will sustain at one time, and to which the iron has been proved—so that the platform, when equally loaded, will bear about 153 lbs. per square foot of surface.

AGRICULTURE.

CHAPTER VI.

INSPECTING, TAKING, AND STOCKING A FARM.

AGRICULTURAL customs vary in the British islands very much according to locality. To attempt to describe them all far exceeds our space. The following is a summary of them as far as regards the present subjects, as they exist in Northumberland, the Lothians, &c.:—

In these districts farms are uniformly let upon leases, these leases being, upon arable farms, almost invariably for either nineteen or twenty-one years. They have doubtless arisen from the fact that, until comparatively recently, the land was neither enclosed nor drained, and no tenant would undertake either of these operations, unless he was sure of retaining his farm for a sufficiently long period as to reap the benefit of his expenditure and trouble. The attachment of the farmer to these long leases on farms that are enclosed and drained is probably excessive. A long lease is not without its drawback. If the tenant finds his farm not profitable, still he is saddled with it; if he dies, his family, who are, perhaps, quite ignorant of agriculture, must still keep it on, until the expiration of the lease; the restrictions imposed in many Scottish leases are far more degrading than holding at will; that the Scottish farmer is any more independent of his landlord in politics than an English one who has a farm held at will is doubtful; it is a notorious fact that in countries where long leases prevail, the farms change hands oftener than where such are not the case; and, lastly, farms held on lease are usually higher rented. Still the system of leases has worked well, and brought about the most productive farming.

In the parts of the country to which we refer, when a lease is coming to a close, it is usual to try to privately arrange with the occupying tenant. If this is not done, or if the landlord and tenant cannot agree, it is common to advertise the farm in the newspapers, and to fix a day for deciding upon the new tenant. In the meantime, those who wish it, send in written offers, stating what amount of rent they are willing to pay.

Any one intending to offer for a farm inspects it, receives the opinions of his friends regarding it, and then calculates what crops of grain, &c., he can procure, what amount of stock he will annually have to dispose of, and what quantity of wool he will have to sell, then the expenses of labouring the farm, the amount of capital he will require, and then making up his mind what profit he will be content with, he makes his offer.

If the offer is accepted, the lease has to be drawn out, and the various covenants that have been agreed upon inserted. Properly speaking, the only conditions that ought to be imposed upon the tenant are, that he pay the rent, and that during the last three or four years of his lease, he do not over-crop the ground. Generally speaking, however, there are a great many more than these.

In the first place, the landlord usually reserves to himself the game. This not only produces heartburnings, but, if pheasants are much preserved, prevents the farmer from destroying most destructive vermin, and compels him to pay rent without being able to sell all his crop. In the next place all sorts of restrictions are put upon the cropping. These, upon almost adjoining estates, may be diametrically opposed to one another, and all tend to retard agricultural improvement. No shoemaker would undertake to make shoes after a particularly detailed manner for twenty-one years to come, and it is not easy to see why a farmer should act differently. Practically, these restrictions are very little attended to. Kaim hens, driving coals, other acts of servitude, &c., are remains of feudalism, and are, in the present state of things, improper and practically found injurious.

Subletting is generally prohibited to the tenant, and this seems not unreasonable.

The periods that rents are paid at is fixed in the lease. These vary, but the most convenient to a tenant are the terms of Candlemas and Lammass. In England, the usual rent-days are Ladyday and Michaelmas. Sometimes the rent is a fixed sum of money, sometimes as much money as a certain fixed quantity of wheat, barley, and oats would sell for, and sometimes partly one and partly the other.

Entry is sometimes at Martinmas, but the most common plan is, for the farmer to have entry to the house, buildings, and grass at Whitsunday, and to the remainder at the separation of the crop. Sometimes the straw and dung are steelbow, as they are called, i.e., the straw and dung of the previous year are given to the incoming-tenant for nothing, on condition that he leave those of the last year of his lease to his successor. This custom is found a particularly convenient one.

Although restrictions with regard to cropping are improper, the tenant should always lay down a regular plan or system of rotation. It is not that a farmer who properly understands his business may not grow any kind of crop as often as he likes, but in ordinarily situated localities, it is found most economical to grow such a number as will never allow either horses or men to be idle. Sometimes very complicated systems of rotation are followed, but the simpler they are the better. Modifications of the same system constitute the four-course, the five-course, and the six-course rotations, which we will describe. We should premise, that in the districts we are in this chapter alluding to, there is no such thing as permanent pasture, save in exceptional cases, to be found. In many parts of England there is a very erroneous and opposite practice prevalent.

We will take a four-course shift.

The first year is called the fallow year, not that the land is ever fallowed, but that the crops now taken occupy the same position in the rotation as the fallow used formerly to do. The fallow division of the farmer is divided amongst peas and beans, potatoes, turnips, and a few vetches. This fallow division receives a good dunging, i.e., every acre receives from twelve to twenty tons of farmyard manure, and four or five cwt. of guano, or five or six cwt. of bones, dissolved usually in sulphuric acid. The turnips are consumed on the farm, unless manure can be bought, in which case it is immaterial whether they are so consumed or sold.

The second year, the land that had been fallow is under wheat and barley, among which rye-grass and clover seeds are sown. The beans, peas, and potatoes are invariably followed by autumn-sown wheat, and formerly it was the custom for all the turnips to be followed by barley, but now a portion of what was turnips is often succeeded by spring-sown wheat. Some farmers apply no manure to the wheat and barley, but top-dressing them is now frequently done, and invariably with profit; and it is found that the best top-dressing for wheat and barley is guano, to the extent of about two cwt. per acre, sown in May.

The third year, the rye-grass and clover that were sown amongst the corn are the crop. A portion is made into hay, and the rest either cut and carried to the animals, or the animals are allowed to pasture upon part of it. At the end of autumn, this is ploughed up. Sometimes no manure is applied to the grass and clover, but of late it has become customary to topdress it; and it is found in practice, that the best top-dressing is a mixture, in about equal parts, of nitrate of soda and sulphate of ammonia. The proper quantity per acre of this mixture is considered to be about two cwt.

The fourth year, the land that was grass is oats, and these sometimes receive a top-dressing of twelve cwt. of guano. The year after is the fallow year, or first of this four-course rotation.

The fifth and sixth course merely differ from this in allowing the grass land to remain as grass for two or three years.

Having taken the farm, signed the lease, formed his plan, and taken possession, the farmer has next to provide himself with stock, animals to labour his farm, and implements. The rotative proportion of stock and cattle varies so much, according to locality and caprice, that it is not easy to state it.

The horses and implements upon a farm of 250 acres, and managed upon the four-course rotation, would be as follows. We should observe that, in the districts to which we confine ourselves, every ploughman has charge of one plough, and one pair of horses, that pull it, and two carts, each of which is drawn by one of his horses. The law in Scotland permits one man to drive two carts on the high-road:—

Horses,	10	Corn-sowing machine,	1
Ploughs,	5	Turnip do.,	1
Carts,	10	Bean do.,	1
Harness,	10	Thrashing-mill,	1
Small plough,	1	Horse-hoe,	1
Harrows,	5	Hay-chopper,	1
Carriage for do.,	1	Turnip-shears,	1
Swing-trees,	5	Cake-breaker,	1
Feering-poles,	5	Corn-bruise,	1
Grass-seed harrow,	1	Water-cart,	1
Finlayson's grubber,	1	Weighing-machine,	1
Two-horse roller,	1	Corn sacks,	40
Presser-roller,	1		

To these must be added a great number of small articles, as wheelbarrows, scythes, rakes, graips, and so forth. Besides the money necessary for the purchase of these, the farmer must provide the sums requisite for his seeds, his servants' wages for some time, and his own personal and household expenditure, until his returns begin to come in. His rent is never sought from him until he has had time to sell his first crop, or, at any rate, part of it.

The beginning farmer has likewise to hire his servants. Agricultural servants, as grieves, ploughmen, &c., are usually engaged by the year or half-year. Hiring-markets are held, and are considered very objectionable. Any one wanting servants had far better make it known by advertisement in the papers, or otherwise, and he is sure to get plenty of applicants, regarding whose qualifications and character he can make due inquiry. Without good servants, the management of a farm becomes most disagreeable labour, and no pains should be spared to secure them. Field labourers are usually people in the neighbourhood, employed by the day.

Another but minor detail that the farmer has to attend to, is to make arrangements with the smith and wright. It is the custom in the parts of the country to which we confine our observations, to make as many contracts as possible with these tradespeople, and not to have things done by the job, such being generally overcharged. The smith usually undertakes to shoe two horses, uphold the plough-irons, and all the malleable iron of farm implements, for £2. 10s. a-year. That is to say, the farmer pays the smith £2. 10s. per annum for every plough that he keeps. In like manner does the wright undertake to mend and paint the wood-work connected with the implements, for the same sum per plough or pair of horses. The saddler, too, contracts to keep the harness in order, and for each pair of horses receives about a pound, or from that to thirty shillings.

DOMESTIC MEDICINE.

CHAPTER VIII.

ON THE CAUSES, THE PREVENTION, AND THE DOMESTIC TREATMENT OF THE DISEASES OF INFANCY.—CONTINUED.

In addition to what was said in last chapter on the subject of *teething*, we may now state, generally, the chief origin of the diseases incident to this period of infant life. The very shades of the thousands of victims who have fallen a prey to mismanagement at this period of their existence, and whose deaths are erroneously attributed to teething, call aloud to every medical man to raise his voice and expose a system of infant treatment, based upon the most foolish and cruel prejudices, and utterly at variance with common sense and sound physiology.

If the formidable symptoms and fatal diseases, which

occur during the cutting of the small milk teeth, are solely to be attributed to the process of dentition, why is the cutting of the second, or permanent teeth, accomplished with so little trouble, and why is even the cutting of the large double teeth in infants so seldom attended with dangerous symptoms? The period of life in which the first set, or milk teeth, make their appearance, is one of peculiar susceptibility in the infant frame. At that age, the growth of the body, and particularly of the brain and intestines, proceeds at a much more rapid rate than it does during any future period of its existence, of the same duration; and, for the accomplishment of this rapid growth, the vital energy must be unusually active, and the blood must be sent in large quantities, and with great vigour, to the growing organ. In no condition of an organ is inflammation more apt to arise than when its vital energies are acting with the greatest vigour: when the liver, for instance, is stimulated into great activity by the effects of temperature in a warm climate, and when the female breast is called into active exercise by the secretion of milk, inflammation and subsequent disease are very apt to occur in both these organs upon the supervention of an exciting cause, which, under different circumstances, would not have produced the least bad effect. The brain, intestines, and other bodily organs of the infant, are precisely in this excited and highly susceptible state during the first epoch of its existence, from the excessive activity of their growth. Undue determinations of blood to any of these organs will, therefore, be produced by very slight causes; and if the health be impaired by bad management or indigestible food, or if the blood has become too rich, and the body too full by the digestion of overabundant or stimulating food, the wonder ought not to be that the irritation of teething should cause inflammation of the brain, water in the head, convulsions, inflammation of the bowels, &c., but, on account of the general mismanagement to which infants are subjected, it is surprising that so many survive this period.

Teething is a natural process; and, although cases do occasionally occur of difficult dentition under the most favourable circumstances, it will invariably be found that the healthier the child—neither too weak, and impoverished by a deficient supply of its natural food, nor too strong, and too full of blood by food of an over-stimulating quality—the easier will this process be accomplished.

If, on the other hand, the child's health be impaired by mismanagement; if its mother be labouring under any disease, or have any physical or moral disqualification for suckling her infant; if it be stuffed with improper and indigestible food, or dozed with deleterious medicine; if it be subjected to living in bad air, to uncleanness, &c.; or if, in addition to an abundant supply of rich and nutritious milk, it be fed with other food during the first six or seven months of its existence, so as to produce an over-full habit of body, then we must expect the irritation of teething to produce symptoms the most formidable, and diseases which, unless checked in the very outset, all the powers of medicine are inadequate to subdue.

WEANING AND ARTIFICIAL FEEDING.—No precise time can be fixed as the proper age at which weaning ought invariably to take place. Its propriety will depend much more on the health and strength of the mother and child, and on the length to which dentition has advanced, than on the age. It may be given, however, as a general rule, that a child ought not to be weaned, at the earliest, sooner than the end of the *seventh*, nor suckled longer than the end of the *fifteenth* month. But between these two extreme points there is a golden mean, not fixed and determined, but equally well marked and easily recognised.

It may be laid down as a general rule, therefore, which ought invariably to hold good, that, unless under very peculiar circumstances, weaning should not be commenced till the child has cut *four*, nor delayed after it has cut *eight* teeth. When this has been accomplished, in obedience to the visible dictates of nature, as exhibited in the means being supplied to the child of supporting an independent existence, the connecting link between it and the mother, so far as wet-nurs-

ing is concerned, ought to be severed; and not more for its sake than for her future health and safety, weaning ought immediately to take place.

Circumstances will occur, however, in which the above general rule must be departed from, and these may arise in connection with either the mother or the child.

If, notwithstanding the use of every means to keep her up, the strength of the mother's constitution prove unable to endure, without hazard, the debilitating effect of the constant drain of milk from her system; if her health begin to exhibit symptoms of giving way, such as the occurrence of loss of appetite, weakness and feebleness of body, wasting of flesh, dimness of vision; and, above all, if the supply of milk get much diminished in quantity—the breasts remaining quite empty till the child commences to suck—and if she begin to be affected with night perspirations, and to be slightly annoyed with a short dry cough—under these circumstances, the suckling of the child by the mother, whatever its age or condition, must be instantly stopped, and it must be either provided with a milk nurse, if possible, or failing that, it must be supported by artificial food.

If, on the other hand, the child have a very delicate and weakly constitution; if it be affected with any disease, such as measles, hooping-cough, or be otherwise unwell, the period of weaning ought to be postponed till the child get stronger, or recover its health, so as to be capable of submitting to the change of food without material detriment.

The appearance of teeth marks a new era in infant life. Before this period, the extreme sensibility of the mucous membrane, or internal lining of the stomach and bowels, is only adapted to the mild and unirritating nature of the mother's milk,—a fluid which has been provided by nature as amply sufficient for its healthy nourishment and growth; any other food, of whatever kind, will prove irritating, and more or less injurious in proportion as its quality is different from human milk. But by the time the teeth begin to appear, the stomach, intestines, and all the other organs have acquired more strength, and less susceptibility, having gradually become adapted to food of a different kind, and of a more varied and stimulating character.

It is not so difficult, therefore, to provide a child with the proper food when the time has arrived at which it ought to be weaned, as to devise a fitting substitute for the mother's milk, when from peculiar circumstances a child must be weaned before the legitimate time, since nothing can be found which is exactly similar to, or can adequately compensate for, its natural support—the milk of a healthy woman.

As we have already stated, such circumstances will happen, from the health of the mother giving way—from her being attacked with disease of the breasts—from her labouring under any constitutional disease, such as scrofula, consumption, epilepsy, or any other illness—from her want of the natural secretion of milk—from the nipples being obliterated by the pressure of tight stays—from an extremely sensitive and excitable temperament—and from, under any of these circumstances, inability to procure a wet-nurse as a proper substitute. In such a case, the food nearest in quality to that of a healthy woman's milk must be supplied to the child; and it must be given in such quantity and in such a manner as will be the nearest approximation to the mode in which it derives its supply from the breast. Even after every effort to imitate the natural process of feeding a child by administering its food of a proper quality, in a proper quantity, and in a proper mode, most spoon-fed children die; and those few who survive the period of infancy, rarely acquire such a strength of constitution as to carry them through any severe illness which may attack them in after life.

With regard, then, to the *quality* of the food employed in artificial feeding, it must be entirely *fluid*. The undiluted milk of animals, such as the ass, or cow, is too rich, containing too much oil and cheesy matter, to constitute a proper substitute for human milk; it ought, therefore, to be diluted with warm water, with the addition of a little sugar, in the proportion of one table spoonful of water to two or three of

milk. This, however, often disagrees with children, producing acid fermentation in the stomach and bowels, and passing through them in the form of firm curds; it is, therefore, found by experienced nurses that a much better mixture is that of a table spoonful of well-boiled gruel, made from barley, the flour of oatmeal, sago, arrow root, or ground rice, and two table spoonfuls of fresh-drawn cow's milk, with the addition of a little white sugar. This ought to be freshly prepared every time the child is fed, which it ought to be every three or four hours, according to the child's constitution. The kind of food, however, ought to be varied according to circumstances, for one kind may agree well at first and disagree afterwards, and children of different constitutions require different kinds of food. In some children we must occasionally have recourse to light beef or chicken tea, mutton or other light broths, free from fat, and strained through a muslin rag, to which some of the different kinds of gruel above mentioned may be added. It must be carefully remembered, however, that whatever kind of food is found to agree best at this period, it must be entirely *fluid*, given *tepid* or *lukewarm*, and *freshly prepared every time the child is fed*.

As to the *quantity* to be given, that must depend greatly upon the child's constitution and habit of body; some children require double the quantity of food which will satisfy others; but we must take into account that the stomach at this age will only contain a few ounces, and every child has a tendency rather to eat too much than too little; much, however, will depend on the mode in which it is administered, whether or not too much will be swallowed by the child.

As to the *manner* in which food ought to be given to an artificially fed infant, before the teeth begin to appear, we must, in this respect also, endeavour to imitate nature as closely as possible. How, then, does *she* act? She, in the first place, affords a very *slow* and *gradual* supply of milk from the breast; the infant requires a considerable time to get its stomach filled, notwithstanding that it can hold only a few ounces,—at first, not more than half an imperial gill—and from this circumstance, and also because the child becomes fatigued by the exertion of sucking, it is not nearly so apt to overfill and overstretch its stomach, and to induce either vomiting of its food, or acidity, gripes, purging, or costiveness. In the second place, the exertion and motion of the lips, jaws, &c., in the act of sucking, excites an abundant flow of saliva, and this not only prepares the glands of the mouth to yield this fluid in proper quantity when solid food becomes necessary, but it is also said to assist the digestion of the food in the stomach.

Neither of these ends can be accomplished by feeding a child with a spoon; and we must therefore have recourse to some plan of more closely imitating nature. This can be tolerably well accomplished by using a properly constructed sucking bottle, which ought to have a narrow neck and a bulb at the extremity about the size of the nipple. The bulb should be covered with chamois leather, through which the infant can suck its food. The only objection to these bottles is the difficulty of keeping them clean; and unless they be so in the most perfect degree, the bad effect of their use will very soon show itself in the deterioration of the infant's health. The piece of chamois leather for the mouth should be kept constantly in spirits when not in use, and it should be exchanged for a new piece weekly. The bottle itself should be well rinsed out with warm water after every time the child is fed, and then immersed in pure cold water until it is wanted.

By the time the child has cut two teeth, food of a different kind will be admissible and necessary; it may then be fed with a spoon, and that management adopted which we are about to recommend as requisite for children before weaning.

From the principles above laid down, on which children ought to be fed, it must be abundantly evident that nothing but *liquid* food ought to enter the stomach of an infant till the appearance of teeth give indication that something in addition to the mother's milk is required, and that the period of weaning from the breast should be commenced.

As generally accomplished, the withdrawing of the child from the breast of the mother is *not weaning*, in the proper sense of the term, but an *abrupt transition* to which the child is subjected, in regard to its food, which ought never to take place. The period of weaning should last two or three months. It should commence when the child has cut two teeth, and terminate when it is perfectly able to live independently of any support from the breast of the mother.

In the first place, then, the interval between the times of giving the breast should be gradually lengthened, and at intermediate periods artificial food ought to be given, but still with the greatest regularity. The proper food to begin with will be that already mentioned, as the most suitable for a child which must be fed artificially; in quantity also about the same; but instead of the sucking bottle it may be fed with the spoon; the greatest care being taken not to cram the infant's stomach, and bring on indigestion and all its train of evils. It should be fed in a sitting posture, in small spoonfuls—for some time perfectly liquid and free from any thing solid—the food being introduced into the stomach in a very slow and gradual manner, and the child's expression and motions carefully watched so as to know when its appetite is satisfied.

In the second place, we must notice that artificial food is only to be given during the day; the child should be accustomed from the very first to be even fed at the breast at as long intervals as possible during the night, so as not to interrupt the mother's rest and thus injure her milk; and it ought on no account ever to be allowed the pernicious habit of falling asleep with the nipple in its mouth.

How often have we heard mothers complaining that their children had "*fallen off*" so much after weaning! From being healthy, happy-tempered, fat and plump, for the first five or six months while on the breast, they now wear a constant expression of suffering, and have become peevish and fretful, lean and emaciated. All these symptoms mothers set down without the least thought or investigation, to the effects of *teething*—little aware and hard to be persuaded that this change for the worse is the consequence of their own mismanagement. Fed, suckled, and put to sleep at all hours indiscriminately—the readiest and often the most indigestible food being employed—gorged at one time and starved at another—the deranged state of the bowels, which has been brought on by improper food and bad management, being unattended to—kept often in a state of filth, from soiled and wet clothes—it is not in the least surprising that the health and strength of the child should give way at the period of weaning; and when to all these causes of disease, we add confinement in close ill-ventilated rooms, insufficient clothing, and want of exercise in the open air, the number of children that survive such treatment at this period is a proof of the wonderful pliability of the infant constitution, and its capability of, in some degree, accommodating itself to circumstances the most adverse to continued existence. Life in these cases may be prolonged, but it will generally glow with such a feeble flicker as to be liable to be extinguished by any future blast to which it may be exposed.

SECOND EPOCH.—This epoch comprehends the period from the weaning of the child to the completion of the first dentition; or, from the end of the ninth, tenth, or twelfth month of its existence, to between the end of the second and the beginning of the third year.

General Management.—In most cases, by about the end of the first year, nature has supplied the child with the means of supporting an independent existence, in providing it with teeth. A marked change has now taken place in its physical development, both externally and internally. Its very external appearance has undergone a visible alteration. "At this time," says Wendt, "the hitherto projecting forehead becomes flattened, the countenance receives expression, the eyes intelligence, the limbs firmness." That sensibility of the general system, and nervous susceptibility, which are so characteristic of infant life, have become much less acute; the stomach and intestinal tube have become less sensitive, digestion is less rapid, food is less frequently required,

and a diet is now not only admissible, but absolutely necessary, which in the first stage of its existence would have been productive of the worst consequences. The activity of the circulation is lessened, the pulsations of the heart having diminished in rapidity, the growth is less active; the quantity of circulating fluids in the different organs is much smaller; and altogether, the bodily structures have acquired greater firmness, consolidation, and consistency, and have become better fitted for the various duties which they were destined to perform in the animal economy.

Under these altered circumstances, if the previous management of the child has been conducted on the principles of physiology and common sense, as above laid down, it enters upon this second epoch with its chances of arriving at maturity much increased in number, and its future treatment and management much lessened in difficulty. It has now nearly acquired the independent use of its limbs, and will give them exercise, in spite of every misdirected attempt to restrain them; it is better able to resist the over-cramming of its stomach, and can effectually check every effort to stuff it with food when it has no appetite, or when the stomach is disordered; and it can also in some degree give expression to its feelings, and give due warning when suffering from cold, hunger, or bodily pain.

Food in Second Epoch.—The proper feeding of children requires the exercise of the greatest judgment and discrimination on the part of their parents and nurses. If they supply them with food in too great quantity, or of too rich and stimulating quality, either the stomach is oppressed, indigestion produced, and the bowels overloaded and obstructed, followed by a numerous train of disorders; or, the excess of nutrition induces a too corpulent and over-full habit of body, giving the child an increased tendency to fever and inflammation—diseases to which children are but too prone without any such exciting cause. If, on the other hand, food is supplied to the child in too small quantity, or too meagre in quality, the body is imperfectly nourished, the growth is arrested, the various organs of the child become deficient in that health and vigour which is necessary for the purposes of continued existence; children fed upon a too low diet are very apt to become scrofulous, and to fall a prey to many of those diseases of which weak vital energy and a certain debility of constitution are strong predisposing causes.

No rule of diet can be laid down which would be found suitable in every case; scarcely do the constitutions of two children agree in every particular, and we must always modify the diet to suit the particular constitution of the child and the circumstances in which it is placed.

The same kinds of food may still be continued which have been mentioned above—farinaceous matter, mixed with milk, or weak broth free from fat; but it should now be given of much greater thickness and consistency; and by the time the child has cut four double teeth it has become enabled to chew food of some degree of solidity; no solid animal food, however, should be given till all the canine, or eye-teeth, are cut, which indeed is no great hardship, as broths and soups made from animal food contain sufficient nutriment for all the purposes of health and growth.

Man is an omnivorous animal; and it is found that a mixed diet of animal and vegetable food is the most suitable, in temperate and cold climates at least, in almost every case. With this the child ought to be provided, as soon as it has cut sixteen teeth, but in such quantity as not to overload the stomach, which can now contain nearly double the amount necessary, and of such quality as not to pamper and tempt the appetite to excessive indulgence. As long as the child is in good health, with a sound constitution, a clean tongue, regular bowels, and no symptoms of over-fulness, or a feverish condition of the system, its diet may be rather liberal, but plain; it ought, however, to be administered at regular periods of four hours to the generality of children of this age; and a child ought not to be allowed to acquire the habit of being fed during the night. But as soon as indigestion, over-fulness, or feverishness supervenes, with white furred tongue, headaches, thirst, heat of skin, &c., the diet must be imme-

diately lowered and the animal food withdrawn; for some time even after these symptoms subside the child must be kept upon a restricted diet.

With children of weakly and delicate constitutions, a more scrupulous attention to diet will be necessary. They will require food at shorter intervals, but in less quantity, and of less stimulating quality than healthy, vigorous children, who can take much exercise; and even this restricted diet must be lowered when they fall into actual ill-health; at the same time, that every means must be adopted, under the eye of the physician, to restore the health and invigorate the constitution.

It is quite impossible to lay down rules of diet which are applicable in every case; children brought up in the country may be allowed more latitude in this respect than those living in towns; and many circumstances may occur to interfere with fixed rules, and make it necessary to depart from them in individual cases; the following, however, may be given as applicable to the majority of children in this epoch, in most ranks of life:—

The child will awake early in the morning with a keen appetite, which must be satisfied but not stimulated to over-indulgence. It may then be supplied with a little warm new milk, with minced bread soaked in it, and slightly sweetened with sugar; or it may have sago, arrow-root, or oatmeal, made into gruel with sweet milk; or, if the child be of a very weakly constitution, it may have some light soup, such as chicken-tea, mutton-broth, or beef-tea, thickened with bread or sago. As the child advances in age, this meal should be dispensed with, and breakfast given a little earlier.

After its appetite is moderately appeased, the child will sleep for some hours, and awake again ready for breakfast by nine o'clock. This may consist of the same ingredients; or it may have a little well-boiled oatmeal or barleymeal potage with new milk.

One o'clock should be the dinner hour for children at this age, and even for several years afterwards. Dinner should consist of mutton, chicken, or beef broth, thickened with ground rice, sago, or fine pearl barley, as free from fat as possible; this diet may be alternated with one solely of farinaceous food. When the child has cut its eye teeth, it may be allowed a little solid animal food, such as beef, mutton, or fowl, not over-cooked, with a good potato, or some other fresh vegetable. For drink, nature points to water as the only safe beverage at this age, and it is the only one necessary.

At five o'clock, the child should have what may be called its tea; which should consist of a cupful or two of hot water and new milk in equal quantities, sweetened with a little sugar, soaked with bread or biscuit, for a young child, but as it gets older, the bread should be eaten with the hand. If the child is delicate, it may have a little weak tea. At seven or eight o'clock, the child is ready to go to sleep for the night, and about this time it should get the same food as it got for its first meal in the morning.

The periods of giving food ought to be fixed and invariable, and no eating, even of half a biscuit, should be allowed between meals. An error which inexperienced mothers and nurses are very apt to fall into, is to give the child food every time it cries. A child may have many different causes to make it cry besides hunger; it will even cry sometimes for want of anything better to do, if it is not properly attended to or amused, and then it will eat to appease, not its hunger but its *langour*. Such treatment will soon induce derangement of the stomach and bowels; medicine will be required; and if the cause be not removed, the health and constitution of the child will be ruined for life.

"The most objectionable articles of food for children," says Sir Anthony Carlisle, "are the indigestible parts of fruit, unripe fruit, salads, all uncooked vegetables, sugared pastry, nuts, cheese, veal, pork, and stewed meats."

Clothing.—The great object of clothing is to afford due warmth to all parts of the body; it ought to be of such texture as to combine warmth with lightness and softness of material; and it ought to be made in such a manner as not

to interfere with the free movements of the body, and to occasion no unnatural constriction on any part. One of the greatest causes of bodily deformity, of stiffness, and awkwardness of gait, is tight fitting clothes on children. It is invariably remarked by travellers, that among nations where fashion prescribes loose and flowing robes for the bodily covering, there are fewer examples of deformity, and a grace, elegance, and noble demeanour in walking, and the performance of all the bodily movements, that are in vain looked for where the caprice of fashion leads to the adoption of clothing which impedes the natural movements, checks muscular development, and deforms the human figure.

No more absurd and pernicious notion ever entered into the heads of parents than that of fancying that they could strengthen the constitutions of their children, and "harden" them, as they call it by inuring them to cold, and exposing them thinly clad to all the severities of the weather.

"The present fashion of clothing young children," says Dr. Clarke, "founded upon the erroneous notion of hardening them, is very injurious to their health. Their arms and chests are entirely uncovered. They generally wear no stockings at all; and, from the stomach downwards, they are almost in a state of nakedness even in winter."

"To rebut the force of these objections, this question has often been asked, What becomes of the children of the poor?"

* * * But, if they inquire, they will find that comparatively few of the children of the poor are reared."

It is invariably found that the families who are best clad and least exposed to cold and damp in winter, are the most healthy; while those, who from necessity or choice, are condemned to undergo the hardening process, are seldom free from disease. "Disorders, which otherwise might have lain dormant, are thus brought into activity by this mode of treating children; and many fall a sacrifice to pulmonary consumptions and scrofulous complaints in more advanced life from this error alone, of being exposed in childhood to cold with the intention of being made strong and hardy."*

Cleanliness.—Few things are of greater importance in the proper management of infancy and childhood than strict attention to cleanliness. A great accumulation of solid and liquid matters are thrown out of the system, through the skin, every twenty-four hours, in addition to the dirt which collects upon its surface, from dust, smoke, &c., from without. If these matters are not thoroughly removed, at least once, but far better twice, daily, the effects of its presence will soon become evident. Distressing excoriations, cutaneous eruptions, which are difficult to heal, and other diseases follow inattention to this particular; even the growth and vigour of the child will be checked, and its constitution permanently debilitated.

From a very early age it is quite possible, by watchfulness and attention, in the first instance, to teach the child cleanly habits; if it is properly managed as to its food and sleep, the bowels and bladder will be evacuated with the greatest regularity, and symptoms of a desire to perform these offices can very soon be detected. If this regularity is encouraged, the mother will save herself an immensity of trouble, and her child a great amount of vexation and annoyance; nay, even this very habit of regularity will have a great effect on the future health and welfare of her infant.

The soiled clothes of children ought to be very often changed; if possible, the inner clothing should be renewed daily, and when once soiled and wet with urine, &c., it should never be dried and put on a second time.

A child of this age should be sponged with cold water and a little yellow soap every morning, particular attention being paid to its armpits, flexures of the joints, &c.; its hair should be carefully combed and brushed; its eyes, ears, &c., thoroughly but gently washed and dried; and its teeth ought to be brushed daily with a soft brush.

Sleep.—Children require much more sleep than adults; and the younger the child the more sleep it requires; but up to the third or fourth year of their age, children should be allowed an hour or two's sleep in the middle of the day.

* Dr. Clarke's Commentaries on the Diseases of Children.

Regularity in the hours of going to sleep, as well as in every other particular, ought to be scrupulously attended to by all who wish to rear a healthy offspring. The child should be always accustomed to retire early to rest and be allowed to get up in the morning as soon as it awakes of its own accord. But on no account should a child be curtailed of its hours of sleep and roused in the morning sooner than it awakes spontaneously; one child requires more sleep than another, and children in general are more complained of for waking too soon, than of sleeping too long.

The sleeping-room should be large and well-aired, but it should, at the same time, be warm and free from draughts. The child's bed ought to be without curtains; and it should lie upon some firm and elastic material—such as a small tick, stuffed with straw, which can be frequently dried and exposed to the sun and air. By and by, a hair mattress will be necessary as it advances in age.

Air and Exercise.—The child now begins, if at all in good health, to feel an irresistible impulse to use its limbs in attempting to walk; its legs and arms are in constant motion; it seizes everything it can lay hold of, and expresses unequivocal signs of wishing to crawl on all fours. As we have already said, these movements, its crawling, its grasping objects, and its endless and varied bodily motions ought on no account to be checked or interfered with in one way or another. Every movement is the manifestation of one of nature's laws, and every obstruction to, or improper interference with, any of these laws is invariably followed by punishment. A child, unless improperly urged, which ought never to happen, will not take so much exercise as to induce over-fatigue; but its parents and nurses are often so delighted to see it beginning to acquire the use of its limbs, that they improperly encourage it to carry its exercise of them to excess. They must be reminded, however, that at this age the bones of its legs are soft and flexible, and if urged to sustain the weight of the body beyond a proper length of time, they will become bent and deformed.

As the age advances, the child must be allowed daily exercise in a garden or field, when it will have a sufficient amount of it in running about at its plays; and this, too, with much more benefit than when urged by an injudicious nurse to take a monotonous walk on a straight road. The child ought to be allowed perfect freedom to run about in the fields, if living in the country; and, if in town, it ought to be carried out quickly to a proper place at some distance, and then allowed to run and play about for a longer or shorter time, according to the state of the weather. One of the most pernicious plans which can be adopted by a nurse is, when she is giving it what she calls out-door exercise, to prevent the child using its legs at all, but to keep carrying it, while she stands or saunters about gossiping with her neighbours, the child at the same time, not only having its legs and lower parts of its body confined and squeezed in her arms; but, if the weather is cold, it is chilled to such a degree as frequently to give rise to catarrhs, croup, or inflammations, which either terminate its existence or impair its constitution for life.

LARGE SHEARS WITH A CONTINUED MOVEMENT.

BY M. FREY, MECHANICAL ENGINEER AT BELLEVILLE.

M. FREY, who devotes his attention to the construction of various ingenious machines, has executed for the workshops of the Northern Railway in France, and for other establishments, several machine-tools of useful application; and, in particular, a system of shears, with a continued movement, which is now employed with advantage in various mechanical operations.

M. Cavé, at Paris, Mr. Nasmyth, in England, and M. Nillus, at Havre, have likewise for several years been engaged in constructing machines of this description, which are very useful, either for cutting thick bars of iron, as rails, wheel-

Thus, at the height of the first gallery, the waggon, *m*, (which has been conveyed either directly by the tramway, *x*, or by the intervention of a horizontal car or moveable frame, *o*,) is hooked to the two pins of the ascending parts of the chain, and is consequently drawn up to the top of the apparatus. It then descends again, remaining always suspended by the same pins, and falls exactly on a tramway, *p*, laid at the entrance to the gallery, and leading to the spot where the waggon is to be emptied.

By making the chains descend to the lower part of the shaft, where they pass over two parallel pulleys, *q*, similar to the first, and mounted on the same axis, they can discharge at the same time several successive galleries, situated at different stages. Thus there are two galleries shown in the annexed cuts, which may be supposed to be at any distance, the one above the other.

When the same mechanism or apparatus is intended to serve for raising the loaded waggons, and lowering them again when empty, the inventor places at the mouth of the shaft, and at the opening into each gallery, cars or moveable frames, *o*, *o*¹, *o*², which, being formed simply of a wooden truck mounted on four wheels, carry at each end short rails, *x*, for receiving successively each of the waggons about to be hooked on the chain, either for raising or lowering them. These trucks receive at fixed intervals a come-and-go movement, by means of a very simple mechanism which has been contrived by M. Cavé for the purpose.

This mechanism consists of a lever beam, placed, like the rest of the motive power at the top of the shaft, and to the extremity of which is jointed a vertical rod receiving an alternating movement, by a very obvious arrangement, connecting the other extremity of the lever with one of the principal axes of the apparatus. The vertical rod is connected with each of the moveable frames or trucks by levers, bent at a right angle, which oscillate on their axes or fulcrums fixed into horizontal beams.

From this arrangement it results, that each time the rod is drawn up, it causes the trucks to move from left to right, and *vice versa*. By this alternating movement, the frames are brought into communication at one time with the tramway on the right, *p*, at another with that on the left, *x*; and thus serve the double purpose, either of delivering the waggons which have been deposited by the chains, or of placing the waggons so as to be caught by the chains, for the purpose of lowering or raising them.

All this additional apparatus of trucks or moveable frames, and the mechanism requisite to give them the desired movements, are not required when two similar sets of chains can be fitted up in the same shaft, with corresponding machinery to drive them; for then the one may be exclusively employed in raising the loaded waggons, and the other for lowering them when empty.

DOMESTIC MEDICINE.

CHAPTER IX.

ON THE GENERAL MANAGEMENT OF CHILDHOOD AND YOUTH, AND ON THE DISEASES INCIDENT TO THAT PERIOD OF LIFE.

THE period of *childhood* may be said to include the years which intervene between the completion of the first and the completion of the second dentition, or from about the end of the second to the seventh or eighth year.

The period of *youth* comprehends that space which intervenes between the seventh or eighth year to the age of puberty, which, in this climate, generally occurs at from the twelfth to the fourteenth year in females, and from the fourteenth to the sixteenth year in males.

During this epoch of life—from the time the first, or milk set of teeth are cut, till the age of puberty—the growth of the various organs of the body, and the development of the mental faculties, proceed at a very rapid rate. The limbs become stronger and more active; the flesh and soft textures

acquire firmness and increased bulk; the bones enlarge, become harder and firmer, and much more adapted for supporting the weight of the body and for defending the internal organs from injury; the functions of digestion and nutrition, of secretion and excretion, are much more perfectly performed; the organs of sense and all the mental faculties improve in power and energy, and, towards the end of this epoch of life, the distinctions of sex, both mental and physical, become more and more prominently marked.

During the accomplishment of these important changes, the circulation of the blood becomes less and less rapid, the pulsations of the heart and arteries less frequent, the breathing more regular and slow, the nervous system less susceptible of impressions by slight causes, and the acute sympathy between the skin and internal organs, which is so visible during childhood, becomes considerably diminished.

In no part of the body are the changes which arise from an increase of development more decided, or productive of more important effects, than in the brain. During the earlier stages of infant life, the growth of the brain, and the consequent size of the head, increase at a remarkably rapid rate. For the accomplishment of important ends, the size of the head is small at birth, the bones of the skull are loose and compressible, they are detached from one another, and, in many places, particularly at the upper part of the forehead, or *anterior fontanelle*, they form a very deficient covering for the brain; it is not, indeed, till about the fifth year that these openings are completely closed. Instead, however, of this being any defect or imperfection, it is of the greatest use in permitting the rapid expansion of the brain, occasioned by the growth of that organ, and by the congestion or determination of blood to the head, which often takes place during teething; this conformation serves also to mitigate the effects of falls or blows on the head, to which children are so liable during the first years of their life. A rapid increase of size, however, is not the only change which the brain undergoes during the period of childhood. From the completion of the first dentition till the age of seven or eight years, the brain assumes a remarkably different structure; it acquires, from year to year, a much greater degree of firmness and consistency, and contains a less amount of blood. It is in these, and other physiological facts, that medical men see so many and so cogent reasons for advising that this organ be not stimulated to undue activity by any sort of forced education and mental training, till it has acquired a sufficient degree of strength and consistency to permit of such exercise without imminent risk to the health and life of the child.

If the constitution is sound and free from hereditary disease—if the child has not suffered from previous illness, or from the effects of early mismanagement, as it advances in age, and gradually acquires strength and vigour of body, it will be more enabled to withstand the different causes of disease to which it may be exposed. Except, therefore, two or three epidemic and unavoidable complaints, such as hooping-cough, measles, &c., to which all children in this climate are subject, the diseases of childhood and youth are, or ought to be, very few and very simple; by following the instructions in regard to the period of infancy which we have previously given, and adopting the general plan of management we are about to recommend, the period of childhood may be passed, and the age of puberty reached, by the generality of children, with very little trouble to their parents, in a medical point of view. But in after years, when the excesses and improprieties of youth begin to tell upon even the soundest constitution, or when a person has been subjected to any of the various causes of disease previously enumerated, acting either by themselves, or in combination with the effects of these excesses, it is then that the human body is so liable to fall a prey to the innumerable and serious diseases which baffle medical skill and shorten man's existence.

GENERAL MANAGEMENT OF CHILDHOOD AND YOUTH.

Food.—In addition to the instructions which are given in last chapter, regarding the food of infants after weaning, we have little to say farther than to repeat, that no regular system,

or fixed theory of diet, can be given, which will apply to all cases, under all circumstances; and to tell those who adhere, with unreflecting obstinacy, to such an opinion, that, sooner or later, they will have ample reason to repent of their folly. The four following requisites of a proper dietary, however, ought to be as closely adhered to as possible.

1. *Regularity in the hours of meals.*

2. *Food of a mixed, but of a plain, simple, and nutritious quality.*

3. *A careful avoidance both of any excess or deficiency in the quantity or quality of nutritious ingredients.*

4. *An absolute prohibition, under ordinary circumstances, of wine or malt liquor, and of stimulating condiments, such as mustard, pepper, &c.*

1. From the earliest age the child should be fed at fixed and regular hours, and, till about the age of two or three years, the intervals between the meals are so short as not to admit of any pieces of biscuit or bread being given with impunity during these periods. As the age advances, however, and these intervals gradually lengthen, there can be no solid objection to allow a child a piece of plain bread or biscuit, if we are certain that it suffers from real hunger, and is not giving expression to a morbid craving for some variety in its occupation, or is expecting to be supplied with some sweetmeat or other dainty, which should invariably be denied.

2. It is in accordance both with reason and experience, that the plainer and simpler the food, the better adapted will it be for the healthy nutrition of the child, and the less productive of those derangements of the stomach and bowels which so often arise from improper food. The diet of children ought neither to be exclusively animal nor exclusively vegetable, but a mixture of both, in such proportions as to suit the individual constitution, age, and appetite of the child. Salt meat, stewed dishes, animal food too much or too little cooked, the indiscriminate use of slops, tainted fish or flesh, highly seasoned articles, new cheese, baked pastes, pies, tarts, and the boiled dough of puddings, and uncooked vegetables, are all objectionable, and some of them very highly so, as articles of food for children. None of these things should appear on the nursery table, or in any way be brought into a child's sight, if he is to be denied its use, as nothing is more apt to excite a desire of gratifying the appetite by stealth, or to lay the foundation of that gluttony or gourmandism which shows itself in after-life, than habitually denying children the luxury of tasting those dainties which they see grown-up people eating with so much relish, and which they imagine, by the very prohibition of their use, to be more gratifying to the taste than they really are. On this account it is much better to allow the occasional use even of pastry and sweetmeats, to children above two years of age, and more particularly if they are in the way of seeing them used at table.

In guarding their children against the use of improper food, parents often fall into the opposite error of denying the use of necessary articles of diet, a remark which applies, in a special manner, to the general prohibition of *ripe fruit*. A moderate use of good ripe fruit from the garden, such as strawberries, gooseberries, &c., or of good oranges, grapes, &c., is not only in accordance with nature's instinctive desires—the gratification of which will be often attempted, if good ripe fruit is interdicted, by the use of unripe and improper fruit—but an occasional allowance of good fruit will be found very cooling and wholesome to children, if not carried to excess.

3. There are people who hold the opinion, that the more nutritious the food, and the more they can cram into the stomachs of their children, the stronger and healthier will they be. There are others who hold an exactly opposite opinion, and condemn their offspring to follow the example of the inhabitants of tropical climates, by confining them to a sparing diet, exclusively composed of vegetable and farinaceous substances. Between these two extremes, however, there is a *golden mean*—a *mixed, plain, unstimulating, and moderately nutritious* diet for children, which will be

adopted by all who follow the dictates of nature on this subject.

4. The stomachs of healthy children and young persons, till far beyond the period of youth, are fully capable of accomplishing all the offices of digestion without the aid of any stimulus whatever. Wine, spirits, and malt liquors of all kinds, are not only *wholly unnecessary*, and, on that account, ought to be prohibited, but their habitual use is absolutely prejudicial in any shape or form; it can only serve to bring about a very bad habit of body, an inflammatory state of the blood, and, in nine cases out of ten, will be productive of the worst consequences in after-life.

With the single exception of salt, and, perhaps, a little vinegar and lemon juice, the use of *condiments*, as mustard, pepper, pickles, &c., ought on no account to be permitted to children and young people; when taken to any extent, even by grown-up persons, they are attended with hurtful effects, except in those long habituated to their use.

Clothing.—The great object of clothing being to serve as a protection from cold, the best way to effect this object is to have every part of the body covered with *warm, light, simple, and easy-fitting* clothes.

When will the caprice of fashion give way to common sense? When will parents throw aside their weak and petty vanity, and clothe their children in accordance with the laws of nature and the physical necessities of the infant frame? The great majority of mothers—in the middle ranks of life, at least—never for one moment think of what shape of dress, or what texture, will most effectually protect their children from the effects of cold, and from sudden changes of temperature, in a moist and variable climate; their sole aim is to make the child represent *their* beau-ideal of *smartness* and *neatness*. But let them remember that such smartness and neatness are effected at the invariable risk, and often at the expense, of the health and life of the child, and that, at the shrine of the demon *Fashion*, many thousands of British children are sacrificed every year.

Some parents, again, err on different but equally false principles, by clothing their children slightly, leaving great portions of their legs, knees, and arms uncovered, for the purpose of making them robust and hardy. But let such parents reflect seriously on the fact, that it is impossible to harden a generation without sacrificing the weaker members; and this could be accomplished far more scientifically, and at an infinitely less amount of suffering to the child, by adopting the practice of some savage tribes, who kill their weakly infants soon after their birth! The mother or nurse may feel warm and comfortable, because warmly clad,—the child may be amused by being out of doors, and it may give no signs of suffering, because cold does not produce its bad effects at the moment of its application,—while, during all this time, the seeds of disease are taking firm root, and will assuredly show themselves, sooner or later, in inflammation of the lungs, windpipe, bowels, or brain. But, because these effects do not immediately follow, the connection between cause and effect is lost sight of, and the health and constitution, or even the life of the child, is destroyed, by the frequent repetition, or the long duration, of a cause which is never suspected by the parents or nurses, from its not being in visible operation at the time of the attack.

It is an utter wasting of words to tell a mother that the pressure of stays acts as a powerful cause of disease in her young daughter, by an undue compression of the internal organs; that if the free action of the lungs, stomach, heart, and liver, be in the least degree interrupted,—which it always is to a greater or less extent by the use of stays,—such confinement and interruption will prevent the necessary growth and bulk, and will render her peculiarly liable to consumption, disease of the heart, indigestion, &c.; *as long as a mother labours under the delusion that a small waist and slender body constitute the ideal of beauty and the perfection of the human form*, so long will she persist in sacrificing everything—health, strength, and even life itself—at the shrine of that capricious goddess, fashion, which rules her with despotic sway. It is equally useless to lecture her upon the impro-

priety of cramping her child's feet by tight and ill-fitting shoes, and telling her how productive such compression of the feet is of corns and other tumours; till she lay aside the Chinese notion that unnaturally small feet is a beauty, she will turn a deaf ear to all such remonstrances. Until, indeed, female education is based upon sounder principles, and until a general outline of human physiology is made one of its elements, medical philanthropists may write and talk, but they will write and talk in vain upon all such subjects.

To parents who are not slaves to the caprice of fashion, and are not obstinately wedded to the antiquated notions they have imbibed from those nurses and old women who fancy themselves much better instructors, on such subjects, than medical men, although the latter have not only an intimate knowledge of the structure of the human body, but have made the causes of its disease a special object of inquiry, reflection, and study,—to such parents we would urgently recommend the following advice:—

Let the dress of children be *warm* in winter, spring, and autumn; let it combine *lightness* with *warmth* in summer, and let it be *simple*, and constructed in such a manner as to place no restraint upon the motions of any part of the body. If the pecuniary circumstances of the parents are incompatible with fine outer clothing, and a sufficiency of inner garments to insure frequent changes, by all means sacrifice the fine clothing to attain the latter object. Whether the child under two years of age has worn flannel next the skin or not, in such a variable climate as Britain, and particularly when they come to be exposed to cold and wet, children above this age ought to have a waistcoat of fine flannel next the skin, at least during autumn, winter, and spring; and if they show the least disposition to weakness of constitution, affections of the chest or bowels, they ought not to throw it aside even in summer. It is said to be more conducive to health to leave it off during the night; but children so often uncover the upper parts of their bodies during sleep, that, in our opinion, they ought to be provided with one flannel waistcoat for the day, and another for the night.

Let children, therefore, have "frequent changes of comfortable and clean clothing, no undue exposure of neck, arms, or legs, and an entire avoidance of unequal or undue pressure by corsets, shoulder-straps, tight shoes, &c."* "The only way we can assist in forming a really fine figure, is to remove all restraint, and secure, as far as possible, so free an action to the muscles as will lead to their perfect development."†

Cleanliness.—To what has been already said on this subject little need now be added, except an injunction to scrupulous exactness and attention to frequent changes of clean clothing, and a rigid adherence to the daily ablution of the whole body with cold water and yellow soap, followed by brisk friction with a soft flesh glove or rough towel.

Every nursery ought to be provided with a large shallow tub, in which the child could sit or kneel, and first be washed, or, if old enough, wash himself all over with a large sponge, then make two or three plunges amongst the water, and afterwards be quickly dried, rubbed, and dressed; the face, neck, and ears should then get an additional washing; the nails, teeth, and hair, ought to be carefully cleaned and brushed every day; everything, in short, should be done to make the child acquire habits of cleanliness, even to the extent of debarring him from the company of the family till he is in every way fit to make his appearance at table.

During infancy, the head requires great attention, and ought to be washed every day; but after two years of age once a-week will be sufficient, if it is carefully combed and brushed every morning. The hair of boys ought always to be kept short, being most conducive to health; and even in girls, under twelve, long hair, when it is allowed, as it often is, to become a receptacle for all kinds of filth and vermin, is not only very disgusting, but most prejudicial to health. Unless, therefore, parents or nurses have ample time at their command to devote to its thorough cleaning every day, the

hair of young girls had far better be kept at the length of three or four inches at most.

In washing the head, soap ought to be used, or what is recommended as preferable, both for the growth of the hair and the removal of scurf and scales—the yolk of an egg.

Sleep.—As the child advances in age, a less amount of sleep will be sufficient; but, as we remarked in last chapter, an hour or two's sleep in the middle of the day, for the first three or four years, is of the greatest utility in restoring that vital energy which is so soon exhausted in childhood, and in promoting the healthy growth and vigour of the infant frame.

During the first epoch of infant life, the child should sleep with its mother, both for her convenience and its own comfort; but afterwards it ought to sleep in a crib or small bed by itself; and it ought on no account to be allowed to sleep with an old person, or one in ill health. The sleeping-room should be as large and airy as possible, comfortably warm, and free from draughts; and to permit the free access of air, the child's bed should have no curtains.

Children ought to be sent to sleep early; seven o'clock, or half-past seven, being the latest they should be allowed to be out of bed, till they reach the age of eight years. From that period till about the fourteenth year, they ought to be asleep by half-past eight, or nine o'clock at latest. Nothing is more liable to retard the growth, to injure the health, to expend the vital energies, to produce a weak, worn-out, and ghastly aspect, and to encourage indolent and irregular habits, than late hours for children and young persons. There is both sound common sense and true philosophy in the old proverb, "*Early to bed, early to rise, is the way to be healthy, wealthy, and wise.*"

Air and Exercise.—If there is one point more than another in which the fashions and customs of the greater portion of the middle and upper classes of this country, are utterly at variance with the precepts of nature and the laws of physiology, it is in the amount and manner of exercise which they allow their children, and more particularly their girls, from two to fourteen years of age. For the first few years of infant life, they are confined for the greater portion of the day to the nursery, and when they are sent out for air and exercise, they are not permitted to use their limbs, but carried out in the nurse's arms, with their legs and under part of the body squeezed together, and their feet, arms, and hands often chilled with cold. Dressed out in all their showy finery, which is much more thought of and more prized than strength of limb and vigour of muscle, their exercise for the next three or four years is a regular soldier-like march or drill, on a straight road, once or twice a-day, with toes out, back and shoulders straight, head erect, no allowance to move to this side or that, and if they dare jump aside and tumble on the grass, or kneel down and pick flowers, they incur the heavy displeasure of the mother and nurse for being so naughty as to spoil their very pretty and very becoming dress!

While yet mere infants, at the age of four or five years, they are confined in the school-room or sent out to school, the great object being to make them prodigies of learning—little old men and little old women. These schools, and particularly infant schools, are quite misnamed; they ought rather to be called *infant prisons*; they are indeed worse than prisons: by the system of teaching practised in them, not only are the mental faculties of infants and children urged to premature activity, at the expense of the healthy growth, of the future strength, and of the robust vigour of the body, but these very faculties themselves are cramped and checked in their development, the minds of the poor victims are overtasked and get confused, an innate hatred and dread of books take deep root, so that their chance of displaying even a mediocrity of talent in mature years is but very small.

In these respects the children of the poor, during the earlier years of their existence, are placed in much more favourable circumstances than the children of their richer neighbours. With no fine clothes to spoil, no rigid rules of discipline to adhere to, no capricious nurse to interfere with them, they are allowed to choose the mode and amount of their exercise,

* Dr. Fleetwood Churchill on the Diseases of Children.

† Dr. Underwood on Diseases of Children.

perfectly free and unrestrained: in fine weather, they almost live in the open air, running and playing about from morning to night; in cold or wet, however, they run the risk of suffering from exposure to these powerful causes of disease. But as to their moral and educational management, the children of the poor are in much worse position than the children of the middle and upper classes; they are sent to school at even an earlier age, not for the purpose of making them learned parrots like the others, but, as a matter of convenience to the parents, to keep them out of the way; they are therefore subjected to the same unfortunate treatment—a system of cramming their minds and cramping their intellects, of enfeebling their bodies and arresting their growth. There is scarcely an instance on record of a precocious child ever having been distinguished for superior talents in after-life. Men of the greatest genius have been generally noted for their dullness and stupidity during their childhood; the cause being that they are possessed of deep reasoning powers, but are deficient in quickness of perception, which is the quality that enables a child to gratify its parents by a display of superior talent while yet a mere infant. But an over-cultivation of the perceptive faculties checks the development of the reasoning powers, and the boy who displays a quick perception is liable to have his brain overtasked, and his mental powers overstrained; he shows a great aptitude for learning, and will perhaps appear as far advanced at the age of six or seven, as his duller brother will be, several years older. This dull brother, however, quietly observes and reflects on everything around him; he thinks and reasons within himself, whereas the quick boy learns like a parrot to be the creature of imitation; he will rarely ever display much originality; he can do nothing but what he has been taught.

A child, from two to ten years of age, will be in perpetual motion during its waking hours; and if it keep at all within the bounds of moderation, its exercise ought not to be interfered with; it cannot be too much in the open air, as long as there is no danger from cold or wet; and it will rarely carry its exercise to the extent of over-fatigue, if left to the freedom of its own will. For delicate and sickly children, who are unable to take a sufficient amount of exercise on foot, pony exercise will be an excellent substitute when it can be afforded; and when this cannot be done, exercise in a swing for an hour or two a-day will be found to be very beneficial to weakly children.

The exercises of children should be free and unrestrained—no tight clothing to interfere with the motions of all parts of the body—no tight-fitting shoes to cramp and distort the feet—and no rigid attention to rules of walking, such as keeping the step, turning out the toes, holding up the head, &c.; if we wish to rear a well-developed race and a healthy offspring, we must allow our children the liberty of scampering about in the green fields, or in some proper playground, with the utmost freedom, and even at the risk of occasionally making a mess of themselves.

But the most urgent and important caution which we would give to parents, is to beware of overtasking the brain while yet in a state of great softness, fulness of blood, and rapid growth; it would be equally reasonable to expect a child to lift heavy burdens with its arms, as to expect it to be able to suffer even a moderate amount of mental application, (which solely consists in the exercise of the brain,) without the most imminent risk of permanent injury. A child ought not to begin its letters till the age of five years; and even then merely as a play. It ought not to be sent to school till it reach the sixth or seventh year. Its confinement in school, during the first year, ought not to exceed two or at most three hours a-day; during the second year, three or four hours; four hours a-day ought not to be exceeded till the twelfth year is reached; and it ought to have a considerable interval of relaxation in the middle of every day. Were such a plan adopted during the education of youth, a "*mens sana in corpore sano*," (a vigorous intellect in a vigorous body,) would not be such a rare commodity; six months' education conducted upon proper principles, after eight years

of age, would be of more value than three years' infant mental drudgery—for it is not education—carried on in the common way, and that too with infinitely less detriment to the health of the child. A moderately lengthened confinement to a sitting posture in school, with no support to their backs, and when their weak and soft muscles are worn out with fatigue, is absolute murder to children and young people; their bodies get crooked; their limbs become soft and emaciated; girls get curvature of the spine; and all to a greater or less extent suffer permanent injury. "Children have an ardent curiosity, a most retentive memory, and a strong propensity to, as well as a great power of, imitation. These circumstances prevent their being capable of patient attention to one object for any length of time, and explain the perpetual restlessness, levity, and caprice, which form the characteristics of that age. In regulating the exercise of the mind and body, these natural dispositions should be invariably kept in view. It may be truly said, that many facts relating to mechanics and to natural history may be communicated with advantage to young children. It is easy, therefore, to contrive a variety of occupation for their minds, and at the same time to afford them a good deal of bodily exercise in the open air, without allowing them to acquire those habits of idleness and of sauntering, which are sometimes with so much difficulty eradicated."*

DISEASES INCIDENT TO CHILDHOOD AND YOUTH.—This epoch of life contrasts very favourably with the period of infancy, in regard to the liability of the child to be affected with disease. After the dangers of teething are over, the child ought to be a very picture of health and happiness. It is true that disorders will arise which can neither be foreseen nor prevented, and it is also true that no preventative measures are yet known which can shield a child from the infection of measles, scarlet fever, hooping-cough, or even from modified small-pox;† still, if the constitution of the child be in a sound state; if it has not been deprived of the enjoyment of a sufficient quantity of wholesome food, of active exercise in a pure atmosphere, and of sleeping alone in a large, well-ventilated apartment, where not more than two others sleep; if it has not been exposed to wet and cold, and, in short, if the general management above recommended has been adopted, its chance either of escaping disease altogether, or of getting safely through most of those diseases which are the cause of so much anxiety and dread to parents, will be very great indeed.

No parent can absolutely change the constitution of his child; if it be naturally weak, or vitiated by hereditary taint, its condition of body may be greatly ameliorated, but can never be thoroughly changed. Notwithstanding the truth of this statement, however, the amount of health and disease which falls to the lot of most children is very much in their parents' own hands. We do not hesitate boldly to assert, that it will in a great degree depend on the treatment of a child by its parents, whether it will reach maturity or not, and whether, having arrived at maturity, it will have a constitution capable of sustaining the body in a sound state of health through the "*wear and tear*" of active life. By the treatment of a child by its parents, we do not mean medical treatment, but the adoption of the general rules of management above laid down; the less medical treatment or administration of drugs they get, the better. Nothing has a more powerful effect in weakening the constitutions of children and in producing disease, than the practice which some parents have of constantly dabbling amongst drugs; they dose their unfortunate children with purgatives, for no better reason than because some time has elapsed since they have had any, or because they erroneously suppose that their blood requires to be purified; they dose them with carmina-

* Dr. Hamilton on the Management of Children.

† Although vaccination has, unquestionably, the merit of saving the lives of thousands, and tens of thousands, of children annually, who would have fallen a prey to virulent small-pox, but for the discovery of the immortal Jenner; still, its warmest advocates do not claim for it the merit of being an effectual preventative of small-pox, but merely of in most cases very greatly modifying, and in many cases of preventing the disease. No parent can therefore neglect the use of it in the child, without incurring the highest degree of culpability.

tives, such as Dalby's Carminative, or some other trash, because they are troubled with flatulence, forgetting that flatulence arises from indigestion, and no carminative on earth can do more than produce temporary relief—most of them, indeed, do much harm; they, or the nurses by stealth, dose them with sedatives, such as Godfrey's Cordial, or some other slow poison, when the children are fretful, perhaps from teething, and are unwilling to go to sleep. All medicine, and particularly calomel, which is so great a favourite with mothers and nurses from its tasteless property, ought to be banished for ever from the nursery, except a little castor-oil, with perhaps a little rhubarb and magnesia. If a child is at all well, it ought never to taste medicine of any sort; and even if it be slightly indisposed, the simplest means should first be tried, such as restricted diet, light food, warm bath, change of air, &c., for it would not be more irrational to apply leeches or a blister to any part of the body where no pain nor the least disease existed, than to administer medicine of any sort, and particularly purgatives, to a child in perfect health.

The constitutions of children, as well as of grown-up persons, are as varied as the expression of their countenances. No two constitutions, even of those belonging to the same family, are exactly alike. One child will be of a costive habit of body, having its bowels opened only once a-day, and a day will now and then even be passed without a single stool; while another child will have its bowels opened regularly twice or three times every day—both these children, at the same time, continuing in the most perfect health. One child has what may be called a *gross* appetite; it is not particular as to what it eats, if it only get sufficient quantity; its stomach seems to digest anything; while a brother or sister has a small appetite and a weak digestion, the stomach becoming quickly disordered if it get anything but the most digestible food, and that too in limited quantity. One child again, and generally the one with the good appetite, is of a restless, active disposition; it is never happy but when romping about, or engaged at some active employment; while its brother or sister, with the weak appetite, is of a quiet sedentary disposition, dislikes being disturbed by the noisy sister, does not seem to require much exercise, and is easily amused with trifles. In short, the variety of constitution and of disposition amongst children is endless; and it would be no less utterly impossible to effect, than madness to attempt, the assimilation of these different and various constitutions and habits of body, by the use of purgatives, or any medical treatment whatever; *as long as the child is in tolerable health, the administration of medicines is most pernicious.*

Our next chapter will be occupied in describing the chief diseases incident to childhood and youth, in detailing their different symptoms, their causes, and the domestic treatment applicable to each; but as the great aim and object of this treatise is *not* to teach "every man to be his own doctor" or his child's doctor, but to instruct those who have their vision undimmed by the mists of prejudice, how to escape disease and avoid the necessity of doctoring, our remarks on these heads will on that account be very brief. It would, indeed, be infinitely more easy for a man to be "his own lawyer" or "his own parson," than his own or his child's doctor; he could study these professions, and no obstacle might stand in the way of his pronouncing a tolerably clear opinion on any given point; but it is totally different with the practice of medicine: when a person becomes affected with any sickness or disease, his mind participates in the ailment; when his child is taken ill, his feelings participate in its ailment; in neither case is his judgment clear and unclouded, *so that even a medical man, much less a non-medical, is totally unfit to be his own or his child's doctor.*

From these considerations, as well as from many others which our space here does not permit us to touch upon, we have no hesitation in saying, that it would not be a greater act of madness to embark on a voyage in a ship without a rudder, or trust her to the guidance of a landsman who knows nothing either of the sea, of the effect of winds, &c., on the ship's motion, or of the various rocks and shoals which may

lie in her path, than to trust to the advice of our first chance visitor, or indeed of any visitor, to be guided by the empirical advice of a prescribing druggist or any other quack, or even to depend on our own skill and judgment, when we ourselves or our families fall a prey to disease.

HORTICULTURE.

CHAPTER VI.

THE PRACTICAL MANAGEMENT OF VEGETABLES.

ALL sorts of garden crops are far better sown in drills than broadcast. By so doing, three very important advantages are obtained. In the first place, it is far easier to keep down the weeds in drilled crops; secondly, the stirring and pulverizing the ground are much more easily accomplished; and lastly, in a drilled crop there is no difficulty in preventing individual plants from being too close together, and from being in consequence starved, and consequently never attaining their full maturity. It may be laid down as a rule, then, that all kitchen vegetables, down to radishes and onions, should be sown in drills.

As a constant succession of crops is taken from a garden, all of which tend to deteriorate the soil, it is not only necessary that the garden be in good heart, but that it be kept so by an abundant supply of manure. It may be put down as an axiom, that in good gardening there should be manuring for every crop. Sometimes, indeed, it is proper to give one crop a double manuring, and the next that follows it none. The plants that require such a treatment will immediately be noticed. The manure commonly employed in gardens is either ordinary farm-yard manure, or stable litter. But the portable manures used by farmers, such as bone-dust and guano, are too much neglected by gardeners. The good effect of a liberal dose of bone-dust to the soil of an exhausted garden is very great.

All drills should, as a rule, be made to run north and south, so as to give to each plant in them the same amount of exposure to the sun. If this be neglected, the chance is that the crop will come to maturity so irregularly, as, when things are managed on a small scale, not to furnish sufficient at a time for a dish. But, as sometimes is the case, if a small garden, only one crop—as of broad beans, for example—is planted, it is better to sow in a little additional quantity, and to make the drills not run north and south. By this the supply may be made to last over a very considerable period.

Every weed should be eradicated the day it makes its appearance. This not only prevents it from propagating, but increases, and to a considerable extent, the amount of vegetable produce obtained. A certain area of the garden will grow a certain amount of vegetables. If peas, for example, are grown upon it, and nothing else, all the amount of vegetation will be peas. But if two-thirds of it are cropped with peas and the remaining third with weeds, one-third less peas will be obtained.

The ground between the drills, when the plants are young, and the roots do not extend far from the centre of the drill, can scarcely be too much stirred. The reason of the good results that follow this process is, that air and moisture are admitted to the different particles of earth. This promotes the union of the elements of which the soil is composed, in such a manner as to become suited to supply the plant more readily with food.

Too little attention is paid to watering vegetables, particularly when they are young, and their roots small and superficial. A young plant, during drought, not only, by making little or no progress, loses time, but it acquires a sickly, diminutive habit of structure, and never produces the return which it otherwise would have done. Plants should not be watered during heat and strong light, as, under such circumstances, the cold produced by the great evaporation that takes place is greater than the good which the supply of water does. The holes in the rose of most watering-cans are too large; and when this is the case, the water falls in such large drops as to batter the surface of the ground, and form a crust so hard as to prevent the access of air and moisture to the soil.

Crops that attain no great height, and come rapidly to maturity, may be sown between the drills of young peas, beans, &c. In this manner, mustard, cress, lettuce, radishes, and spinach may be grown. But any one following this practice must remember, that even these small crops take so much from the ground, and that, to keep up the fertility of the soil, he must restore it in the shape of manure.

Having made these general observations, we proceed to the management of each individual vegetable.

PEAS.

It is common to sow a crop of peas in November, in the hope of having an early crop. A part of the garden, where the soil is light, dry, and sheltered, should be chosen for this purpose. As a general rule, the soil where peas are planted should have been manured for the previous crop, as the presence of undecomposed manure is believed to cause the pea to produce an excess of stalk, and therefore a deficiency of pods. The drills for this early crop should be an inch and a half deep, and they may be made about a yard asunder. The kind selected should be the Prince Albert, and a pint of seed should plant a row twenty yards long. One or more similar sowings may be made in February.

From February to the end of May, the main crops of Prussian blues and Imperial greens should be sown; and to insure a continuous supply, it will be necessary to have a sowing about once in three weeks. The drills for these should be made about two inches deep and five feet asunder, and one pint of seed is sufficient for a row of thirty yards and more.

After the end of May, the Prince Albert peas may be sown at intervals until the end of July, in the same manner as for the earliest crops.

It is common to soak peas in water for a few hours before sowing them, to hasten their germination.

Always after the peas are covered in in the drills, a few baited mouse-traps should be placed near them, as garden mice are very apt to scratch down to the seed, and eat it. Means must be taken, too, to prevent the ravages of birds.

When the young plants have attained the height of an inch, they must be earthed up, and this must be repeated from time to time, always selecting dry weather for the operation. The earth between the young plants should also be loosened, and weeds cut down. When the young plants have attained a height of about six inches, it is time to stick them. These sticks should be five or six feet high, and have a good many branches on. Each row of peas has a row of sticks, but some of the sticks should be placed before the peas, and some behind.

The early crops should be protected from the frost, by being covered at night with straw and the like, and after April, if the weather be dry, the peas must be watered. The late crop will almost infallibly require watering; and if this precaution be neglected, they will be ruined by mildew.

The early crops are gathered, at least at first, when the peas are very young, but afterwards they should be allowed to reach their full size; and a few of the earlier ones should not be gathered at all, but allowed to ripen, as doing this is found to make the crop bear for a longer time.

BEANS.

A few early long pods are sown in October in a sheltered place, in rows two feet asunder, and the beans three inches apart from one another; they should be about two inches deep. A still better plan to obtain an early crop is to sow them thickly together in a bed of light earth, in a warm situation, and protected during severe weather by some contrivance of straw, bushes, &c. When spring comes (March) they must be transplanted, and placed in rows two feet apart. In February, the main crops are begun to be sown. First, a crop of long pods may be sown at the distance above mentioned, then one of Mazagan, and then one of Windsor. These two last should be planted two and a half feet apart. Successional crops of these may be sown until the end of June, when another sowing of long pods may be put in; or a number of the beans sown in March, may, when they are in flower, be cut down. Fresh

stems will arise from these, and produce beans very late in the season.

When the young plants are three or four inches high, they should be earthed up; and this process, and keeping them free from weeds, repeated from time to time. When they come into full blossom, many gardeners pinch off the tops, with a view of making them pod better. It is very doubtful, however, if this has any such effect.

Beans should be gathered before they have attained their full size, and the pods should not be twisted off, but cut with a knife or pair of scissors.

KIDNEY BEANS.

Kidney beans do best on a light dry soil, which has been well manured for the previous crop, but which has had no fresh manure added to it.

An early crop of Dutch dwarfs may be sown in the middle of April. The drills should be two feet apart, an inch and a half deep, and the beans one or two inches asunder. From May till the end of July, successional crops of the purple-spotted, in somewhat wider drills, and the seed not so close, may be put into the ground. At the beginning of August, a late crop of Dutch dwarfs may be tried, although it will probably be destroyed by the frost. If the ground at the time of sowing be dry, the beans should be soaked for a few hours in water.

The after culture consists in earthing them up, and keeping them clear of weeds.

The pods should be gathered when they are young and tender.

SCARLET RUNNERS.

There is little use in sowing scarlet runners until the middle of May. The seed should be sown in drills four feet asunder, and about two inches deep. The seeds should be about three inches apart from one another. When the plants have attained a height of about three inches, the earth should be drawn up around them, and sticks or poles about nine feet high put into the ground behind and before them, for them to climb up.

The after culture and gathering of the pods is the same as those of the kidney bean.

THE ONION.

The soil cannot be too rich for onions, and a large quantity of very rotten dung should be intimately mixed with it. But due care must be taken that the manure really is well decomposed. The usual plan is to sow onion seed broadcast, and, for a bed of twenty-four feet long and five broad, from one to two ounces of seed will be necessary.

But it is far better to cultivate onions in drills about eight inches apart. These should be made about the beginning or middle of March. In about three weeks the young onions make their appearance. They must be carefully weeded and thinned from time to time, until those that are left are about six inches apart. In September, they will probably have attained their full growth, and their leaves and stalks will fall down. They should then be pulled up on a dry day, and spread in the house. (For the mode of preserving them, see next chapter.)

In September, or in August, a second sowing is made to supply young onions in spring. The Strasburg is the best variety for this purpose.

The silver-skinned onion, for pickling purposes, should be sown in March, and perhaps they may be better sown broadcast.

THE LEEK.

Leek seed (an ounce will produce a great many plants) should be sown in March, and the young plants kept carefully clear of weeds. In the month of June, a portion of them must be transplanted into very rich ground, placed in drills fifteen inches apart, the plants being about six inches from one another in the drills. A large deep hole is made with the dibble, the top and root a little shortened, and then the plant is put in. The earth is scarcely closed over the plant. The remaining leeks from the seed-leek must be transplanted a month later.