THESIS

on

THE ADVANTAGES AND EFFECTS of DRAINAGE AND VENTILATION.

by

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Little do the unscientific understand when winter comes round accompanied by constant rain, brief daylight, wintry winds wailing amongst the trees, stripping with eager ruthlessness the last of the few remaining leaves which so lately were clothed in all the glory of Autumnal foliage, how necessary for our existence such things are. It is nature's holiday. Like a thrifty house-wife, she prepares for the coming sunshine, the rain descends to wash away the accumulated waste and filth of summer-time, the wind blows to disperse noxious vapours, so when spring comes all is cleanly, that is would be so if man

would follow out the dictates of common sense and learn a lesson from nature herself, for the kind earth opens her bosom to receive all the substances deposited on her surface and with a happy alchemy converts them, if only man would let her, into a substance with which to infuse fresh vigour into the roots and seeds which shall be appointed for germination on the ensuing spring.

Various changes then are constantly going on around us, but nowhere more evidently than in expressed opinions, which incessant revolution is by many considered among the uses of the present advanced state of civilization. Events, new theories rather flash than come upon us. The old and in many instances the well-tried doctrines of ages are upset, are cast before the wind. To say a thing belonged to the old school is with many a synonyme for all that is worthless; dogmatically they assert that so and so is correct, is the bottom of the matter, upon this opinion they rear a stately theory,

perhaps at present exhibiting no special outward sign of weakness, but whose foundations are built upon the sand, hollow and baseless it soon falls to give place to one perhaps as unstable. In almost no subject has there been greater diversity of opinion and greater ignorance than in the matter of drainage and ventilation, both so intimately united that to separate is only to do the work by halves.

When the Grecian and Roman empires were in the zenith of their power, great attention seems to have been paid to drainage, but gradually, a darkness which could be felt, an utter neglect of everything sanitary descended on the world at large, interweaving itself round us, so that its effects, its vibrations in the shape of pestilence were felt everywhere. All suffered poor and rich alike, victims not of any factitious laws, of municipal dilliness, or of the caprice or theory of some individual, but of ignorance, content to live and die as their fathers

had done of dysentery, of plague, of malignant fever. Forced to crowd into towns for fear of robbers and for mutual pro-tection; their houses clustered in a valley near some castle, a disease found the pop-ulation unprotected by any measure calculated to ward off the distemper, or to abate its rigour. There, death thrust in his sickle and drew it not out till perhaps no creature remained on whom to execute his dire designs. But such neglect could not last for ever, light begins to dawn where before had been black darkness, cities and towns begin to bestir themselves and attempt to rid themselves of the accumulations of filth, a legacy of past ages.

The attention of the public has now for some time past been closely directed to sanitary measures particularly drain-age, as a means at least of ameliorating the condition of mankind at large, in this they have been guided by the physician, who is now the great sanitarian, ever ready

to give at the favourable moment advice to inaugurate sanitary reforms and also to see to their thorough and satisfactory working afterwards. In this work disappointments are sure to be experienced, for there are those in every place, whether in the city or in the country, who will resist everything in the shape of change or improvement, following the example of the Physicians of Lisbon of old, who were opposed to the removal of the filth which had been allowed to collect and fester in the streets, so when a fever afterwards broke out, they contended that "it was owing to to the taking away of the mud which absorbed and destroyed the pestiferous particles, and that these generated the disease."

In considering this subject it naturally divides itself into two great heads viz.- I Drainage. II Ventilation.

Under drainage I propose to discuss—

1st. The meaning of the term

2dly. Drains to be of use must be efficient.

3dly The effect of drainage on man's health.

II Under ventilation,—

1st. The meaning of the term

2dly The effect of ventilation on man's health

3dly The combined influence of drainage and ventilation in eradicating disease or of modifying its effects, therefore necessary to man's well-being.

First then as regards the term drainage. By this term we mean a removal of waste matters either fluid or solid. As regards that of houses, this may be done in numerous ways, either you may have the effete substances from your dwelling carried merely out of your sight into some cesspool or sink, or else your house may be connected with a vast congeries of underground tunnels, intended to convey them away through smaller channels. Of the best form of drains and of the mode of making them I need not enter.

Secondly drains to be of use must be efficient. About this there cannot be two opinions, a thing half done is not done

at all. Leakage in a drain turns it into a vast cesspool, the ground around becomes soaked with putrid fluid, it permeates the soil, it filters into some well fouling it with decaying vegetable or animal matters, thus loading the water, which is when pure the great aid to health, with organic decomposing remains, and which is thus ever ready to become a nidus of some disease when taken into the body. It is quite certain that in impure water, when made use of in common by human beings, you have a source of evil before you, a habitation, a condition where unlooked and unwished for, Repose agents unseen and unknown to man except by their dangerous effects. The water is poisoned by these decaying matters, as a consequence, the air around is less pure than usual, for the water necessarily gives off emanations, indeed it is quite impossible to prevent air from partaking of the quality of the water, they have an attraction for one another, and the materials the one contains are sure to be found in the

other, often to the great detriment of the health of a whole community. Stagnation must be guarded against. It is absolutely necessary that there should be a fall, that the drain should be flushed, so that the putrid stream should be ever moving, allowing of no deposit, but everything regularly passing onwards. If such is not the case, the underground drains are converted into vast reservoirs of filth, and you return to the old cesspool system, which most, if not all, condemn as a great source of evil, and one liable perpetually to enlarge its dimensions as the population grows. Increasing day by day, it often becomes the beginning, the germ of desolation to those residing near its baneful influence, ready to receive into company with its other multifarious stinks, that little something which accumulates as a poison alike in the cesspools of towns, and the middens of the country, and which makes itself felt on mankind in

genesal by the formidable array of fevers, cholera, and dysentery. Stagnation in a main drain, means also closure of the supplying drains from each house. Emanations of course occur, polluting the atmosphere and rendering perfectly re-gatory the end for which the drain was made; indeed it is worse, for the excrementitious matters, coped up within the narrow limits of the com-mon sewer are concentrated, and not only are disagreeable and disgusting, but may if not of themselves, de novo in fact, give rise to a long list of di-seases, are at any rate, by their odour an indication that something is wrong, a warning in fact that something else may be present which we know often allies itself to effluvia from drains.

Bad smells of themselves do not I think give rise to fevers &c but I think every day experience shows that disease in its worse form is aggravated and is more rife were the air is foul

and the drainage deficient. Therefore let us take bad smells as a warning, dangerous they are at all times, deadly we know them to be often.

It is quite necessary also that there should be a proper exit for the drains. On this point there is much difference of opinion. Three courses are open for the discharge from drains, all of which have objections. First into some river or running stream. Here certainly the filth is ever moving onwards, that is to say, if there is a plentiful supply of water. Here certainly dilution takes place, but why spoil the pure water, why disfigure nature's pleasant places by your turbid stream, what right have you to poison your neighbours further down the stream, who may thus be cut off from this their only supply of water! Malodorous smells arise, foul and filthy, wafted by every breath of wind, unpleasant to say the least. The state of the

Thames is an example of this mode of draining into rivers. One has only to sail on its bosom to be aware that the stench from the water is abominable, noisome and offensive, yet when this state of things is at its height, as in 1858, it was not found that it was at all the means of producing disease, nor has it been shown that it was in that year, in itself able to produce cholera and the like complaints anew. Capable the stench from the Thames may be of increasing the virulence of a disease when imported or carried into its neighbourhood, but the essence of the scourge is not the bad smell, for the Medical report for 1858 says "Diarrhœa and summer cholera were perceptibly less fatal than usual," and this when the stench was intense.

Secondly directly into the sea. Here it is quite evident that this exit is not open to all. When sea water and sewage come in contact a truly

disgusting compound is formed, chemical decomposition takes place and gases and other things are formed which all would try to avoid. Further the sea receding often leaves the decomposing substances on the shore, the sun acts on them and smells are evolved dangerous and hurtful.

Thirdly as manure. Here may well be asked what is sewage? It is the unconsumed atoms of animal and vegetable life in a state of decay and being disorganized. We as men have given our quota to the mass, we have been the means of inducing chemical change, much more air and water. All means tend more or less to reduce animal and vegetable matters to their original state. If such be the case surely it is wrong for us to waste, to throw away that which if applied to the soil would help to enrich and improve it. We cannot consume these waste substances directly ourselves, yet we ought as members of a vast community to lose as little as possible

for remember this drainage exposed to the air and other influences yeilds when spread over fields as manure, salts and other things absolutely necessary for the growth of plants made use of by man. Dr. Farr speaking on this very subject says "chemistry has shown that the same elements (sewage) become grasses, grains, fruits, and flowers by the natural magic of the earth." Moreover it must be evident that the ground is the true disinfectant. Numerous are the barren places longing for, so to speak, and requiring those things we withhold from them, often to our own ruin. Why then do we persist in poisoning our rivers, in driving healthseekers from our seashore, in storing up our drainage round our own hearths? Nature says give your waste to the earth, Medical science says the same, so does common sense. Give all you can, she will never be satisfied. Of course there are difficulties

in this plan. Are you not creating that very nuisance, the pollution of the air which above all you try to avoid? Allowed we are, to some extent, but then this means of cultivating the soil should be carried on away from towns; and then it is a very different thing to have the sewage bound up within some large city, with its numbers of inhabitants to having it spread over thousands of acres exposed to the united disintegrating influence of air, and rain, and heat. Such a use has been made of the contents of sewers in many towns, and there is no reason why it should not be applied to all, for the demand would constantly exhaust the supply. Obstacles that arise are easily overcome by mechanical skill. The chemist may come in and disinfect the foul stream if you will, so that there can be no possible reason why the waste of our large towns, should not be a source of health and prosperity,

to us instead of pestilence and desolation.
This leads me to consider —
Thirdly the effect of drainage on man's health. One has only first to look back on the records of past ages, and there read the accounts of the terrific maladies that once desolated the civilized world, and then to look around him, and ask, if we have such pestilences in our own times, to say we have not. What is the reason? Mainly I believe, the greater attention paid to sanitary matters in the present day particularly drainage. Not that I would ascribe to drainage entirely this change in the so called type of disease: for no doubt a better diet, better ventilation, better houses, and other things connected with the general advance of civilization have had a great deal to do with it.
In considering this part of my subject I will treat of it under two heads First The effect of general drainage. Secondly

of drainage as carried on in towns.

First then the effect of general drainage on man's health. The vicinity of marshes has ever been considered a very fruitful abode of diseases of all kinds, the especial delight of fevers, remittent and intermittent, of dysentery, of diarrhoea. History teems with instances of the destruction of armies from living near these abodes of desolation. The mortality of the marsh fever of Walcheren, of the Valley of the Po, of the Compagna of Rome, of the fatal swamps of the Niger, of the terrible fevers of the West & East Indies and of the West coast of Africa are all set down to malaria, to be dependent on stagnant water, on vast quantities of decaying matters. But is it the fermenting vegetable substances, the stagnant water that are the cause of the agues? I think not. I believe there must be a something, a cause, which, so to speak, loves to dwell in these terrible morasses. There can be no

doubt that the state of the atmosphere, of the water, of the ground near marsh land has a vast influence on disease, for we all know the peculiar characters of agues &c, a series of phenomena peculiar to marsh districts. General drainage has also a peculiar influence on the climate, it makes it drier, it exposes the ground to the influence of the sun, of the air, of light, doing away with swamps and lagoons, which at any rate are hurtful to mankind. Agriculture is everywhere the most powerful improver of climate, and its advancement gives not only support to man in the shape of food, but in a greater degree ministers to his health and well being by purifying the air he breathes. Secondly. The effect of drainage as carried on in towns. If such drainage is of no more good than merely to carry away out of our sight those things which in close proximity to our abodes, are a source of annoyance

to us, surely there is something gained. but this is the smallest good they do. The annoyance might be endured, if that was all, if nothing worse came of it. Science has shown to us plain -ly, that fermenting human excre -ment and other effete bodies in and around our dwellings are a source of evil, a poison if taken into the system. It matters little whether, ac -cording to one author, the danger is capable of arising anew from the decaying mass, or whether the cause of disease merely germinates and lives, being carried to it by some external agency, for all seem to agree in ascribing evil effects to neglect of drainage, all agree that pure air and pure water are necessary to robust health. I maintain therefore it is impossible to have either with -out there is good drainage. Collections of filth must necessarily give off ema -nations, the fluid part sinks into the

soil, into the vast underground strata of waterstreams, thus in both ways, and under certain circumstances becoming a cause of wide-spread pestilence. Fevers, cholera, diptheria, Dysentery &c are according to some directly occasioned by this state of matters. ~~xxxxxx~~

There can be little doubt that numbers of deaths occur which might have been prevented if there had not been a fatal neglect of sanitary science. Year after year people are content to dwell in houses undrained, cut down they soon may be, but others press in to occupy their vacant places, never inquiring of the cause of their death, which might have been fever, which, if not directly due to the accumulation of filth is much aggravated by it. How easy the remedy, yet how supine the people, Nature says remove your filth by drains and I will abate the virulence of the disease, the plan is plain, neglect is

suicidal. It is not only in towns that neglect of sanitary measures is felt, even in the country, in fact everywhere were there is an abundance of filth. In the most thinly populated regions fevers and other infectious diseases come with a sweep, and is it to be wondered at, when we see the state of many farm-houses and cottages in this country, surrounded by filth, the manure of oxen and swine, in close proximity to a stagnant pond, and the house itself standing on its own oozing cess-pool? certainly not, the wonder is that fever is not more prevalent, and I think the inhabitants have generally to thank their own isolated situation, their constant exposure to free currents of air laiden with health giving ozone more than their own sanitary precautions and efforts. It is this want of dilution of the specific poison in our large towns that causes or fosters epidemics. I dont mean to

say that if you were to make drain-age as good and effectual as possible, turning it to uses at which none could cavil, that you could thoroughly eradicate, or get rid of many diseases as fevers, other things just as necessary have to be thought of, as a dwelling properly exposed to atmospheric influences, ventilation, a proper and nutritious diet, all conditions as essential as drainage certainly. But I maintain that drainage is a safeguard against epidemics, where present, at least it abates their intensity, and therefore the number of deaths, which is at any rate something to have gained. This was very well shown in our army during the war in the Crimea, where the mortality from October 1854 to April 1855 was 600 in a 1000. In November and December 1855 it was 44 and even 33 per thousand "thanks" the writer "says to abundant provisions, good clothing and other hygienic improvements."

Later from January to May 1856 the mortality descended to 12½ and 8 per thousand "owing to the proper drainage of the camps, the regular removal of the soil, and the greater attention paid to sanitary affairs".

I now come to the second great head of my subject viz Ventilation.

II By this term is meant a guaranteeing to each individual a certain quantity of pure air which shall be sufficient to keep him in a state of health. In the above definition I am careful in saying pure air not simply air, for air essentially consists of two kinds pure and foul; it is this last which ventilation attempts to obviate. Ventilation is necessarily to some extent subordinate to drainage and dependent upon it. Ventilation aims at removing foul air, drainage at removing those things which by exhaling gases and odours cause the air to be contaminated. Given a case of foul smell dependent

on bad drainage, ventilation is only of secondrate importance, certainly it is of use in diluting and may be removing any sensible odour for a while, but the cause still remains and the cure can be accomplished only by effi-cient drainage. It has been shown that impure water is a source of dan-ger to man, so also is impure air, both are necessary to our existence, but air most of all, for in whatever circum-stances we are placed we must have air to carry on the functions of the body, to preserve life. If then we are so often making use of this article air, how necessary that we should have it pure and this leads me to consider —.

The effect of Ventilation on mens health.

It is generally considered that the natives of the country, the mass of agricultural labourers are as a class more healthy than the population of our large towns. In the comparison

the first thing that strikes us is that the labourer at least pursues his calling in the open air, whilst the mechanic, the tailor, the cotton-spinner are packed together in a room, breathing over and over again their own sickly emanations. Of the two states certainly the labourer's is the most preferable, but then it has its ills. Exposed as he is to the inclemency of the seasons, he, quite reckless sits soaking in wet clothes, exposed it may be to the rude east wind; a state of matters giving rise to Rheumatism, to thoracic and cardiac disorders. To carry the comparison farther. The situation of the dwellings of either serves little to ward off epidemics, for we hear of villages occupying the lowliest locality, suffering equally with the lowest regions of any city. Again, as to their houses, both are generally ill-built, both often ill-drained, both generally over crowded, both always ill-ventilated. The question is never asked is it healthy that so many persons should live, should

sleep in one small room, that is of secondary importance, the question is how many can be squeezed into one room, can lay their aching limbs on it may be the bare boards and seek that rest which comes ever to the weary? As regards feeding, hard times fall on both alike, famine generally finds both unprepared. The difference therefore is not so great between the two, but the countryman surely is most to blame, for air the balmiest and the most invigorating is ever about him, if he will exclude it from his dwelling, means also are generally at hand by which his waste could be disposed of, but that which is easiest done is generally worse done, for it is my opinion that as a rule country villages can vie with any town in their neglect of drainage and ventilation

It is singular that persons of all classes more or less, but particularly the poor

should have such a dread of pure air. They suppose it to be the source of all evils and all ailments, more especially of that dire disaster inflammation. I think this must have arisen from there not been able to see the difference between a constant change of air, cool and healthy, and a draught of air. It is really wonderful in cases of illness to what an extent this is carried, much to the detriment of the patient, how every crevice is stopped up, how every breath of air is intercepted, how the patient is compelled to breathe over and over again the vitiated air. Most know the fearful smells that assail one on visiting a patient of this kind, the stench is horrible, a feeling of dryness comes into the throat on taking in the fetid air, and either you rush to the window and throw it open, or else you make your way into the open air. Can this state of matters be right? Assuredly not, and we have its effects. Well

has Dr. A. Combe said "if 1/10 of the preserving attention and labour bestowed to no purpose in rubbing down and currying the skins of horses were bestowed by the human race in keeping themselves in good condition, and a little attention more paid to diet, clothing and ventilation, colds, nervous diseases and stomach complaints would cease to form so large an item in the catalogue of human miseries" Want of ventilation is in my opinion a direct cause of Phthisis, of Struma, of the concentration and consequent spread of fevers and epidemics of all kinds; it is the cause also of that weird and prematurely old appearance which we see, particularly in the inhabitants of our large manufacturing towns; again it is a common cause of disease in children, and is the direct agency of the large mortality amongst them; and lastly in the year 1854 sixty one thousand deaths in England were referable to the imperfect operation of

the sanitary organization. This is surely a very formidable array of dis-asters, but the remidy is easy, for fresh air, the sparkling sunshine, and cooling breezes are abundant and not bought and sold as waters often is. Fresh air pure and uncontaminated never causes disease, if proper precautions are taken. All agree in condemning a draught as injurious, but it is quite possible to have a constant supply of fresh air without a draught by means of apparatus suited to the end in view, giving to each his due supply of air. It is to fresh air as much as to the skill of the Physician, that the wonderful success of our hospitals is owing. Here the the patient removed from the influence of his own concentrated emanations, of the close and sickening room, is at least placed in a more favourable condition for effecting a cure, at anyrate he inhales wholesome air, which is a great aid in the restoration of health & vigour.

It has also been shown that workmen are actually able to do a greater amount of work if their workshops are well ventilated. This is particularly true of Tailors and milliners, a body of human beings shut up during the whole day in rooms almost hermetically sealed against the inroads of pure air, compelled to breath in an atmosphere stagnant, polluted, noxious in the extreme. No wonder their health fails, that consumption is rife, that habits of intoxication are engendered on account of the depression of mind felt when such a state of matters exists. We continually hears the complaints of such persons, that the trade is a killing one, I say it is not the trade in many cases, it is a want of fresh air that causes the mortality. Broken in mind, unhealthy in body, their spirits depressed, no wonder that disease commits frightful ravages among our pent up town population, it has ever been so, and one is

brought to remember by their state, the awful mortality on board ships in former times, the crowding of the sailors, soldiers and emigrants, the dreadful sufferies, the despondency and degeneracy that was induced.

It is this knowledge of the good effects of fresh air, that makes most persons occupied in business in our great cities yearn for the hillside and the sea breeze, for they know that there, something is present, which gives renewed vigour to mind and body, and which being absent from the town causes depression and inaptitude for exertion.

From all the above it may I think be safely concluded that air pent up in confined places, rendered impure either by gases, stagnant pools, drains, by processes incident to the vast manufactories, or by emanations and effluvia from our own bodies, or from numbers of persons crowded together are at least a source of danger, a means

by which disease may be induced, epidemics arise according to one view, or according to another, a means of aggravating, of causing their occurrence in a very virulent form, over which Medical art has little control. However this may be, it is an acknowledged fact that where epidemics occur most frequently and in their worse form, there will be found the greatest neglect of ventilation.

This leads me to consider in the last place —

The combined influence of drainage and ventilation in eradicating disease or of modifying its effects, therefore necessary to man's well-being.

We are very apt, I think to forget, that still close upon one half of our population die before they are twenty years old, are cut off in the very vigour of their life just when they are about to become useful members of society. We hear of cases of longevity, we hear that the average of the length of life is

longer, and we are content, but surely there is some reason why so many persons die so young? To use a vulgar phrase it is the seasoning that kills. Youth is the age when epidemics mostly occur, taking away their numerous victims.

First then let us consider the influence of drainage and ventilation on the progress of the Exanthemata proper viz. variola, varicella, Rubeola & Scarlatina. No one as far as I know has ever supposed he could entirely eradicate these diseases by the above means. Yet if they cannot accomplish that end, they are a mighty aid in rendering the disease mild. What more necessary in these ailments than pure air, than pure water, the one to prevent the concentrated infection acting injuriously on the patient himself, and on the persons around, the other to quench the great thirst consequent on the malady. Most Phy

-sicians know the difference between treating a case way of Scarlatina where the earth and air are fouled by decay -ing matters, and one where there is no lack of fresh air. No doubt proper shelter, good nursing and the judi -cious use of nourishing food go a long way towards ameliorating the condition of the sufferer, but all these may be rendered quite nugatory by the absence of ventilation and drainage, for according to one view when these are not present the nature of the disease is altered and that which is generally a mild and not dange -rous affection is rendered fierce, deadly, and intractable; according to another the disease comes among people whose strength is sapped by a neglect of sani -tary measures, who therefore readily fall victims. It matters little which is the right view, both point to the same source, both show how necessary to mildness of attack and recovery, pure air and other sanitary measures

are.

Secondly on Fevers in general as Typhus, Typhoid, Remittent and Intermittent, and with these, I shall take Cholera and Diphtheria

Fever has become, and is now considered the great sanitary test in this country. It is the ravages of this class of diseases which have called into existence Boards of health, Officers of health and other means towards the same end. Upon the views which are held on the causes of these diseases, or means of entirely eradicating or preventing them, depend in great part the application of Medical science to sanitary improvement, as to the propriety of spending enormous sums for the construction of works considered necessary for preserving the public health. In considering these diseases a little more in detail we shall have to encounter two entirely different sets of opinions concerning both which much may be said.

First then of Typhus. Some consider that

"it may be generated de novo through the contamination of a confined portion of air, by the pulmonary & cutaneous exhalations of numerous individuals" others again consider that "it does not originate, at least generally, in faulty drainage or other sources of foul air".

Secondly of Typhoid. One says "it is often if not always generated by the putrid emanations from drains or other sources, or by decomposing organic matter in water," on the other hand some say "that Typhoid may be propagated by means of sewers and water closets, and that the effluvia from defective sewers have no specific power except when they are charged with the specific poison contained in the secretions from the diseased bowels of those already affected". Many more authorities could be quoted, many theories adduced concerning the spread and origin of Dysentery, Diphtheria, and the like disorders, but the question with all of them resolves itself

unto two leading points. First. Is fever caused generally or always by miasma and other foul emanations, does it in fact arise de novo from drains from marshes from human excrement? Secondly. Is the cause of these diseases a specific virus which finds a resting place merely in foul smells, in places where ventilation and drainage do not exist?

Of course it is a difficult thing to decide which is right, both seem however to ascribe danger to the accumulation of filth, to the want of drainage and ventilation.

From a consideration of the whole question I am of opinion that you will find Typhus most rife where there is great overcrowding, where the atmosphere is degenerated from its original pureness, where emanations from human beings are concentrated; in addition to this a low state of the system and bodily powers either by starvation or through constant working in an impure atmosphere.

I would consider Typhus almost and essentially a disease of the poorer classes, for it is rare to find in the highes or middle ranks of life the combination of overcrowding, impure air and star-vation. It is the disease of large towns. Typhoid on the other hand is most prone to occur where the drainage is radically bad, where animal excre-tions exped up within narrow limits, afford a suitable receptacle for the specific poison. This disease attacks all alike rich and poor, the robust, the weak, the old, the young, the town, the country, all are subject to be attack-ed, if they have rendered themselves liable to the disease by neglect of sani-tary measures. From the foregoing it may be safely concluded that Typhus and Typhoid Fevers, the pests of our country are to a great extent dependent on drainage and ventilation, not caused directly by a neglect of these measures I firmly believe, nevertheless such remis-

-ness occasions a proneness to the malady in the human subject, and gives an opportunity for a nidus to be formed, in which the specific poison lives and spreads itself far and wide.

Cholera also is supposed by some to arise from bad drainage, from putrid human emanations. There can be no doubt it shows itself in our most crowded cities, loving to follow the course of some com-mon sewer choked with filth, showing itself by preference where sanitary measures are utterly neglected and radically wrong. To take a case from a report of H. M. Commissioners on this disease — They say "this small house is crowded with lodgers, several of whom are sick, the cellar is half full of water and soil from adjoining privies, which can be seen through the broken floor of the room, the smell within was fear-ful at night when the door was closed on the seven souls who lived in the room". Is it to be wondered that

Cholera devastated such a hot-bed of misery as that? But did Cholera arise de novo here, a fit place for such a thing to happen if it ever does? I think not, like fever it has its own specific poison. The same may be said of Diphtheria, once supposed to depend entirely on bad drainage.

I think therefore we may conclude, as we did of the true Zymotherma ta, that drainage matter as such, foul air, overcrowding, fetid gases and effluvia do not of themselves give rise to Fevers, to Cholera, to Diphtheria, they merely act as exciting causes both by favouring the abode of the specific virus, but especially by lowering the condition of the vital powers, thus rendering the body weaker and therefore more likely to succumb to the action of disease, for if one is in good health both bodily and mentally, he may generally set disease at defiance.

Thirdly other diseases are said to be

entirely due to a neglect of sanitary measures particularly ventilation, of these Phthisis and Struma are the most formidable. That close confinement in stinking apartments is often the direct cause of these maladies, there can be little doubt, we have only to inquire into the conditions of our great city population to be convinced that their general trades have an immense influence on the production of these disorders.

Many statistics might be adduced of the increased health of towns in modern times, I shall content myself with one viz that of Taunton with which I am intimately connected.

The Population according to the census of 1851 was 14.176
— do. ——— do — 1861 was 14.667

The deaths from Zymotic Diseases in 1848 were 78
— do ——— do ——— 1849 were 96

This being prior to the introduction of the Health of Towns act, the Borough not being drained. To contrast with this —

The deaths from Zymotic Diseases in 1862 were 31
— do ——— do ——— 1863 were 53

being ten years after the introduction of the Health of Towns act, the Borough being well drained, I might mention that the excess of deaths in 1863 as compared with 1862 was caused by the prevalence of Scarlatina, 19 deaths occuring from that disease alone, deducting which 34 remain being an excess of three only over 1862. The above figures speak for themselves, for we can refer to no other cause than drainage this very remarkable falling off in the number of deaths and this with an increased population.

In conclusion, I think it has been shewn that the absence of drains combined with filthy habits and other nuisances favourable to the reception of disease are in themselves great sources of disease, but is it through drainage and ventilation alone that we hope to totally rid ourselves of these epidemics, which alike make themselves felt in the desert, in places remote from

man's abode, which rage with uncontrolled fury in crowded cities, in thinly populated villages, which are common alike to the torrid, to the frigid, to the temperate zones, which attack equally those working in the bowels of the earth, or on the side of some high mountain, all suffer old & young, rich & poor, strong & weak? Certainly not, they have no such lofty pretensions, a want of them is not the direct cause of the malady, therefore to remedy such a want, is certainly not to eradicate the disease. But if we cannot eradicate, we can lessen their violence, we can narrow their limits, therefore drains and ventilation are to be advocated strongly, for they are not only good in themselves, for we all know that a certain amount of cleanliness is essential alike to morality and physical strength, but more, they take away the cause from disease, for they lessen directly the rate of mortality. Combine with them plentiful employment, nutritious diet, shelter

from the inclemency of the weather and you will be at least on the road to take the sting out of that specific virus which we believe to be the cause of fevers and all other epidemic disorders. In the words of a well known author "disease misery and crime in their worse form are constantly and every where found together." The essence of the whole matter is that misery and crime produce disease, and disease produces misery and crime in a circle which revolves in the same calamitous monotony from day to day and from year to year of the very brief existence of the masses crowded together in the lowest parts of our great cities.

If then this is the true view, that fevers, that cholera, that other epidemic maladies are not born so to speak in foul sewers and malarious air, some persons will ask what is the good of all these drainage works which cost our cities so many thousands of pounds year after year? There can be little doubt

that a want of drainage has been too much estimated as the root of all evils, nevertheless it is a beginning in the right direction, a step towards ameliorating the condition of the Masses: give also plenty of fresh air and exercise, prevent also destitution as much as lies in human power, and I almost think you will do away with fevers, at any rate you will hear them of their terrors, for it is a fact that whatever tends to increase the health of the people helps to increase directly the power of resisting these great epidemics, so on the other hand what tends to weaken the strength, depress the nervous system, or lower the constitution, gives an opportunity for the epidemic to act. In this way I think may be explained one cause why the inhabitants of our great towns suffer so severely.

To conclude, Can it be right to allow our fellow labourers to poison themselves by working in unwholesome & foul air?

How many rise up early and sit late striving to gain their daily bread to whom health is life? How many ply with their needle, live sedentarily and launch all their energies in making their fingers accomplish as much as possible? How many are there who seek after worldly fame, glory, honours, power in the battle field? How many who attempt to grasp at the rewards which glitter on the path of high and glorious achievement on the briny ocean? How many, a band of disinterested men, who seek to assuage the moral torments of their fellowmen in the dens and dark places of the earth? How many who expose themselves to infection, to disease in its worst form seeking to cure their ailing fellow beings? Seeing then, that so many are concerned immediately in this matter, so many daily exposed to malaria and ills due to want of ventilation, shall we allow them through any neglect of ours to

suffer? A hard-striving band of workers no doubt they are, all interested more or less in this great work of ventilation and drainage. Many martyrs no doubt there have been through neglect of these things, men & women dying a miserable, a nameless, an inglorious death. Let us then taking warning from their death use every lawful means to instil into the minds of all the great necessity of them as life-giving agents, rich and poor alike, all want the knowledge, all have too great a dislike of those common yet inestimable blessings Pure water and Fresh air.