


CLEANLINESS—BATHING—VENTILATION.

MONG the leading conditions essential to health, are *cleanliness*, and a *constant supply of pure air*; and as it is important that all should be made acquainted with the dangers arising from a neglect of these conditions, we respectfully submit the following explanations and advices on the subject. In treating of cleanliness, it will be necessary to commence with a short account of

THE SKIN.

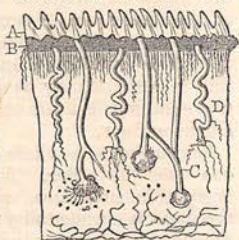
The external covering of the body, as is well known, is a soft, pliant membrane, called the *skin*, which protects the more delicate substances beneath it from injury; but it is less generally understood that this covering is not confined to the outer surface only. It continues over the lips and up the nostrils; lines the mouth and tongue; and still continuing onward, covers and lines all the parts of the throat; lines the windpipe, and extends through its innumerable branches in the lungs—lining all the passages and cells, and presenting to the air which enters the lungs an extent of surface equal to the whole external skin of the body, or, as some think, much greater. The skin also continues down the food-pipe, lining it and the stomach, and the whole intestinal canal and the ducts which open into it. In this manner, it may be said that the skin has neither beginning nor end, but is a universal and continuous coating of the body inside and out.

Throughout its whole extent, the skin consists of three layers, one over the other. The outermost, or cuticle, is an exceedingly thin substance, which may be observed to peel off when the hand is accidentally frayed, or when it is raised by a blister; the next is a layer which contains the colouring matter, giving, as the case may be, a shade from the slightest tan to the sooty black of the negro; and the third or lowest is the true skin, a thick layer, which, when taken off animals, is tanned into leather. As a whole, the skin is much more thin and delicate at one part than another, that upon the soles of the feet and palms of the hands being, by constant use, the thickest and most durable, and that within the mouth, lungs, &c. being excessively fine, and easily injured. As respects these inner parts, the skin is usually spoken of as the mucous membrane—the membrane which is moist with a mucous fluid.

Besides answering merely as a covering to the body, the skin performs various useful functions in our general economy well worth knowing. On examination with a microscope, it is found

that the lower or true skin consists of a vast combination of glands, ducts, blood-vessels, and nerves, the whole of which, communicating with the interior on the one hand and the surface on the other, are concerned in keeping the general skin in order and the body in health. Of the nerves, which are universally distributed over the surface, it is here only necessary to say that they are the instruments of the sense of touch, and convey to the mind the consciousness of pleasant or unpleasant sensations. As an organ of sensation, therefore, the skin acts an important part, and on this account alone the keeping of it in a healthy condition is deserving of careful consideration. Our interest at present, however, is confined to the functions of exhalation and absorption. An unthinking person would suppose that the surface of the body, from its general smoothness, was so close in texture that neither air nor liquid could pass readily through it. Such would be a mistake. The whole membrane may be likened to a sieve. Throughout its entire extent, externally and internally, there are a multitude of small holes or outlets, so closely set together, that we could not anywhere puncture ourselves with the point of a needle without touching one of them. These holes, called *pores*, communicate with the ducts beneath, and these ducts terminate in glands or receptacles in the muscles.

In the annexed cut we offer the representation of a section of a piece of skin, greatly magnified. The surface is covered with small conical eminences, marked A, called *papillæ*; in these are the extremities of the nerves of sensation, and also the outlets or pores. B marks the layer containing the colouring matter and the true skin; the ducts, marked C, supply nourishment to the skin; and those of a spiral form, marked D, convey the perspiration to the surface. Intermingled with the whole are numerous blood-vessels and nerves.



By the apparatus now described, portions of the fluids no longer required in the system are conveyed to the surface of the body, when they escape into the atmosphere usually in the form of vapour, but sometimes as perspiration. In the extreme heat of summer, or when engaged in hard work, this liquid exhalation is very apparent. Not being observable in ordinary circumstances, it is styled the *insensible perspiration*. In this office of an exhaler, the skin acts as an auxiliary to the lungs, which throw off more copiously the waste liquid of the system in the form of vapour and deteriorated air. The amount of these two kinds of exhalation—the cutaneous or skin exhalation, and pulmonary or lungs exhalation—has engaged the inquiries of various writers on human physiology; two Frenchmen, Lavoisier and Seguin,

having had the honour of presenting the most accurate survey of the subject. Dr Andrew Combe, in his valuable treatise on the Physiology of Health, alludes as follows to the result of Seguin's investigation. He found that "the largest quantity of insensible perspiration from the lungs and skin together amounted to thirty-two grains per minute, three ounces and a quarter per hour, or five pounds per day. Of this, the cutaneous constituted three-fourths, or sixty ounces in twenty-four hours. The smallest quantity observed amounted to eleven grains per minute, or one pound eleven and a half ounces in twenty-four hours, of which the skin furnished about twenty ounces. The medium or average amount was eighteen grains a minute, of which eleven were from the skin, making the cutaneous perspiration in twenty-four hours about thirty-three ounces." As seventeen ounces of water at an ordinary temperature are equal to about a pint, it appears that a man in good health and in general circumstances exhales through the skin nearly two pints of liquid daily. That such a large quantity should escape unnoticed, seems indeed strange; but, as Dr Combe goes on to observe, "When the extent of surface which the skin presents, calculated at 2500 square inches, is considered, these results do not seem extravagant. But even," says he, "admitting that there may be some unperceived fallacy in the experiments, and that the quantity is not so great as is here stated, still, after making every allowance, enough remains to demonstrate that exhalation is a very important function of the skin. And although the precise amount may be disputed, it is quite certain that the cutaneous exhalation is more abundant than the united excretions of both bowels and kidneys; and that, according as the weather becomes warmer or colder, the skin and kidneys alternate in the proportions of work which they severally perform, most passing off by the skin in warm weather, and by the kidneys in cold. The quantity exhaled increases after meals, during sleep, in dry warm weather, and by friction, or whatever stimulates the skin; and diminishes when digestion is impaired, and in a moist atmosphere."

Some years ago, Dr Smith made investigations as to the extent of loss by perspiration during hard labour in a heated atmosphere. Eight workmen, in a large gas-work in London, where they require to work diligently, and be exposed to a high temperature at the same time, were weighed before going to work, and immediately afterwards. In an experiment in November, they continued to work for an hour and a quarter, and the greatest loss sustained by any one man was two pounds fifteen ounces. In another experiment in the same month, one man lost four pounds three ounces in three quarters of an hour; and in an experiment of the same kind in June, one man lost as much as five pounds two ounces in an hour and ten minutes. It must be borne in mind, however, that this extraordinary difference was not caused by any direct loss of bodily substance, but by a dimi-

nution of general weight, resulting from the decomposition of the food recently taken, as well as from the exhalation of other waste fluids then lurking in the system. The experiment is here narrated for the purpose of impressing on the mind the magnitude of the operations which the skin, as an exhaling membrane, has sometimes to perform.

As nature does nothing in vain, we may ask what has been her design in causing such an exhalation of vapour and liquid from the body? The design has been the purifying of the system. The lungs are a cleansing apparatus; they inhale air in a pure condition, and having absorbed its valuable property, oxygen, they expel it in a vitiated state. This vitiated air, known by the name of carbonic acid gas, when drawn back into the lungs without any mixture of atmospheric air, soon causes suffocation and death; and even when mixed to any extent with pure air, it cannot be drawn into the lungs without injury to health. So, also, are the pores of the skin a cleansing apparatus, and, as mentioned, they are auxiliary to the lungs. The two apparatuses work towards the same important end, of throwing off decomposed and useless matter, and are in such close sympathy with each other, that when one is deranged, the other suffers, and health is consequently impaired. Thus, in all the irritations and affections of the external skin, the mucous membrane of the alimentary canal and lungs sympathises directly and powerfully; and, on the other hand, any derangement or affection of the mucous membrane at once acts on the skin and its pores.

Besides their exhaling functions, the pores and other minute organs in the skin absorb air and moisture from the atmosphere, though less actively than the lungs, and are therefore inlets as well as outlets to the system. When the pores are in a state of great openness, or relaxation from heat, the power of absorption is materially increased. Hence, contagious diseases are more readily caught by touch when the body is warm and moist, than when dry and cold. A pure and bracing atmosphere is well known to be more conducive to health than one which is heavy and relaxing.

When the skin is in a proper condition, and the atmosphere pure, the vital functions, suffering no impediment from external circumstances, proceed with the requisite energy, and the feelings enjoy that degree of buoyancy which is the best criterion of a good state of health. Of the evils arising from a vitiated atmosphere, particularly in dwellings, we shall afterwards speak. Meanwhile, we confine ourselves to the injuries likely to ensue from a derangement of the perspiratory organs in the skin. The derangement most to be avoided is the stopping of the pores, and consequent suppression of the insensible perspiration. Sudden exposure to cold, after being heated, ordinarily produces this effect. When it occurs, the duty of expelling the excess of matter which would have escaped by the pores is thrown upon

the lungs, the bowels, or the kidneys, causing undue irritation and disorder. Very commonly the lungs are the readiest to suffer. They become clogged with phlegm, which produces an irritation, and this irritation causes a cough, and with the cough expectoration (spitting). In instances of this kind, the sufferer is said to have a *cold*; but, correctly speaking, his pores have been shut by some cold exposure.

When in a perfectly healthy condition, the skin is soft, warm, and covered with a gentle moisture; the circulation of the blood is also in a state of due activity, giving it a fresh and ruddy colour. The degree of redness, as, for instance, in the cheeks, is usually in proportion to the exposure to the outer atmosphere; such exposure, when not too severe, causing active circulation of the blood not only throughout the body, but to the most minute vessels on the surface. Hence the pale and unhealthy hue of persons confined to the house and close sedentary employment, and the ruddy colour of those who spend much of their lives in the open air. When the exposure is too severe, or more than can be conveniently counterbalanced by the animal heat, a chill, as already stated, is the consequence, and the skin assumes a pale appearance, the forerunner, it may be, of bodily indisposition: the insensible perspiration has been suppressed, and the lungs have got into a state of serious irritation. Warmth and other remedies restore the healthy functions of the pores; but when the cold is neglected, inflammation of the bronchiæ, or air-tubes communicating with the lungs, or some other pulmonary affections, ensue, the lamentable issue of which may be—death.

The danger of suppressing the perspiration is increased by another circumstance. Along with the liquid exhalation passes off the superabundant heat of the body. If, therefore, we check the insensible perspiration, this superabundant quantity of heat is unable to make its escape by the surface, and returns upon the vital organs within. Fevers, rheumatism, and other dangerous maladies, are the consequence of this form of derangement, the end of which also is too often—death. In the greater number of cases, the skin may be said to be in a condition neither precisely healthy nor unhealthy, but between the two. The pores, partially clogged, are unable to expel the insensible perspiration with sufficient energy, and the kidneys and lungs are correspondingly charged with an excess of duty—not perhaps to a degree sensibly inconvenient, yet in some measure detrimental to general health, as well as to the activity of the mental functions dependent on it.

DRESS, WASHING, BATHING, &c.

It must be obvious, from what has been said, that cleanliness is indispensable in securing not only a healthy condition, but also much comfort both of body and mind. Cleanliness is attained by an attention to various circumstances and practices; for the

most part people are clean only by halves. Dress, washing, bathing, household arrangements, all require consideration.

Dress.—Purification of the skin may be greatly promoted by the wearing of clean garments. That garment which is placed next the skin, the shirt, be it of linen, cotton, or woollen, ought to be changed less or more frequently according to circumstances—such as the degree of labour, the nature of the employment, the warmth of the climate, and so on. The reason for the change is evident. The shirt is the immediate receiver of a large proportion of the matter thrown out by the pores, and much of what it receives it retains. Besides, therefore, becoming unseemly from its appearance, it becomes foul, and the foulness reacting on the skin, irritates and clogs it. Custom is the great regulator in affairs of this kind; but is not always correct. Some change their linen daily, others every two or three days, the greater number weekly. What is very inconsistent, those who change their garments the least frequently are the manual labouring classes, who should change them more frequently than any one else. As it is principally for the benefit of this numerous body that we pen these pages, we must speak as explicitly as possible.

Addressing men (and women too) who labour daily at a mechanical employment, we would offer the following advices:—

1. Do not sleep in the shirt which you wear during the day. Have a night shirt and a day one. Cotton makes the best, as it is certainly the cheapest, night shirt. A clean day shirt should, if possible, be put on twice a week, and a clean night shirt once a week. Do not be contented with the old-fashioned practice of putting on a clean shirt only on Sundays. The washing of a shirt is a very small matter; and it must be a wretchedly-paid employment that cannot afford a trifle for this useful and agreeable purpose.

2. If you labour at an employment in which fumes and exhalations of a deleterious kind are apt to be absorbed by the clothes you wear, make a rule of changing your whole garments every evening when done with work; and let your work-clothes be washed pretty frequently, and well exposed to sun and air. This advice is particularly offered to house-painters, plumbers, and all who work in oils, pigments, and metals. By inattention to this practice, the health of house-painters is extremely liable to injury. They may be said to be gradually killed by the absorption of poison through the skin, as well as by the lungs. One ordinary symptom of the disease which they contract is known by the name of *painters' colic*. Indeed, every individual employed at chemical-works, dye-works, gas-works, and the like, should be extremely attentive to the cleanliness of their clothes and persons. After ten hours' exposure in such places, both the skin and garments are to a certain extent saturated with noxious fumes, and though for several years these may produce no other

sensible effect than the inconvenience of an offensive odour, yet they are most assuredly undermining the health of the parties exposed. Washing the body thoroughly after the hours of labour, will enable the skin to throw off the greater part of the effluvia it may have absorbed; and shaking and exposing the garments to the air will materially assist in dispelling the offensive odours. It should be known, too, that dark-coloured cloth imbibes effluvia much more readily, and retains it longer, than cloth of a light or white hue.

3. The best kind of outer garments for workmen of any class are such as will easily wash; indeed all their daily work-clothes should be of materials that can be readily washed and dried. The neatest and most economical kind of cloth for jackets and trousers is strong white fustian. A tidy workman desirous of feeling comfortable and of looking respectable, may very easily have two suits, one to use while another is being washed and dried. How much a good wife may do to insure this health-giving cleanliness, need not be insisted on.

In France and Germany, workmen of every class wear a blue linen or cotton blouse over their clothes while at work, which keeps everything clean, and looks neat. The wearing of such blouses would certainly be an improvement on the use of dirty and never-washed coats or jackets. They would also be advisable on the score of economy, as protecting from tear and wear the more expensive coat and waistcoat, which in warm weather or in in-door employments might be dispensed with altogether. Blouses are also easily cleaned, and when well-shaped and neatly stitched, are anything but inelegant. By being fastened round the waist by a belt of the same material, they will not be incommo-
dious.

Washing.—The hands, face, neck, and arms, should be washed at least *twice* daily, so as to remove every vestige of impurity from the skin. These ablutions should be in the morning on rising and in the evening after labour. If the labour be of a dirty kind, as, for instance, that of painters, plumbers, blacksmiths, engineers, &c. the washing should be not only morning and evening, but at breakfast and dinner—before, not after, these meals. At the same time, the hair should be brushed, which, by the way, ought to be protected in all dusty employments by a light linen or paper cap. There cannot be the least doubt that, by such ablutions alone—nothing else being used than soap and water—the health of workmen would be very essentially promoted. Almost every gentleman washes his hands five or six times a-day; how much more desirable is it for artisans engaged in dusty or dirty professions to clean and refresh themselves as frequently!

Sponging.—This is the next step towards personal cleanliness. In cases where bathing by entire immersion of the body cannot be conveniently obtained, it may answer every desirable end to

sponge the body all over with water every morning on getting out of bed. In doing so, begin by wetting the head and shoulders, and then proceed to the rest of the body. To save a slop on the floor, the person may stand in a broad shallow tub or pan, or even on a square of oilcloth, which is cheap, and can be easily removed. After sponging, rub and dry the body with a rough towel, and then immediately dress.

This process is so simple, so inexpensive, and will occupy so little time, that no one need neglect it on any common pretence. When a sponge cannot be conveniently obtained, a wet towel will answer the purpose. The small amount of trouble incurred by this kind of ablution will in general be amply repaid by an increase of health and comfort.

Opinions differ as to the temperature of the water to be employed in sponging the body: some advocate cold, others tepid, or partially warm water. The regulation of this may be generally left to the feelings. If the skin feel comfortable and warm after sponging with cold water and drying with the rough towel, cold water may be used with safety; if the skin, however, feel chilly, the water ought to be warmed, or the skin may be rubbed with the dry towel without any previous sponging. A main object in the operation is to keep up a healthy action in the skin, and this may in many instances be effected by dry friction, either with a brush, hair-glove, or rough towel.

The Shower-Bath.—The use of the cold shower-bath or the douche is more required as the means of giving a shock to the system, for the purpose of recovering the constitution from some kind of morbid affection, than merely for preserving health. As it should not be applied without the recommendation of a medical attendant, we do not require to give any directions as to this mode of bathing.

Bathing.—Here we arrive at the great and almost universally-recognised engine of personal purification. Entire immersion of the body in a bath of tepid or warm water is unquestionably the most effectual means of cleansing the skin from its natural or artificial impurities. For purification, however, the bath must be of soft and fresh water; sea water, cold or tepid, may refresh and invigorate, but it cleanses much less effectually than fresh water. The temperature of the tepid bath is from 85 to 90 degrees of heat, and that of the warm bath from 90 to 100 degrees. As an extreme heat may prove injurious to many constitutions, the safest temperature for most persons is about 90 degrees, which is an agreeable warmth below the heat of the blood, and suitable for ordinary bathing. With respect to the best time for bathing, a person in good health may take a bath at any time, except immediately after meals. The length of time spent in the bath may vary from fifteen to twenty minutes; a longer time, particularly if the bath be hot, is too relaxing, and far from safe or beneficial. The tepid or warm bath should not

be taken oftener than twice a week; though once a week will suffice. On coming out of the bath, the body should be well rubbed all over with a cloth.

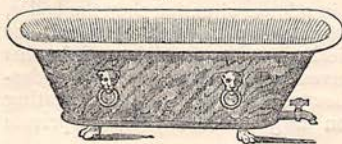
According to the Jewish dispensation, certain observances to insure personal cleanliness were the subject of religious injunction; and for a similar reason Mahomedans in eastern countries have been enjoined to perform ablutions at stated times and seasons. In these Oriental countries, and also in Russia, the use of the warm bath is universal among the richer classes, and the public establishments for bathing are in some places on a scale of great splendour. Inattention to cleanliness of apparel seems to render these ablutions indispensable for personal comfort.

Although, from the greater habitual cleanliness of the people of Great Britain, as well as from the colder climate, they do not require to be subjected to the same kind of bathings and scrub-

bings which are deemed necessary among the Oriental nations, it is allowed by all medical writers that the use of the bath is of great value in preserving health, and in giving a buoyancy to the

feelings. Every man who can afford the means, and possesses the conveniency, should have a private bath fitted up in his dwelling-house, in connexion with pipes of warm and cold water. Where fixed baths cannot be attained, a moveable bath of the form given in the annexed cut may be employed.

Public Baths.—The mass of the people having neither the means to purchase nor the convenience for using private baths, must of course resort to public ones; and for their accommodation, therefore, every town ought to possess one or more establishments fitted up with all proper conveniences for bathing.* In this respect, notwithstanding our wealth, our boasted civilisation and mechanical skill, we fall infinitely short of the Greeks and Romans, who had not only their domestic, but their public baths,



* Eminent physicians have endeavoured to draw the attention of the British government to the importance of public baths, and of countenancing their use by every aid of example and encouragement. While we wonder at their prevalence among all the eastern and northern nations, may we not lament that they are so little used in our own country? We might, perhaps, find reason to allow that erysipelas, surfeit, rheumatism, colds, and a hundred other evils, particularly all sorts of cutaneous and nervous disorders, might be alleviated, if not prevented, by a proper attention to bathing. The inhabitants of countries in which the bath is constantly used, anxiously seek it, in full confidence of getting rid of all such complaints; and they are rarely disappointed. I may add my testimony to theirs, having not only upon the occasion which gave rise to these remarks, but in cases of obstructed perspiration much more alarming, during my travels, experienced their good effect. I hardly know any act of benevolence more essential to the comfort of the community, than that

in which the poorest citizen might lave. These we consider luxuries; to them they were necessities, which they carried into their most distant provinces; and thus it is that in Britain the ruin of the Roman bath is as frequent as the ruin of the Roman temple. A better state of things, however, seems to be approaching; and for some years past, the institution of baths has much engaged the public attention. In organising such establishments, the following points require consideration:—

1. An abundant supply of soft fresh water. The quantity desirable for a single bath is from forty to fifty gallons. Whether for single or public plunge-baths, the number of bathers per day may be multiplied by forty, and the quantity of water to be consumed will thus be ascertained.

2. The water should flow into a large tank, from the tank to the boiler, and the boiler to the baths, the waste escaping by a conduit. If the tank is placed in a lower situation than the boiler, a steam power will be required to pump it. In most situations it is desirable to be as economical of space as possible, and for this purpose it is generally contrived to have the reservoirs underground; the plunge-bath, shower, and douche baths, heating apparatus, and waiting-room on the ground floor; and the private baths in the upper storey.

of establishing, by public benefaction, the use of baths for the poor in all our cities and manufacturing towns. The lives of many might be saved by them. In England they are considered only as articles of luxury; yet throughout the vast empire of Russia, through all Finland, Lapland, Sweden, and Norway, there is no cottage so poor, no hut so destitute, but it possesses its vapour bath, in which all its inhabitants, every Saturday at least, and every day in cases of sickness, experience comfort and salubrity. Lady Mary Wortley Montagu, in spite of all the prejudices which prevailed in England against inoculation, introduced it from Turkey. If another person of equal influence would endeavour to establish throughout Great Britain the use of warm and vapour baths, the inconveniences of our climate would be done away. Perhaps at some future period they may become general; and statues may perpetuate the memory of the patriot, the statesman, or the sovereign, to whom society will be indebted for their institution. When we are told that the illustrious Bacon lamented in vain the disuse of baths among the Europeans, we have little reason to indulge the expectation. At the same time, an additional testimony to their salutary effects, in affording longevity and vigorous health to a people otherwise liable to mortal diseases from a rigorous climate and an unwholesome diet, may contribute to their establishment. Among the ancients, baths were public edifices, under the immediate inspection of the government. They were considered as institutions which owed their origin to absolute necessity, as well as to decency and cleanliness. Under her emperors, Rome had nearly a thousand such buildings, which, besides their utility, were regarded as masterpieces of architectural skill and sumptuous decoration. In Russia, they have only vapour baths, and these are, for the most part, in wretched wooden hovels. If wood is wanting, they are formed of mud, or scooped in the banks of rivers and lakes; but in the palaces of the nobles, however they may vary in convenience or splendour of materials, the plan of construction is always the same.—*Travels in Russia, by Edward Samuel Clarke, LL.D.*

3. The establishment should possess washing-rooms, single private bath-rooms, a large plunge bath-room, and a waiting-room; also a separate apartment for the washing and properly drying of the towels and hand-cloths.

4. In the washing-room or rooms there should be basins, at which all persons proposing to use the plunge-bath ought in the first place to wash their hands, face, arms, and neck. If a regulation of this kind is not enforced, the plunge-bath will very shortly be unendurable.

5. The plunge-bath may be made of a circular or oblong form. That generally recommended is oblong, measuring 40 feet in length by 30 feet in breadth; the depth, by means of a sloping bottom, to be from 4 to 6 feet. Within the bath there may be a step to assist in descending and ascending. At one end, near the surface of the water, there should be several inlets, to be kept constantly running, and at the opposite extremity outlets for escape. By the careful adjustment of these orifices, the water may be kept in a state of considerable purity, notwithstanding its continual use. Besides this, the whole volume of water should be discharged twice a-week, and the bottom of the bath well scrubbed. The number of persons admitted at one time will require to be regulated according to circumstances. Over the bath there should be the means of ventilation.

6. Where possible, the whole suite of baths should be lighted from above; and each room should be furnished with hot water pipes, so as to raise its atmosphere to any desired temperature. We have spoken of a boiler, but this is only one means of heating that may be adopted. Steam-pipes, or a circulation of hot water, may be employed to keep the swimming-bath at the proper temperature; and the hot-water tank may also be heated by steam. These, as well as other matters of detail, ought to be intrusted to the architect and plumber.

7. Another important requisite is, that the situation be as central as possible for the great body of those for whose use it is intended. A short walk one would suppose to be rather agreeable than otherwise to the working-classes; but experience has found that, unless a bathing establishment be in their immediate vicinity, and be continually before their eyes, they are apt to seize every trifling accident—as a little unusual fatigue, a wet night, or the like—as an excuse for abandoning the ablution.

Where steam-engines of large power are employed in connexion with cotton factories or other works, there is usually a certain quantity of waste steam or waste hot water at disposal, which could at an insignificant cost be directed into baths for the use of the workmen of the establishment; and we hope this will be done wherever it is practicable. The improved health and cheerfulness of the parties benefited will be more than compensatory for the necessary outlay.

VENTILATION.

The lungs, as already stated, inhale and use up pure air, and expel only that which is vitiated. It is calculated that every human being consumes on an average two and a half hogsheads of pure air per hour. That may be called the allowance required by nature for the due action of the lungs, the purification of the blood, and the preservation of health. Dwellings, work-rooms, and other enclosed places, would require to afford that quantity of fresh air for each inmate; and not only so, but something more to supply the consumption of air by fires and artificial lights. In a room having a number of lights, at least as much as four hogsheads per hour for each individual should be admitted.

By neglecting to afford such supplies by means of channels for ventilating, almost every dwelling-house, work-room, school, church, theatre, &c. becomes filled with an impure air, to breathe which is most injurious to health. In many dwellings of the humbler classes, the confinement of air is considerably aggravated by the number of individuals who sleep in one apartment, the want of certain precautions as to cleanliness, and also in some cases the want of daylight. The well known result of these accumulated evils is an immense amount of fever and other diseases, terminating in death.

This subject has for a number of years engaged the consideration of parliament and men of science, and numerous reports have been published, showing, by the most conclusive evidence, that the want of ventilation is daily producing diseases most fatal to the general population. A perusal of the following passages from these sanitary reports cannot but prove useful to those who are inclined to think lightly of ventilation.

“Of defective ventilation, until very lately, little had been observed or understood, even by professional men or men of science; and that it is only when the public health is made a matter of public care by a responsible public agency, that what is understood can be expected to be generally and effectually applied for the public protection. Vitiated air not being seen, and air which is pure in winter being cold, the cold is felt, and the air is excluded by the workmen. The great desideratum hitherto has been, to obtain a circulation of air which was *warm* as well as fresh. This desideratum has been obtained, after much trial, in the House of Commons; but there is reason to believe that, by various means, at an expense within the reach of large places of work, a ventilation equally good might be secured with mutual advantage.”

One of the parties examined observes—“I have collected the evidence of several master tailors in London on the effects of work in crowded or badly-ventilated rooms. Some are inclined to ascribe more of the ill health to the habits of the journeymen in drinking at public-houses, and to the state of their private

dwellings, but in the main results the loss of daily power—that is, the loss of at least one-third the industrial capabilities enjoyed by men working under advantageous circumstances: the nervous exhaustion attendant on work in crowds, and the consequent temptation to resort continually to stimulants, which in their turn increase the exhaustion, are fully proved, and indeed generally admitted. I have caused the mortuary registers to be examined, but find that they do not distinguish the masters from the journeymen, and that there are no ready means of distinguishing those of the deceased who have been employed in the larger shops. It is also stated that many who come to work in town, and become diseased, return and die in the villages. But in the registered causes of death, of 233 persons entered during the year 1839, in the eastern and western Unions of the metropolis, under the general head 'tailor,' no less than 123 are registered as having died of disease of the respiratory organs, of whom 92 died of consumption; 16 of diseases of the nervous system, of whom 8 died of apoplexy; 16 of epidemic or contagious diseases, of whom 11 died of typhus: 23 are registered as having died of diseases of 'uncertain seat,' of whom 13 fell victims of dropsy; 8 died of diseases of the digestive organs, and 6 of 'heart disease;' and of the whole number of 233, only 29 of old age; and of these, if they could be traced, we may pronounce confidently that the greater proportion of them would be found to be not journeymen—of whom not two or three per cent. attain old age—but masters. On comparing the mortuary registers in the metropolis with the registers in the north-western and south-western parts of England, where we may expect a larger proportion of men working separately, I find that whilst 53 per cent. of the men die of diseases of the respiratory organs in the metropolis, only 39 per cent. die of these diseases in the remote districts; that whilst five per cent. die of typhus in London, only one per cent. fall victims to it in the country; that whilst in London only 12 in the hundred attain old age, 25 in the hundred are registered as having attained it in the remote districts. I have been informed that some tailors' workshops at Glasgow have been carefully ventilated, and that the immediate results are as satisfactory as were anticipated, but the change has been too recent to permit any estimate of the effects on the general habits of the workmen.

The preceding case may serve as a general instance of the practical difference of the effects in the saving of suffering as well as of expense, by active benevolence exerted with foresight in measures of prevention, as compared with benevolence exerted in measures of alleviation of disease after it has occurred.

The subscriptions to the benevolent institution for the relief of the aged and infirm tailors by individual masters in the metropolis, appear to be large and liberal, and amount to upwards of £11,000; yet it is to be observed, that if they or the men had

been aware of the effects of vitiated atmospheres on the constitution and general strength, and of the means of ventilation, the practicable gain of money from the gain of labour by that sanitary measure could not have been less in one large shop, employing 200 men, than £100,000. Independently of subscriptions of the whole trade, it would, during their working period of life, have been sufficient, with the enjoyment of greater health and comfort by every workman during the time of work, to have purchased him an annuity of £1 per week for comfortable and respectable self-support during a period of superannuation, commencing soon after *fifty* years of age.

If we thus find the crowding of unventilated places of work injurious—in which persons rarely pass more than twelve out of the twenty-four hours, being free during the remaining time to breathe what air they please—how much worse should we expect the consequences to be of the same fault in workhouses, hospitals, schools, and prisons, in which individuals often pass both day and night in the same apartments, or if in different apartments, still in the same crowd. Accordingly, since the attention of medical men has been sufficiently directed to the subject, the explanation has become complete of many deplorable cases of general ill health and mortality in such places, attributed at first to deficiency or bad quality of food, or to any cause but the true one—want of ventilation.* A striking illustration of this was afforded in the case of a large school for children during the years 1836 and 1837, as recorded in the second volume of the Poor Law Reports. Such general failure of health and such mortality had occurred among the children as to attract public notice, and the animadversions of many medical men and others who visited the schools; but by most the evil was attributed chiefly to faulty nourishment; and it was only after the more complete examination made by direction of the board, and of which the report is published, as above stated, that the diet was found to be unusually good, but the ventilation very imperfect. Suitable changes were then made; and now, in the same space where 700 children were, by illness, awakening extensive sympathy, 1100 now enjoy excellent health. The defective state of information on the subject of ventilation is frequently shown in reports, which assume that apartments containing given cubic feet of space are all that is requisite for life and health, whereas if a spacious drawing-room be completely closed against the admission of air, an inhabitant confined to it would in time be stifled, whilst by active ventilation or change of air, men working in connexion with diving-machines live in the space of a helmet, which merely confines the head.

* "In the space of four years, ending in 1784, in a badly-ventilated house, the Lying-in Hospital in Dublin, there died 2944 children out of 7650; but after freer ventilation, the deaths in the same period of time, and in a like number of children, amounted only to 279."—Gen. Rep. p. 107.

In the majority of instances of the defective ventilation of schools, the pallid countenance and delicate health of the school-boy, commonly laid to the account of over-application to his book, are due simply to the defective construction of the school-room. In the dame schools, and the schools for the labouring classes, the defective ventilation is the most frequent and mischievous."

From this, as well as all other testimony on the subject, it is clear that society is daily suffering to an indescribable extent by *atmospheric impurity*. Great loss of life, occasional or lingering bad health, poverty from inability to labour, mental depression, crime, and intemperance, are the well-observed results of this discreditable state of things.

To assuage as far as possible this enormous evil, very extensive improvements would be required in the construction of towns and dwellings generally, and perhaps these may in time be effected, including more plentiful supplies of water. Meanwhile, the evil may be materially lessened by employers and public bodies adopting means for ventilating work-rooms, churches, and other edifices. This may be done in two ways: The first consists of leading tubes from the unventilated apartments to a large fire or furnace, the natural demand for air by the fire drawing off the vitiated atmosphere, while fresh air is left to enter by numerous small openings or crevices; such being, in fact, the plan pursued for ventilating the houses of parliament. The second process of ventilation may consist in propelling fresh air into buildings (or into ships) by a small and cheaply-constructed apparatus, lately invented by the benevolent Dr Neil Arnott; the vitiated air in this case being expelled by the intrusion of what is fresh. A power equal to that of a man or boy can work the apparatus.*

In workshops, schools, and public rooms, open fire-grates are preferable to stoves, as they require a continual current of air towards them—thus drawing off all impure air, as well as noxious vapours and dusty particles. Where an open fire is used, a very equable ventilation may be kept up by a few apertures in the walls, slanting from the outside upward to the ceiling. The only thing to be attended to in all cases of artificial ventilation, is for parties not to sit in the currents so created, the results of which inadvertence are too frequently colds, rheumatism, and the like.

With respect to the ventilation of private houses, we offer the following admonitory hints:—

1. If at all possible, never have more than one bed in a room; and let the window of that room be thrown open whenever the weather will permit.

* Those desirous of applying this ingenious apparatus should communicate with Dr Arnott. His address is Bedford Square, London.

2. Let each bed be as open and airy as possible; that is, have plenty of room for the air to play over it and about it. Closing up the front of the bed, so as to leave only a small open space, as is the case in many cottages in the country, is a plan greatly to be condemned.

3. The bed should be as open and airy during the day as the night, for during the night it absorbs impurities which should have liberty to escape after the persons rise from it.

4. On rising in the morning, open wide the curtains or doors of the bed, throw down the bed-clothes, or, what is better, hang them on screens during the day, and open the window and door, so that the air may blow freely through the house, and carry off all impurities in the atmosphere. Such precautions are especially necessary in the case of newly-built houses, where moisture and other injurious exhalations are apt to arise from the walls, the painting, and wood-work. Indeed, no recent erection ought to be inhabited till all the apartments have been well-seasoned by fires and thorough atmospheric exposure.

5. A good housewife will also take care to allow nothing to remain within doors which may cause a bad smell. All by- corners and closets should be regularly swept out, washed, and ventilated.

6. If the house consist of only one apartment, and be inhabited by several individuals, it should be limed or whitewashed once a-year, and every part of the floor and entrance passages washed weekly. All such cleansings should be in the morning, in order that the house may be quite dry before night.

7. Allow no impurities of any kind to accumulate about the door or outside of the dwelling: the odours rising from stagnant gutters and open drains are a fertile source of fever.

It may be asked, how is it to be known when a house is overheated or ill-ventilated. If, on going from an apartment to the external air, you feel a sudden chill, depend upon it the difference between the internal and external temperature is too great, and the former ought to be lowered by gradually admitting more of the external air. If, again, on coming from the open air, you are sensible of a stifling musty odour in any apartment, at once throw open the door or windows, and see for the future that a continual current be admitted, to prevent such a want of ventilation. Many people, instead of admitting the fresh air, endeavour to dissipate bad odours by artificial scents, but this is a mere temporary and injurious expedient. The evil still remains, and in a few hours it is found that such a practice has been only to substitute one offensive smell for another.

By attention to these simple but necessarily brief directions, as regards cleanliness and ventilation, much disease and suffering, loss of time through ill health, moral deterioration, and other obvious evils, might be avoided, and a vast amount of comfort and enjoyment secured.