ON THE

DISEASES OF TOWNS.
POPULAR LECTURES

ON THE PREVAILING

DISEASES OF TOWNS:

THEIR

EFFECTS, CAUSES, AND THE MEANS OF PREVENTION.

RECENTLY DELIVERED AT THE

BRIGHTON LITERARY AND SCIENTIFIC INSTITUTION.

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BY

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AND

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1848.
PREFACE.

The four following Lectures on the Sanitary State of Towns were read before the members of the Royal Literary and Scientific Institution at Brighton, on January the 18th, 25th, February the 1st and 8th, respectively, in the current year, and are now published at the request of several gentlemen who were present at their delivery, as well as by some others who read the abbreviated accounts of them which appeared in the public papers.

The reasons which first induced me to bring this subject under the notice of the public of Brighton, and afterwards to comply with the request of my friends, that I should have the matter conveyed to them by lectures put into print, are the following:—

Firstly, That there are sacrificed to certain physical circumstances in towns, admitting of either
complete or partial removal, at the lowest computa-
tion, as many as 51,000 lives annually; and this,
independent of the pain, grief, and woe, thereby oc-
casioned to the sufferers and the surviving relatives,
is accompanied and followed by an immense train
of evils affecting all classes, the magnitude of
which, those whose attention has not been directed
to the subject have not the least conception of, and
the full extent of which, even by those who have
made it a subject of strict investigation, has hardly
been fully arrived at.

Secondly, That though the enlightened decrees
of the legislature may, to a considerable extent,
serve to mitigate these evils, they will fall far short
of producing their full harvest of good, unless the
inhabitants in each town, both individually and
collectively, join with them in attempting to promote
the necessary sanitary objects; and that it is impos-
sible that they can give this essential aid to the
state, unless they are acquainted with the nature of
the evils and the means required for their remedy.

Thirdly, That though a great deal has been
written on the subject, but very little has yet ap-
peared in a form calculated for general perusal, and to fit the public for the discharge of the above-mentioned important duties.

The object of the delivery of these Lectures, in the first instance, having been partly for local purposes, and my present object being to render them generally useful and applicable, I have, of course, made such alterations in them as I thought would best serve the latter purpose. There will still, however, be found much in the Lectures having verbally only a local reference, but as the main defects in all towns are very similar, (the difference being only one of degree), and the remedies required consequently the same, it will be found more or less applicable to all towns, and it is on this account that I allowed it to remain.
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ON THE

DISEASES OF TOWNS.

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Mr. Chairman, Ladies, and Gentlemen,

The object of this and the following Lectures which I hope to have the honour of delivering to you, is to bring under your notice a short but general view of the prevailing diseases of towns, the causes to which they are attributable, their effects, and the means of prevention.

There is a saying in the mouth of every one, the truth of which is now seldom or never denied, that health and long life are the greatest of God's blessings. But in regard to this saying there is this remarkable anomaly, that, though of all others it is the one, the truth of which in theory is the most universally admitted, it is that of all others which in practice is the most universally neglected. It would require no laboured demonstration, no minute exposition of the nature of the human system, to show that our institutions, habits, and modes of life, are, on the whole, adverse to the preservation of the health; that they have been
formed, not as they ought to have been, in relation to the wants and requirements of the system, but as the results of the prejudice, indolence, and fashion which have at different times characterised, and, indeed, we may say, disgraced society. The consequences of these unnatural circumstances acting upon the human frame, through many successive generations, have been a general lowering of the standard of health, the generation of numerous and intricate forms of diseases quite unknown in the primitive ages of society, and the general curtailment of human life to considerably within one-half of its natural period of duration.

But though these remarks apply, in a greater or less degree, to all our habits and modes of life, there is one state of society to which they apply with far greater force. I allude to the condition of the populations in towns. The most superficial acquaintance with the condition of these places must be sufficient to induce the conviction in the least comprehensive minds, that they abound in numerous circumstances excessively injurious to the human system, and to which accordingly it is impossible for most persons to be exposed for any length of time without their health being materially injured. The consequence of this has been that the inhabitants of towns, as contrasted with the inhabitants of the country, suffer from almost a
double amount of disease, and have the ordinary
duration of human life curtailed of a great many
years, to the extent in some places, and amongst
certain classes of the community, of its barely carry-
ing them even to the verge of manhood.

But almost equally strange with this apathy,
which until very lately has prevailed in all matters
relating to the preservation of the health, is the
suddenness with which, within the last four or five
years, that apathy has been dispelled, and its place
supplied by a zeal and interest, worthy of so im-
portant an object, and of so enlightened a nation.
Previously to that period, it was difficult to meet
with any one out of the medical profession who
had any faith in sanitary measures; while there
was hardly a person to be found who thought their
practical application on an extensive scale at all
feasible. At the present time they occupy a large
share of the public attention, and such is the faith
that is entertained of their utility, that they are
about to become subjects of extensive Parliamen-
tary interference, and to have in consequence their
provisions enforced in all towns throughout the
kingdom; thus admitting the great and important
principle, hitherto certainly practically disowned,
but which, in the opinion of the most competent
authorities, is calculated in the course of time to
effect vast change for the better in large masses of
the community now fearfully depressed; that the care of the public health is a legitimate branch of legislative and administrative control.

Nor, indeed, did government interfere in this matter before there existed the most urgent necessity for such a step. For, look in what direction we will, we find epidemic and contagious diseases increasing fearfully upon us, threatening, indeed, unless means be speedily taken for checking them, a recurrence to their severity of former years. The examination of the public records, and the reports of the Registrar-General, would show you that there is scarcely a town throughout the kingdom in which, during the last three or four years, there has not been a considerable increase in the rate of mortality from typhus and other contagious diseases. This is more especially the case in Edinburgh, Glasgow, Liverpool*, Manchester, London, and the other large commercial and manufacturing towns in the country. In Glasgow, within the last seventeen years, the rate of mortality has increased

* "Liverpool, created in haste by commerce—by men too intent on immediate gain, reared without any very tender regard for flesh or blood, and flourishing while her working population was rotting in cellars—has been severely taught the lesson, that a part of the population, whether in cellars or on distant shores, cannot suffer without involving the whole community in calamity. In itself one of the unhealthiest towns of the kingdom, Liverpool has for a year been the hospital and cemetery of Ireland. The deaths registered in the four quarters of 1846 were 1934, 2098, 2946, and 2735; in the three quarters of 1847 ending in September last, 3068, 4809, and 5669! The population of Liverpool was 223,054 at the last census. It is impossible to represent more correctly than is done by the short notes of the registrars the
from 1 in 39 to 1 in 26; and that, it is stated, chiefly from the greater prevalency and virulence of fever. The steadily increasing rate of mortality from fever in the metropolis is, unfortunately, too well proved by the Registrar-General's returns of the weekly deaths from typhus during the last three years.

*Deaths from Typhus in London in each week, and the averages for each quarter in the years 1845, 1846, and part of 1847.*

<table>
<thead>
<tr>
<th>Weeks ending Saturday</th>
<th>1845</th>
<th>1846</th>
<th>1847</th>
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<tr>
<td>1st week</td>
<td>39</td>
<td>41</td>
<td>49</td>
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<td>2d &quot;</td>
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<td>37</td>
<td>39</td>
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<td>3d &quot;</td>
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<td>7th &quot;</td>
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<td>8th &quot;</td>
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<td>32</td>
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<td>9th &quot;</td>
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<td>10th &quot;</td>
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<td>11th &quot;</td>
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<td>32</td>
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<tr>
<td>12th &quot;</td>
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<td>26</td>
<td>33</td>
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<tr>
<td>13th &quot;</td>
<td>31</td>
<td>36</td>
<td>34</td>
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</table>

Piteous spectacle which this great town presented, with the floating lazarettos on the Mersey, the workhouses crowded with destitute paupers, the three large 'sheds, which will hold 300 persons, nearly full of patients at the present time, and the fever getting more prevalent among the upper classes.' It will require all the energy of the inhabitants of Liverpool, and the utmost resources of science, to place the health of the town in a satisfactory condition.”

### ON THE DISEASES OF TOWNS.

<table>
<thead>
<tr>
<th>Weeks ending Saturday.</th>
<th>Deaths from Typhus.</th>
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<tr>
<td></td>
<td>1845.</td>
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<tr>
<td>14th week</td>
<td>19</td>
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<td>15th &quot;</td>
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<td>16th &quot;</td>
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<td>38th &quot;</td>
<td>29</td>
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<td>41st &quot;</td>
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<td>42d &quot;</td>
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<td>43d &quot;</td>
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<td>44th &quot;</td>
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<td>45th &quot;</td>
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<td>46th &quot;</td>
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<td>47th &quot;</td>
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<td>48th &quot;</td>
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<td>49th &quot;</td>
<td>20</td>
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<tr>
<td>50th &quot;</td>
<td>28</td>
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<tr>
<td>51st &quot;</td>
<td>34</td>
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<tr>
<td>52d &quot;</td>
<td>28</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1301</td>
</tr>
</tbody>
</table>

Weekly average derived from deaths of 1842-3-4-5 and 6, and corrected for increase of population to middle of 1846, 32
From this table it will be observed, that the weekly deaths from typhus in 1846 very generally and greatly preponderated over that in 1845, being, in several weeks, nearly double, and in some few more than double; that the deaths in 1847 were still more in excess of those in 1846, being, in numerous instances, considerably more than double the number in the corresponding week of 1846, and in one instance more than treble; and that generally from the month of August of the past year the mortality has been considerably greater than at any previous period since the commencement of registration. (First Report of the Metropolitan Sanitary Commissioners.)

From the same authority it has been ascertained that in England and Wales the number of deaths from epidemic diseases during the last two years has increased 20 per cent.; and that during the year ending July 1847 the excess of deaths over the usual average, in a small part only of the country, amounted to 34,000. The increase of mortality which took place in some of our densely populated towns during the first three months of that year, viz. the July, August, and September of 1846, as contrasted with the corresponding months of the preceding year, is shown in this table:—

<table>
<thead>
<tr>
<th>Towns</th>
<th>1845</th>
<th>1846</th>
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</thead>
<tbody>
<tr>
<td>Maidstone</td>
<td>124</td>
<td>239</td>
</tr>
<tr>
<td>Brighton</td>
<td>219</td>
<td>372</td>
</tr>
<tr>
<td>Portsea Island</td>
<td>239</td>
<td>433</td>
</tr>
</tbody>
</table>
During these three months Mr. Chadwick calculated that in a part only of the country 10,000 lives were destroyed by causes which there was every reason to believe might be removed*.

But in addition to this more permanent increase of disease, I must not forget to mention the very

* The deaths registered in the last quarter of the year 1847, in 117 districts, subdivided into 582 subdistricts, 36 of which were in the metropolis, and the remaining 81 comprised, with several agricultural districts, the principal towns and cities of England, were 57,925. The population in 1841, was 6,612,800. The average number of deaths deduced from the returns of the corresponding quarter of nine preceding years, and corrected for increase of population, is 46,549. There is consequently an excess of 11,376 deaths in the quarter.—Registrar-General's Mortuary Returns for the quarter ending Dec. 31, 1847.
unusual amount of sickness, and high rate of mortality which prevailed during the last month in London*, and many other parts of the country, and which indeed is still going on, though, happily, somewhat less severely. London had not previously witnessed during this century such an amount of sickness†.

But besides this increase of diseases peculiar to the country, diseases that may be called of indigenous growth and origin, we are threatened with a much more serious epidemic from abroad, which

* December 1846.
† In the second report of the Metropolitan Sanitary Commissioners it is obsevered:—

"Having examined, as closely as the time and means at our disposal would permit, the late extraordinary increase of mortality in the metropolis, amounting, in eleven weeks, to 6,145 deaths above the usual average, an excess of mortality during those eleven weeks greater than the entire mortality from the cholera in the metropolis during the twenty-one weeks, when it prevailed in the year 1832; we find that, of this excess of 6,145 deaths, 1,532 deaths were registered as deaths from epidemic influenza, but that the deaths from epidemic typhus, and from pneumonia, bronchitis, and the whole class of diseases of the lungs, commonly brought on at all times by cold, damp, and atmospheric impurity, have also been very numerous; the number of deaths from typhus having been during the eleven weeks 999, and the number above the average from diseases of the lungs (apart from influenza) 2,655.

"That sickness and mortality from diarrhoea, and from typhus of precisely the same type as that which preceded the former visitation of cholera, have been excessive amongst the population of the low, ill-drained, ill-cleansed, and over-crowded neighbourhood that are marked as the cholera tracts of 1832."
experience has shown is hardly less fatal in its effects than the pestilences of former years. The epidemic to which I allude is the cholera, which, having broken through the boundaries of its ordinary habitation in the East, has passed into Europe, and appears with slow but certain steps to be making its way in our direction. It reached Moscow about the latter end of last September, and, in the course of the ensuing six weeks, destroyed 1007 persons out of 2360 attacked. Later reports stated it to be within fifteen miles of St. Petersburgh, and to be likewise extending itself in a north-westerly direction towards Germany.

Now, respecting the question as to whether this epidemic is likely to reach us or not, it is worthy of remark, that the route which it has hitherto pursued is very similar to that which was taken by the epidemic of 1832. This last epidemic, after ravaging Asia, passed into Russia, and from Russia it spread through Austria and Poland, to the north of Germany. From these districts, in the course of a short time, it effected its passage to Great Britain, appearing first at Sunderland, and thence extended to many other parts of the country; but was, on the whole, most prevalent and most fatal in the wretchedly crowded and dirty manufacturing towns of the north. From Great Britain it crossed the Atlantic, and invaded America, and, at the same time, took a south-easterly direction,
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ravaging France, Spain, and the northern coasts of Italy and Africa, "moving onwards in its course in defiance of all natural or artificial barriers, under opposite extremes of temperature and climate, in the teeth of adverse winds, over lofty mountain chains, across wide seas, through hot, cold, moist, and dry."

The present epidemic also originated in Asia, has passed, like its predecessor, into Russia, and is now extending in the direction of the north of Germany; arrived at this point, if it still continue to follow the former route, its next step will be this country.

Now, it is a matter of universal observation, that towns are liable to the attacks of this disease in proportion as the atmosphere in them is polluted by the filth and dirt which are allowed to accumulate within their precincts, and the inhabitants poverty-stricken, and over-crowded, or sunk in vice and dissipation. These, indeed, are its chief, if not its only causes; and as we are well aware that all of them exist in frightful excess in all our large towns, and in most of our small ones, and therefore that we are liable to its importation amongst us, even in its worst forms, does it not afford the strongest argument that can be adduced that we ought without delay to apply ourselves with energy to the removal of these causes, and thus, in all human probability, place ourselves in a position
secure from its attacks: or, if it should come, we have certain proof that its virulence will, by such means, be greatly lessened. We know, from the experience of the past, that if the disease should break out amongst us, we shall all be active enough. But then it may be too late: the most extensive and energetic measures may then not be sufficient to prevent its committing great havoc amongst us, or even perhaps permanently taking up its residence in this country. And what may then be done, being done hurriedly, will be done ineffectually and at an enormous expense, independently of our having to experience all the horrors of a frightful pestilence*. 

* The following are the conclusions respecting the cholera, set forth by the Metropolitan Sanitary Commissioners upon their last inquiries:—"Having received much additional information as to the progress of cholera towards Europe, and as to the means of its prevention, we find—

That the disease, as that recently appeared in Persia, in Trebizonde, and in Russia, is unchanged in its general character; and that it is at the present time, according to the latest information, in a similar position to that in which it was in 1831, when its progress was arrested by the frost, previously to its advance upon Europe, immediately after the thaw took place.

That the more recent experience in Russia has led to the general abandonment of the theory of its propagation by contagion; a conclusion in which, after a full consideration of the evidence presented to us, we fully concur.

That the views which we adopted in relation to the expediency of especial Cholera Hospitals, except in cases of peculiar necessity, have been confirmed by the coincident adoption of the same conclusions in Russia.

That we have received much information, tending to establish
These remarks I have made for a two-fold purpose: firstly, to impress upon your minds the great importance of the subject we are about to take into consideration,—to prove to you that we stand, as it were, upon the brink of a precipice, down which we are liable to be hurled at almost any moment. My object is to point out to you where and what that precipice is, and how it may be avoided; and it is consolatory to know that, in the opinions of the most competent authorities, by the exercise of the requisite caution and activity, guided by the aids of science, it is quite within our power to avoid it. Secondly, I have made these remarks for the purpose of justifying my appearance before you, and soliciting your attention. In doing so, I feel I am only following the example of many excellent individuals of high professional celebrity, who in a

the conclusion, that cholera is not the sudden disease which has hitherto been supposed; that the commonly known form of the malady is, in reality, its second stage; and that its first stage is manifested by the premonitory symptom of diarrhoea, which is commonly unattended to, but which, if met by the strict observance of proper regimen, and by appropriate medicine, may be arrested before passing into the more violent and fatal stage of the disease.

That, in addition to our former recommendations, we further recommend, that preparation be made for, what appears to us, to be one of the most important measures of alleviation, the establishment of local dispensaries, where persons affected with the disease, as manifested by the premonitory symptoms, may be immediately placed under the proper treatment for arresting the further progress of the malady."
variety of ways are taking very great pains to make
the public acquainted with the causes, and means
of removal, of the prevalent diseases which afflict
and depress the lower orders; firmly convinced
that such a mass of misery and distress has only to
be brought before the public to excite their sympa-
thies and enlist their hearty co-operation in its
relief,—without which it is impossible that any great
or permanent improvement of this kind can be
effected.

I now, therefore, proceed to the consideration
of the subject matter, which it is my object in these
lectures to bring under your notice.

But before doing so, it is desirable, perhaps, that
I should give you a short sketch of the plan ac-
cording to which I propose to conduct these lectures.
My object is to give you a succinct but comprehen-
sive view of the whole subject, and to use this town* for
the purpose of illustrating the various topics
comprising it,—so far, at least, as it admits of being
applied to such a use; by which means, while I am
carrying out one design,—that of affording you
general information,—I shall also be fulfilling an-
other object I have in view,—that of making you
acquainted with the prevailing diseases and existing
defects in this town. It appears to me that this
intention will be best carried out by first bringing

* Brighton.
under your notice the particular diseases chiefly prevalent in towns, and the extent to which they prove destructive to life, after which I shall proceed to describe the various evils such diseases and consequent mortality produce on the population. The nature and extent of the evils being ascertained, I shall then attempt to prove that they admit to a very considerable extent of removal. The nature, extent, and curableness of the evil being ascertained, we shall then be prepared with greater satisfaction to proceed to the investigation of the causes which produce them, and to suggest the appropriate means for their removal. This latter part of the subject will be reserved for the third and fourth lectures.

In treating the subject in this systematic and comprehensive manner, I am well aware that I am departing from the course usually followed in popular lectures of this description. But I cannot help thinking that the much greater interest, with which, owing to the near approach of the cholera and other circumstances, the public now generally regard this subject, will fully justify me in this departure from ordinary rule; or, at any rate, if I am in error, I hope it will be conceded that it is an error on the right side. For I am very doubtful if proportionate good results ever flow from the partial and desultory handling of subjects, more especially of such a subject as the one we are now about to enter upon.

I shall here also take the liberty of reminding
you that this subject is not one calculated to afford amusement and entertainment; it does not, indeed, admit of being treated of in such a manner. A great deal of what I shall have to bring under your notice must necessarily consist of statistical details, arguments, and illustrations: indeed, of a great deal of matter which will require the closest attention, and the active use of the intellectual faculties, to render it intelligible. But I think I may promise you, without the fear of incurring any charge of attaching undue value to the subject, that this information being fairly mastered by the mind, you will not find it inferior to any other description of knowledge, which can be conveyed in this manner, in rendering you either useful to yourselves or to your fellow-creatures.

The amount of disease and death prevailing in towns, is, as I have just stated, greatly in excess of that of country districts. What those diseases are, together with their effects, we have now, according to the proposed plan of the lectures, in the first place to consider. But before entering upon the subject, in order to clear up at the outset an obscurity in which it would otherwise necessarily be involved, I shall endeavour to give you a general idea of the causes in which the diseases of towns originate, reserving their more minute consideration for a future period. The general causes of the present unhealthiness of towns do, I think, proceed from a perversion of the natural habits in the ex-
cessive crowding together of human beings on limited spaces of ground, and without any provisions for preserving, by artificial means, those conditions which are essential to health and life, and which man does enjoy when living in healthy rural situations. The main condition of life thus destroyed is the purity of the atmosphere. The production of animal and vegetable refuse matters is a necessary concomitant of human society. These, when allowed to accumulate in such large quantities as at present occurs in our towns, by the emanations they give out when undergoing putrefaction, render the atmosphere quite unfit for healthy respiration. Now, it is to the impurity of the atmosphere so caused, together with defective ventilation of the interior of the houses, that, in the opinion of nearly all persons who have investigated the subject, a large proportion of the excessive amount of disease, and high rate of mortality prevalent in towns, is attributable.

The most obvious and direct effect of the polluted atmosphere of towns on the human constitution, is the generation and propagation of a class of diseases to which the term zymotic has been applied (epidemic, endemic, and contagious diseases). The principal diseases composing this class are typhus, small-pox, measles, scarlet fever, hooping-cough, and diarrhoea, all of which are far more prevalent and fatal in towns than in rural districts. A good general idea of the extent to which these diseases
prevail in large towns, and the mortality caused by them, may be obtained by the ascertainment of these particulars in any one town: on the present occasion I shall make this town* the subject of such inquiry.

The number of deaths from contagious, epidemic, and endemic diseases, registered in the mortuary returns of the Registrar-General for this town during a period of 5 years, from 1838 to 1842, is 829, making the yearly average of deaths for that period 166. Taking the ordinary estimate of twelve cases of illness to one death, the number of cases amounts to 9948, and the yearly average number of cases to 1899, which in round numbers holds the proportion to the whole population of about 1 in 30,—showing that 1 out of every 30 of the population is annually affected with some one disease of this class.

This proportion of course varies in different classes of the community. Amongst the higher orders probably it is not greater than 1 in 40, while amongst the lower orders it may be as high as 1 in 20; for this class of diseases is much more prevalent amongst the lower than amongst the higher orders of the community.

In regard to the relative number of deaths which occur from this class of disease in the two classes of the community, the disproportion is certainly much greater. I am not aware of any inquiries having been made for the purpose

* Brighton.
of ascertaining this point; so the exact proportion is not known: but, judging from general observation, I should say that for every single death amongst the rich there are eight or ten amongst the poor: such are the effects of the superior attention and care, and the greater convenience of life, which the rich are able to command. The Rev. Mr. Elwin, in his report to the Commissioners on the sanitary state of Bath, says, that in an epidemic of the small-pox which raged there in 1837, and which destroyed 300 lives, he does not think that out of that number there was a single gentleman, and not above two or three tradesmen.

The annual number of deaths from the principal diseases composing this class in each of these five years, is shown in the first division of this table:

<table>
<thead>
<tr>
<th>Disease</th>
<th>1838</th>
<th>1839</th>
<th>1840</th>
<th>1841</th>
<th>1842</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typhus</td>
<td>35</td>
<td>17</td>
<td>37</td>
<td>25</td>
<td>32</td>
</tr>
<tr>
<td>Small-pox</td>
<td>20</td>
<td>1</td>
<td>5</td>
<td>86</td>
<td>20</td>
</tr>
<tr>
<td>Measles</td>
<td>33</td>
<td>27</td>
<td>5</td>
<td>32</td>
<td>12</td>
</tr>
<tr>
<td>Scarletina</td>
<td>13</td>
<td>10</td>
<td>6</td>
<td>5</td>
<td>130</td>
</tr>
<tr>
<td>Hooping-cough</td>
<td>12</td>
<td>56</td>
<td>34</td>
<td>21</td>
<td>11</td>
</tr>
<tr>
<td>Diarrhoea</td>
<td>11</td>
<td>9</td>
<td>12</td>
<td>14</td>
<td>39</td>
</tr>
<tr>
<td><strong>Total deaths from zymotic diseases</strong></td>
<td>125</td>
<td>121</td>
<td>110</td>
<td>185</td>
<td>288</td>
</tr>
<tr>
<td>Hydrocephalus</td>
<td>27</td>
<td>29</td>
<td>45</td>
<td>29</td>
<td>42</td>
</tr>
<tr>
<td>Convulsions</td>
<td>58</td>
<td>71</td>
<td>61</td>
<td>67</td>
<td>43</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>36</td>
<td>48</td>
<td>47</td>
<td>64</td>
<td>62</td>
</tr>
<tr>
<td>Consumption</td>
<td>223</td>
<td>194</td>
<td>224</td>
<td>236</td>
<td>190</td>
</tr>
<tr>
<td>Teething</td>
<td>29</td>
<td>20</td>
<td>31</td>
<td>38</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total deaths</strong></td>
<td>916</td>
<td>898</td>
<td>980</td>
<td>1102</td>
<td>1126</td>
</tr>
</tbody>
</table>
The deaths during the three former years from the entire class of zymotic diseases were respectively 125, 121, and 110. These three years, therefore, as regards this class of diseases, were comparatively healthy; the number of deaths being considerably under the average of the five years. The only circumstance worthy of remark occurring during this period is the number of deaths which took place in the year 1839 from hooping-cough,—a disease belonging to the endemic class, and much more fatal in towns than in country districts. In the year 1841, however, there was a great rise in the mortality from this class of disorders, owing to the prevalency of the small-pox, which caused 86 deaths. The number of deaths from this complaint during the two preceding years was very trifling. In the next year (1842) the mortality was still greater, becoming nearly treble what it was in some of the preceding years. This was owing to the still more fatal effects of scarlet fever, which destroyed 120 lives, and to an increase in the number of deaths from diarrhoea. Thus we see that Brighton in three out of the five years before us suffered from some fatal epidemic. In 1839, from hooping-cough; in 1841, from the small-pox; and in 1842, from scarlet fever.

Typhus, the modern scourge of great towns, you will observe, is not very fatal in this town; the number of deaths for the five years being only 156, or a yearly average of 31. This, compared with the
mortality it causes in some towns, is trifling. In Glasgow, for instance, it is stated that the "victims from fever constitute within a fraction fifty-five out of every hundred patients treated in the hospitals."

The annual number of deaths from typhus in England and Wales is, on an average, about 16,000, but lately it has considerably exceeded this. The deaths in the same portion of the country from the entire class of epidemic, endemic, and contagious diseases is about 60,000. "The effect is the same," observes Mr. Chadwick, "as if the whole county of Westmoreland, now containing 56,469 souls,—or the whole county of Huntingdonshire,—or any other equivalent district, were entirely depopulated annually, and were only occupied again by the growth of a new and feeble population, living under the fears of a similar visitation. The annual slaughter in England and Wales from preventable causes of typhus, which attack persons in the vigour of life, appears to be double the amount of what was suffered by the allied armies in the battle of Waterloo."

Supposing the opinion correct, that this class of diseases is entirely preventable by the enforcement of proper sanitary measures,—an opinion in which I am inclined to concur,—there were sacrificed to the present system of neglect in this town, during a period of five years, from one class of diseases alone, no less than 829 lives.

There is one other circumstance in respect to
this class of diseases to which I would direct your attention before I leave their consideration, and that is, the great extent to which they vary from year to year. Thus, in 1841, the number of deaths from the small-pox was 86; in the preceding year it was 5; in the year before that again, only 1. The deaths from the scarlet fever in 1842 were 130; in the two preceding years they were only 5 and 6: and the same variations are observable to a greater or less extent in all the other diseases composing this class. This, indeed, is one of the chief characteristics of this class of diseases, and contrasts strikingly with the other diseases composing the table, which you will observe vary comparatively, but in a trifling degree, from year to year.

These zymotic diseases are the most obvious and direct results of the unfavourable circumstances of life in which the poor are placed. But I should be giving you but a very inadequate idea of the effects of these adverse circumstances to which the poor are exposed, did I leave you with the impression that they are the only diseases which are produced by them. Their more indirect operation on the human frame, though less obvious and more difficult to trace, is equally certain, equally fatal. By depressing the vital powers of the system, and thereby diminishing its powers of resistance, they become the predisposing causes of
many of the most fatal diseases to which the human frame is subject. In the opinion of many of the first authorities in the profession, it is to the depressing effects of the polluted and stagnant atmosphere of towns on the human constitution that a large proportion of the scrofulous diseases of the poor, more especially of that most prevalent and fatal of its forms—consumption, is chiefly ascribable. Hear the experience of Sir James Clark on this point, whose work on consumption is one of the best we at present possess. He says: "If an infant born, in perfect health, and of the healthiest parents, be kept in close rooms, in which free ventilation and cleanliness are neglected, a few months will be sufficient to induce tuberculous cachexia." "There can be no doubt," he observes in another place, "that the habitual respiration of the air of ill-ventilated and gloomy alleys in large towns, is a powerful means of augmenting the hereditary disposition to scrofula, and even of inducing such a disposition de novo. Children reared in the workhouses of this country, and in similar establishments abroad, almost all become scrofulous; and this more, we believe, from the confined impure atmosphere in which they live, and the want of active exercise, than from defective nourishment." The ability of a confined impure atmosphere to produce consumption is confirmed by the fact, that the same distin-
guished physician has actually succeeded in inducing consumption in rabbits, by confining them in cold, damp, and close situations, and supplying them with innutritious food. The same phenomenon also presents itself in the cows which are kept in the close and vitiated stables of the metropolis and other large towns, and also in the monkeys in this country, which are often crowded together during the winter in a confined heated atmosphere, and amongst which consumption commits more extensive ravages than among the human race.

The number of deaths arising from this disease in this town will, I think, surprise you. It amounts, on the average, to 217 annually,—bearing the enormous proportion of more than 20 per cent. to the total deaths; i. e. more than twenty out of every hundred deaths which take place in this town are caused by consumption. This is a larger proportion than that which obtains in Liverpool from the same complaint; and which is the most unhealthy town in the kingdom. We must also bear in mind that this mortality from consumption in Brighton, is confined chiefly to the poor; for a large proportion of the upper and middle ranks, knowing that the air of the town is prejudicial to consumptive people, leave it on the first appearance of any alarming symptoms, and either go
abroad to some more favourable home district, and frequently never return.

The other forms in which scrofula, originating in the bad air of towns, shows itself amongst the poor, are in affections of the eyes, ears, joints, and in abscesses in different parts of the body. Also in a variety of skin diseases, and in numerous other forms, which, if they do not destroy life, certainly render it miserable; and not unfrequently, by incapacitating their victims for their ordinary employments, render them a burden upon their friends, or upon the community.

Another disease which I have found exceedingly prevalent amongst the poor of this town,—and the same thing has been noticed by many other medical men, who have either written or given their evidence on the diseases of the poor of towns,—is indigestion. The reason of this, I imagine, is, that the action of the atmosphere is indirectly necessary to complete the chemical changes which the food undergoes before it is capable of being applied to the purposes of nutrition. If, therefore, the atmosphere is vitiated in its properties, in either being devoid of the due proportion of its natural constituents, or is mixed up with others which are adventitious to its natural composition, it is evident that the digestive operations must be disturbed. But whether this be the correct expla-
nation of its operation or not, is of no practical importance; the fact is certain, that a residence in an impure close atmosphere is invariably productive, sooner or later, of disorders of the digestive organs. These diseases are certainly not so fatal as many others, but they become of great importance as laying the foundation of many other disorders of a highly fatal character. By interfering with the process of nutrition, they frequently so enfeeble the system as to render it incapable of resisting the effects of cold, and by this means become the indirect cause of many fatal inflammations of the lungs and other organs of the body. Contrary to what you would, à fortiori, expect, that inflammations would be the most fatal in the country, where the inhabitants are the most exposed to the effects of the weather, these complaints are far more prevalent and fatal in towns; and this is ascribed by medical men to the above-mentioned depressing effect on the constitution rendering it more susceptible to atmospheric changes. Casting your eyes over the table of deaths, you will find that pneumonia, or inflammation of the lungs, is very fatal in this town,—the total deaths during the five years being 257. Another circumstance which renders indigestion a disease of importance as prevailing extensively amongst the poor, is, that though it is not often in itself fatal, it is an excessively harassing and dis-
tressing disease, and from its great prevalency produces, in the aggregate, an immensity of both physical and mental suffering. Its effects upon the mind are peculiarly distressing. The patients afflicted with it become depressed, melancholy, and desponding,—indifferent to their own interests,—incapable of assisting themselves, and not unfrequently, in order to obtain momentary immunity from the wretchedness oppressing them, fly to ardent spirits, which aggravates the disorder, and in the end, sooner or later, is certain to conduct them to the lowest depths of sin and wickedness.

Lastly, common opinion ascribes a large proportion of the diseases of children, as inflammation of the brain, (hydrocephalus), convulsions, teething, &c., to the same depressing effects on the constitution of a close and polluted atmosphere. The number of deaths from these three complaints during the five years is—

Hydrocephalus . . . . . . 152
Teething . . . . . . . 137
Convulsions . . . . . . 300

The following statement by Dr. Guy* is formed from materials extracted from the report of the Registrar-General, of the diseases which occasion the excessive mortality of large towns:—Deaths in

* Lecturer on Forensic Medicine at King's College Hospital.
ON THE DISEASES OF TOWNS.

1,000,000 from small pox, country 500, town 1,000; from measles, country 350, town 900; scarlet fever, country 500, town 1,000; typhus, country 1,000, town 1,250; epidemic and contagious disorders together, country 2,400, towns 6,000; (waste of life in towns under this head, 2,200 a year); scrofulous diseases and consumptions, country 3,800, towns 4,600.—Total excess of deaths in towns, 5,500 in the 1,000,000.

Of the severe pressure the foregoing diseases exert upon the lower orders, we have a fearful illustration in the reduced duration of life that has been found to obtain amongst them in all places in which inquiries have been instituted for the purpose of ascertaining that point. The following tables, taken from Mr. Chadwick's report on the sanitary state of the population, exhibit the average age attained by the three classes of the community in some of our large towns, and in some of the districts of the metropolis. It is not pretended that they represent the exact relative sanitary state of the populations, but I think that they are sufficiently correct for popular use, and for the formation of general conclusions:—

<table>
<thead>
<tr>
<th>No. of Deaths</th>
<th>Liverpool, 1840</th>
<th>Average Age of Deceased</th>
</tr>
</thead>
<tbody>
<tr>
<td>137 Gentry and professional persons, &amp;c.</td>
<td>. . .</td>
<td>35 years.</td>
</tr>
<tr>
<td>1,738 Tradesmen and their families</td>
<td>. . .</td>
<td>22 &quot;</td>
</tr>
<tr>
<td>5,577 Labourers, mechanics, and servants, &amp;c.</td>
<td>. . .</td>
<td>15 &quot;</td>
</tr>
</tbody>
</table>
### Bethnal Green

<table>
<thead>
<tr>
<th>No. of Deaths</th>
<th>Average Age of Diseased</th>
</tr>
</thead>
<tbody>
<tr>
<td>101 Gentlemen and persons engaged in professions, and their families</td>
<td>45</td>
</tr>
<tr>
<td>273 Tradesmen and their families</td>
<td>26 years</td>
</tr>
<tr>
<td>1,258 Mechanics, servants, and labourers, and their families</td>
<td>16</td>
</tr>
</tbody>
</table>

### Manchester

- Professional persons and gentry, and their families | 38 |
- Tradesmen and their families | 20 |
- Mechanics, labourers, and their families | 17 |

### Bolton Union

- 103 Gentlemen and persons engaged in professions, and their families | 34 |
- 381 Tradesmen and their families | 23 |
- 2,232 Mechanics, servants, labourers, and their families | 18 |

### Leeds Borough

- 79 Gentlemen and persons engaged in professions, and their families | 44 |
- 824 Tradesmen, farmers, and their families | 27 |
- 3,395 Operatives, labourers, and their families | 19 |

### Derby

- 10 Professional persons, or gentry | 49 |
- 125 Tradesmen | 38 |
- 752 Labourers and artisans | 21 |

### Whitechapel Union

- 37 Gentlemen and persons engaged in professions, and their families | 45 |
- 387 Tradesmen and their families | 27 |
- 1,762 Mechanics, servants, and labourers, and their families | 22 |

### Strand Union

- 86 Gentry and persons engaged in professions, and their families | 43 |
- 221 Tradesmen and their families | 33 |
- 674 Mechanics, labourers, servants, and their families | 24 |
ON THE DISEASES OF TOWNS.

Bath.

<table>
<thead>
<tr>
<th>No. of Deaths</th>
<th>Bath.</th>
<th>Average Age of Deceased.</th>
</tr>
</thead>
<tbody>
<tr>
<td>146 Gentlemen, professional persons, and their families</td>
<td>. . . . . . . . . . .</td>
<td>55 years.</td>
</tr>
<tr>
<td>244 Tradesmen and their families</td>
<td>. . . .</td>
<td>37 ,</td>
</tr>
<tr>
<td>896 Mechanics, labourers, and their families</td>
<td>. . . .</td>
<td>25 ,</td>
</tr>
</tbody>
</table>

Truro.

<table>
<thead>
<tr>
<th>No. of Deaths</th>
<th>Truro.</th>
<th>Average Age of Deceased.</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 Professional persons, or gentry, and their families</td>
<td>.</td>
<td>40 ,</td>
</tr>
<tr>
<td>136 Persons engaged in trade, or similarly circumstanced, and their families</td>
<td>. . . .</td>
<td>38 ,</td>
</tr>
<tr>
<td>447 Labourers, artisans, and others similarly circumstanced, and their families</td>
<td>. . . .</td>
<td>28 ,</td>
</tr>
</tbody>
</table>

The reduction of life amongst the labourers of towns will appear more conspicuous when contrasted with the age attained by the labourers in country districts.

<table>
<thead>
<tr>
<th>No. of Deaths</th>
<th>Unions in the County of Wilts.</th>
<th>Average Age of Deceased.</th>
</tr>
</thead>
<tbody>
<tr>
<td>119 Gentlemen and persons engaged in professions, and their families</td>
<td>. . . . . . . . . . .</td>
<td>50 years.</td>
</tr>
<tr>
<td>218 Farmers and their families</td>
<td>. . . .</td>
<td>48 ,</td>
</tr>
<tr>
<td>2,061 Agricultural labourers and their families</td>
<td>. . . .</td>
<td>33 ,</td>
</tr>
</tbody>
</table>

County of Rutlandshire.

<table>
<thead>
<tr>
<th>No. of Deaths</th>
<th>County of Rutlandshire.</th>
<th>Average Age of Deceased.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Professional persons and gentry, and their families</td>
<td>. . . . . . . . . . .</td>
<td>52 ,</td>
</tr>
<tr>
<td>Tradesmen and their families</td>
<td>. . . .</td>
<td>40 ,</td>
</tr>
<tr>
<td>Mechanics, labourers, and their families</td>
<td>. . . .</td>
<td>38 ,</td>
</tr>
</tbody>
</table>

Having now pointed out to you the chief diseases which prevail amongst the poor of this and other large towns, and the frightful destruction of life which is the consequence, our next step is to ascertain the effects which such excessive sickness and mortality produce on the population. These effects are of the most varied description, and ex-
cessively wide in their ramifications; and though most persons are acquainted with some of them—for some are so obvious that they cannot be overlooked—there are few who have anything like an accurate conception of the full extent of the evils they entail upon us, but with which it is desirable that we should all be familiar. We shall first consider the pecuniary effects, or the actual cost in money, which is thrown on the community by sickness and a high rate of mortality. This is incurred in a variety of ways—

1. There is the expense of medical attendance in sickness. This is either public or private: the former when families are attended by the parish officers, or by the medical men attached to the dispensaries and similar institutions; the latter when families employ their own medical man. We are in possession of no data to enable us to form any satisfactory estimate of the total cost entailed upon the county by this item of expense. The only calculation of the kind we possess is one for the county of Lancashire, framed by Dr. Lyon Playfair. He ascertained that there are practising in that county 76 physicians, 1246 general practitioners, and 1581 chemists and druggists, making altogether 2581 persons connected with the medical profession; and supposing each to receive on the average £300 a year, the annual sum expended in medical attendance and medicines in this county
alone amounts to £774,000. Supposing this estimate at all near the truth, the annual cost for the United Kingdom on the same account cannot be much less than £14,000,000 or £15,000,000.

2. There is the cost incurred for the support of hospitals and other charities for the relief of sickness: also the expense thrown on the rates and private individuals in maintaining the poor during the periods of illness and convalescence, when of course most of them are unable to support themselves. It is stated by Dr. Southwood Smith that the extra expense incurred by the Bethnal Green and Whitechapel Unions during the quarter ending Lady-Day 1838 was—Bethnal Green, £216. 19s.; Whitechapel Union, £400; altogether £616. 19s.: which is at the rate of £2467. 16s. a year. And if such is the cost of a single district, and for a single disease alone, what must be the expense entailed upon the united country by the whole class of diseases?

3. There is the immense burthen thrown on the contributors to the poor-rates, and on private individuals, for the support of the widows and orphans of those who die prematurely. The total number of orphan children on account of whose destitution relief was given from the poor's-rates in the year ending July 1840, was 112,000. The number of widows chargeable on the rates at that period was 43,000. Of these numbers more than 100,000
cases of orphanage, and 27,000 cases of premature widowhood, were ascribed by Mr. Chadwick to removeable causes. Reckoning the cost of maintaining each of these persons at 4s. 6d. per week, the total expense amounts to £1,860,000 per annum. The aggregate cost incurred by the surviving friends and relations in the support of the widows and orphans not chargeable on the rates is probably much greater than this.

4. There is the expense consequent upon the loss to the country of the productive labour of those who die prematurely, or have the natural period of working ability abridged by sickness.

5. In the expense incurred on account of sickness, it is fair to include a considerable portion of the charges attending vice and crime; for, as we shall presently see, disease and sickness have an invariable tendency to lower the morals of the people.

We are not in possession of the requisite information to enable us to form any estimate, approaching even to exactness, of the aggregate expense thus incurred by the United Kingdom on account of sickness and a high rate of mortality; but it is known, and I am sure you will not be inclined to doubt the fact, to amount to a great many millions annually. I am afraid to mention the sum at which I should be inclined myself to estimate it, lest you should think I was exaggerating; but I do not
hesitate to say that it must be considerably more than we pay annually for taxes,—that is to say, more than £50,000,000. Now, it is not pretended that even the most general and complete sanitary measures can ever beget such a state of health amongst the entire population as to save the whole of this vast expenditure; but in the opinion of many talented and trustworthy individuals, whose attention for many years has been directed to the subject, a large proportion of it is preventible. Thus Dr. Lyon Playfair has estimated the loss and cost of all preventible sickness and death for Liverpool at £1,072,381; for Manchester at £810,086; for Bury at £254,444; for Chorlton and Worsley at £290,563; for the whole county of Lancashire at £5,133,557. Mr. Hawkesby has estimated the loss for Nottingham at £300,000; Mr. Clay the loss for Preston at £990,000; Mr. Coulthart the loss for Ashton-under-Lyne at £235,000. According to Dr. Lyon Playfair’s estimate for Lancashire, Dr. Guy has calculated that the annual loss and cost for the metropolis would greatly exceed £2,500,000; for England and Wales it would fall little short of £11,000,000; and for the United Kingdom it would be nearly £20,000,000.

I shall now illustrate the foregoing account I have given you of the various ways in which disease and premature death entail expense on the community, by bringing under your notice a very in-
teresting document prepared by the Rev. G. Lewis of Dundee, for the purpose of shewing the expense which he considered the inhabitants of that town had incurred from the fever which prevailed amongst the poor. This I am anxious to do, because I believe that there are but very few who have any idea of the enormously expensive nature of disease; and I do not think that this fact can be better brought home to the mind than by the actual display, in one view, of the various items of expense. Mr. Lewis' calculations extend over a period of seven years,—from the year 1833 to the year 1839,—during which period there occurred 11,808 cases of fever, and 1,312 deaths; the half of which cases and deaths he considered were those of persons in the prime of life.

The different items of the amount are represented in this table:

<table>
<thead>
<tr>
<th>Description</th>
<th>£.</th>
<th>s.</th>
<th>d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of labour for six weeks of 5,248 adults, at 8s. a week</td>
<td>12,595</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Attendance, medicine at home and infirmary, at 1s. 6d. each</td>
<td>5,248</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Loss of labour for six weeks of 5,248 under age, at 4s. a week</td>
<td>6,297</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Expense of treatment of the above, at infirmary or home, at 10s. a piece</td>
<td>2,624</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Loss by death of 656 adults, at £150 each</td>
<td>98,400</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Loss by 656 deaths under age, at £75 each</td>
<td>49,200</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Treatment of 1,312 cases, at £1 each</td>
<td>1,312</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>£175,676</strong></td>
<td><strong>12</strong></td>
<td><strong>0</strong></td>
</tr>
</tbody>
</table>
The first item of expense in the bill is the loss of labour of 5,248 adults, the half of those who recovered, at 8s. a week for both sexes. Six weeks, according to Dr. Southwood Smith, physician to the London Fever Hospital, and the first authority in these matters, is the average time which an attack of fever detains a patient. This amounts to £12,595. The next item in the bill is for medicines and medical attendance of the above cases, which comes to £5,248. The expense incurred by the loss of labour, and cost of medical attendance, of the remaining half of those who recovered being under age, is estimated at one-half of that of the adults, or £6,297. 12s., and £2,624 respectively. The two next items of expense may not probably be intelligible to many of you. They are called loss by death of 656 adults, and 656 under age. You may think it strange that any one should set about estimating the money value of human beings, in the same way that the farmer does his cattle. But it has been shown by political economists, that every able-bodied person is of a certain value to the state, and when accordingly that person dies so much capital is lost to the country. Now Mr. M'Culloch has estimated the value of a full-grown workman just arrived at maturity at £300. Mr. Lewis, however, sets down the money value of these male and female adults, at the one-half of this, or £150,
and that of those dying under age at £75 each, which makes the loss, by premature death, for the former to be £98,400, and for the latter £49,200. To this is to be added £1 a piece, or £1,312 for attendance and medical expenses. These several items of expense added together amount to the enormous sum of £175,676. 12s., or to £25,096. 13s. per annum.

I do not, of course, pretend to say that the estimate is correct to the figure, but even allowing a great deal for exaggeration, there will still be a very large sum left to which no objections can be made. Nor do I wish you to understand that I adduce this estimate as indication of the average expense incurred in the towns of England on account of fever, for happily this complaint is, on the whole, far less prevalent and fatal in our towns than in those of Scotland. But even amongst us, and in this town, which is as exempt from fever as most towns, the cost entailed upon the community by that complaint is considerable. Taking this estimate as our grounds for calculation, the cost of the 146 deaths from fever, and the corresponding cases of illness which occurred in this town during the five years to which our attention has been called, amounted to about £20,000, or to £4,000 annually.

A second injurious effect of excessive sickliness, and a high rate of mortality, is the necessary ten-
dency it has, by prematurely removing the middle-aged workmen, to substitute a young and thoughtless population in the place of a more mature and experienced one. There is an opinion still afloat amongst the public, and I believe it is entertained by some very sincere and excellent individuals, that disease and pestilence are the natural means used by Providence for checking the population, and keeping it within the means of subsistence; and some few, it is to be regretted, go almost so far as to assert, that it does not therefore become us to attempt to thwart the designs of Providence by interfering in its relief. Now, however contrary to reason it may at first sight appear to you, the facts which have lately been brought to light by the present excellent system of registration, in regard to this country at least, do not justify this impression. They show that, as a general rule, the number of births is dependent upon the number of deaths; increasing as the number of deaths increase, by which means, even in places where the rate of mortality is the highest, the number of deaths is more than counterbalanced by the increasing proportion of births.

This fact is shown in the following tables, which exhibit the ratio of deaths to births in Manchester and the surrounding townships, and in the districts of the metropolis.
Manchester and the surrounding townships.

<table>
<thead>
<tr>
<th>Localities</th>
<th>Population</th>
<th>Deaths</th>
<th>Total deaths of males and females</th>
<th>Proportion of births to population.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males. Females</td>
<td>Male. Fem.</td>
<td>1 in</td>
<td>1 in</td>
</tr>
<tr>
<td>Broughton</td>
<td>1,554 2,239</td>
<td>44.40 89.56</td>
<td>63.21</td>
<td>36.82</td>
</tr>
<tr>
<td>Chatham and Crumpsall</td>
<td>8,963 4,862</td>
<td>45.03 63.14</td>
<td>53.48</td>
<td>34.74</td>
</tr>
<tr>
<td>Pendleton</td>
<td>5,109 5,796</td>
<td>40.22 49.96</td>
<td>44.87</td>
<td>25.47</td>
</tr>
<tr>
<td>Chorlton-upon Medlock</td>
<td>12,551 15,771</td>
<td>30.91 47.79</td>
<td>38.48</td>
<td>26.05</td>
</tr>
<tr>
<td>Hulme</td>
<td>12,850 13,969</td>
<td>37.24 38.48</td>
<td>37.87</td>
<td>23.17</td>
</tr>
<tr>
<td>Ardwick</td>
<td>4,586 5,320</td>
<td>35.55 34.54</td>
<td>35.00</td>
<td>24.27</td>
</tr>
<tr>
<td>Salford</td>
<td>24,762 26,760</td>
<td>27.30 36.60</td>
<td>31.42</td>
<td>22.83</td>
</tr>
<tr>
<td>Manchester</td>
<td>79,061 84,606</td>
<td>26.61 30.15</td>
<td>28.33</td>
<td>26.79</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>144,436 159,328</td>
<td>28.84 34.62</td>
<td>31.60</td>
<td>25.74</td>
</tr>
</tbody>
</table>

**Metropolis.—1841.**

<table>
<thead>
<tr>
<th>Unhealthiest Sub-Dist.</th>
<th>Proportion percent of population</th>
<th>One death in Dths. Bths.</th>
<th>Ratio of deaths to births.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1—25</td>
<td>2.99 3.62 33 28</td>
<td>1 to 1.21</td>
<td></td>
</tr>
<tr>
<td>26—50 Less Unhealthy</td>
<td>2.66 3.14 38 32</td>
<td>1 to 1.18</td>
<td></td>
</tr>
<tr>
<td>51—75 Average</td>
<td>2.43 2.83 41 30</td>
<td>1 to 1.35</td>
<td></td>
</tr>
<tr>
<td>76—100 Healthier</td>
<td>2.18 2.77 46 36</td>
<td>1 to 1.27</td>
<td></td>
</tr>
<tr>
<td>101—125 Healthiest</td>
<td>1.80 2.40 56 42</td>
<td>1 to 1.33</td>
<td></td>
</tr>
</tbody>
</table>

The mortality is 66 per cent. higher in the unhealthy than in the healthy sub-districts; the pro-

portion of births is 51 per cent. higher in the unhealthy than in the healthy sub-districts*.

* The following are the proportion of births and deaths to the population in 1840, and the total rate of increase of population between the years 1831 and 1841:

<table>
<thead>
<tr>
<th></th>
<th>Deaths per annum</th>
<th>Births per annum</th>
<th>Population increase per cent.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 to 1 to</td>
<td>1 to 1 to</td>
<td></td>
</tr>
<tr>
<td>Hereford</td>
<td>64</td>
<td>45</td>
<td>2.9</td>
</tr>
<tr>
<td>Dorset</td>
<td>61</td>
<td>34</td>
<td>9.7</td>
</tr>
<tr>
<td>Cornwall</td>
<td>59</td>
<td>30</td>
<td>13.4</td>
</tr>
<tr>
<td>Devon</td>
<td>58</td>
<td>36</td>
<td>7.8</td>
</tr>
<tr>
<td>Sussex</td>
<td>55</td>
<td>34</td>
<td>10.0</td>
</tr>
<tr>
<td>Southampton</td>
<td>55</td>
<td>37</td>
<td>12.9</td>
</tr>
<tr>
<td>Essex</td>
<td>53</td>
<td>35</td>
<td>8.6</td>
</tr>
<tr>
<td>Wilts</td>
<td>53</td>
<td>35</td>
<td>8.2</td>
</tr>
<tr>
<td>York, North Riding</td>
<td>53</td>
<td>33</td>
<td>7.2</td>
</tr>
<tr>
<td>Rutland</td>
<td>53</td>
<td>30</td>
<td>10.0</td>
</tr>
<tr>
<td>Suffolk</td>
<td>53</td>
<td>32</td>
<td>6.3</td>
</tr>
<tr>
<td>Bucks</td>
<td>52</td>
<td>33</td>
<td>6.4</td>
</tr>
<tr>
<td>Lincoln</td>
<td>52</td>
<td>31</td>
<td>14.2</td>
</tr>
<tr>
<td>Stafford</td>
<td>51</td>
<td>31</td>
<td>24.2</td>
</tr>
<tr>
<td>Norfolk</td>
<td>51</td>
<td>34</td>
<td>5.7</td>
</tr>
<tr>
<td>Cumberland</td>
<td>51</td>
<td>35</td>
<td>4.3</td>
</tr>
<tr>
<td>Gloucester</td>
<td>51</td>
<td>37</td>
<td>11.4</td>
</tr>
<tr>
<td>Salop</td>
<td>50</td>
<td>37</td>
<td>7.2</td>
</tr>
<tr>
<td>Oxford</td>
<td>50</td>
<td>32</td>
<td>6.1</td>
</tr>
<tr>
<td>Hertford</td>
<td>49</td>
<td>29</td>
<td>9.6</td>
</tr>
<tr>
<td>Kent</td>
<td>48</td>
<td>35</td>
<td>14.4</td>
</tr>
<tr>
<td>Somerset</td>
<td>48</td>
<td>33</td>
<td>7.8</td>
</tr>
<tr>
<td>Derby</td>
<td>47</td>
<td>35</td>
<td>14.7</td>
</tr>
<tr>
<td>Northampton</td>
<td>47</td>
<td>39</td>
<td>10.9</td>
</tr>
<tr>
<td>Warwick</td>
<td>47</td>
<td>31</td>
<td>19.4</td>
</tr>
<tr>
<td>Hants</td>
<td>46</td>
<td>28</td>
<td>10.3</td>
</tr>
<tr>
<td>Cambridge</td>
<td>45</td>
<td>28</td>
<td>14.2</td>
</tr>
<tr>
<td>Surrey</td>
<td>45</td>
<td>33</td>
<td>19.7</td>
</tr>
<tr>
<td>Bedford</td>
<td>44</td>
<td>26</td>
<td>13.0</td>
</tr>
</tbody>
</table>

[Continued next page.]
The fact of an increase of births being a general attendant upon a high rate of mortality may be thus illustrated. A young man, we will say, at the age of 21 finds employment, and in consequence of that, marriage. But instead of living to the natural period of superannuation, which is estimated at 60 years in the healthiest districts, at the age of 25, owing either to an unsound hereditary constitution, or to the unhealthy nature of his employment or place of residence, is attacked with consumption and dies, leaving a widow and two orphan children. His vacant place of work is immediately occupied by another young workman, who, we will say, lives to the age of 35, when he is carried off by some epidemic, leaving a widow and

<table>
<thead>
<tr>
<th></th>
<th>Deaths per annum</th>
<th>Births per annum</th>
<th>Population increase per cent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northumberland</td>
<td>44</td>
<td>29</td>
<td>12.2</td>
</tr>
<tr>
<td>Westmoreland</td>
<td>43</td>
<td>35</td>
<td>2.5</td>
</tr>
<tr>
<td>York, East Riding</td>
<td>43</td>
<td>34</td>
<td>14.6</td>
</tr>
<tr>
<td>Durham</td>
<td>43</td>
<td>28</td>
<td>27.7</td>
</tr>
<tr>
<td>York, West Riding</td>
<td>43</td>
<td>27</td>
<td>18.2</td>
</tr>
<tr>
<td>Chester</td>
<td>43</td>
<td>34</td>
<td>18.5</td>
</tr>
<tr>
<td>Berks</td>
<td>42</td>
<td>28</td>
<td>10.2</td>
</tr>
<tr>
<td>Middlesex</td>
<td>42</td>
<td>35</td>
<td>16.0</td>
</tr>
<tr>
<td>Leicester</td>
<td>40</td>
<td>29</td>
<td>9.5</td>
</tr>
<tr>
<td>Monmouth</td>
<td>30</td>
<td>26</td>
<td>36.9</td>
</tr>
<tr>
<td>Nottingham</td>
<td>36</td>
<td>23</td>
<td>10.8</td>
</tr>
<tr>
<td>Worcester</td>
<td>33</td>
<td>20</td>
<td>10.4</td>
</tr>
<tr>
<td>Lancaster</td>
<td>32</td>
<td>26</td>
<td>24.7</td>
</tr>
</tbody>
</table>
seven children. The vacancy occasioned by his death is occupied by a third, who lives to the age of 40, when he is killed by an attack of inflammation, leaving a wife and five orphan children. Thus the period of time which ought to have been occupied by one only, has been filled by three generations of workmen, all of whom died prematurely, leaving three widows and three families of orphan children, amounting to 14 in number. Had the first workman lived to the natural period of superannuation, which it is considered, by a judicious combination of internal and external sanitary measures, may be prolonged to 60 years, there would have been but one family, consisting, we will say, of 9 children reared, instead of three families of 14 children, causing the increase of births to be 50 per cent. greater than it would have been in the former case, which more than makes up for the excessive loss by deaths. Another cause of excessive births being a general attendant upon a high rate of mortality is, that a large proportion of the deaths are those of children under one year of age, which enables the mothers to bear children in more rapid succession.

The vacancies in work, occasioned by premature deaths, do not, of course, occur in any one place in the precise manner I have narrated, but it fairly illustrates the general mode in which the vacancies caused by premature deaths are filled up by young men who, in consequence of finding employment,
marry early in life, thereby increasing the fecundity of the population.* Had these young men been unable to have procured employment, the most cautious of them would have delayed their marriages to a later period of life, or would have sought for employment elsewhere.

The large proportion which the young bear to the old amongst the poor in Manchester and other physically depressed districts, as contrasted with rural situations, has frequently been the subject of remark by those who have witnessed large assemblages of the working classes brought together on any public occasion, in the two descriptions of districts; and experience has shewn that such a population is far more dangerous and more difficult to govern than one in which the elder and middle-aged men bear a natural proportion to the young. It is reported that the bulk of the seditious assemblages held by torchlight in Manchester consisted of mere boys, and that there were scarcely any men of mature age to be seen amongst them;—those of mature age and experience, it was stated, generally disapproved of the proceedings of the meetings, as injurious to the working classes themselves; and they were generally described as being above the influence of the anarchical fallacies which appeared to sway those wild and really dangerous assemblages.

* Dr. Lyon Playfair states, that out of 2824 married men working in factories in different parts of Lancashire, he found that the average age of marriage among males was not above 23 years.
In the metropolis the experience is similar. The mobs against which the police have to guard come from the most depressed districts; and the constant report of the Superintendents is, that scarcely any old men are to be seen amongst them. In general they appear to consist of persons between 16 and 25 years of age. The peace officers at Bristol also state that the havoc during the riots there was committed by mere boys.*

Thirdly.—A low sanitary condition of the population is invariably, indeed necessarily, attended with, and also produces, deteriorated physical qualifications.

When the human frame is subject, generation after generation, to adverse external circumstances of life, it gradually loses its natural qualifications, and becomes deformed, stunted in size, and deficient in strength; or as the farmer would say of his cattle under similar circumstances, the breed deteriorates. It is a matter of universal observation that the working inhabitants of our manufacturing towns are far inferior, both in size and ability to labour, to the inhabitants of healthy country districts. The number of persons coming from such depressed districts, available for public service, is comparatively small. The experience of the Metro-

* Report on the sanitary condition of the population, by Mr. Chadwick.

The principal actors in the late revolution in France, it is stated in the papers, were young men under 20 years of age.
politan Police, in regard to the depressed districts of the metropolis,—as Spitalfields and Whitechapel,—is, that two out of every three of the candidates for admission are found defective in their physical qualifications. It is remarked that it is rare that a candidate coming from these districts is found to possess the requisite qualifications for the force, which is recruited from the open districts at the outskirts of the town, or from Norfolk and Suffolk, and other agricultural counties.

Similar observations respecting the physical imperfections of the poorer inhabitants of unhealthy districts have been made by the officers of the army. Sir James M'Gregor says that,—"A corps levied from the agricultural districts in Wales, or the northern counties in England, will last longer than one recruited from the manufacturing towns,—from Birmingham, Manchester, or near the metropolis. Indeed, so great and permanent is the deterioration, that out of 613 men enlisted, almost all of whom came from Birmingham and five other neighbouring towns, only 238 were approved for service.*

The same thing has been observed in foreign

* Dr. Lyon Playfair states:—"It was a matter of constant complaint by the recruiting officers in the various districts of the country, that the sons are less tall than the fathers; and the difficulty is constantly increasing of obtaining tall and able-bodied men.

"I found the indication of recruiting officers often very shrewd and useful; but without one exception they complained of the difficulty of getting men 'to pass the surgeon' in this country.
countries. It is on record, that at Mulhausen, once celebrated for a fine race of men, such is their

As an example, I may adduce the evidence of Serjeant Farrell, of the 47th Regiment:—

"'Have you long been engaged in the recruiting service?"
"'For nearly ten years.
"'Do you find it equally easy to recruit in Lancashire now as formerly?
"'Where I could get ten recruits formerly, that I could venture to send up, I can now only get one; and that one is often rejected. Out of seven I got lately, only one passed.
"'Do you think that this difficulty arises from people getting better wages at factories than in the army?
"'No, not at all. When persons go to work so soon they do not grow up to the proper size; they have always some deformity; and in the towns, somehow or other, they are pale, sickly, and thin in flesh. The only place where I can get good men is from the country districts.

"'What reason does the surgeon assign for refusing the men you send from the towns?
"'For being too thin; not being sound-chested; and not standing straight.
"'From what towns do you find it most easy to procure good men?
"'I have been only in Yorkshire, Somersetshire, and Bristol. In Yorkshire there are some good men, better than I have found in Lancashire; but they are by far the best in Somerset. In that and other country districts I could easily get good men; but here, in Rochdale, there is almost no use in staying: I have only been able to pick out 30 good-looking men for the last 18 months; and out of these only one was passed by the surgeon for every four rejected.'

"Through the politeness of the head recruiting officer of the Liverpool district, which includes Lancashire, Cheshire, and parts
deterioration through the manufacturing system, that for every one hundred conscripts found fit for

of Shropshire, Derby, North Wales, and Staffordshire, I have obtained returns of the number of persons sent up from various districts, and rejected as unfit for service. The total number sent for inspection from all the districts to the Staff Surgeon in Liverpool, between the 1st of January 1843, to 31st October 1843, was 1560; of which 876 were approved, 684 being rejected. In Liverpool, during the same time, 980 were presented for examination, 439, or 47 per cent., being rejected. Of the 471 admitted, only 54 were natives of Liverpool; 218 being from other parts of England, 180 from Ireland, the remainder from Scotland and Wales.

"The Liverpool sub-division, including Liverpool, Chester, Middlewich, Preston, Warrington, and Blackburn, sent in 955 men, of whom only 436 were approved; 54 per cent. being rejected.

"The Manchester sub-division, including Manchester, Oldham, Macclesfield, Ashton, and Rochdale, (Manchester sending the largest proportion), sent in at the same time 358 men, of whom 102, or 28 per cent., were rejected.

"The Newcastle sub-division, comprising Newcastle, Stafford, &c., offered 163 men, of whom 40, or 24 per cent., were rejected; the Shrewsbury division, sending in 84 men, of whom 23, or 27 per cent., were rejected as unfit for service. The following table gives the general results.

"Table shewing the per centage of recruits rejected as unfit for service, out of those sent up for examination to the Staff Surgeon at Liverpool:—

<table>
<thead>
<tr>
<th>District</th>
<th>Recruits Sent</th>
<th>Rejected</th>
<th>Percentage Rejected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liverpool (town)</td>
<td>930</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liverpool (sub-division)</td>
<td>955</td>
<td>54</td>
<td>54 per cent.</td>
</tr>
<tr>
<td>Manchester</td>
<td>358</td>
<td>28</td>
<td>28 per cent.</td>
</tr>
<tr>
<td>Newcastle</td>
<td>163</td>
<td>24</td>
<td>24 per cent.</td>
</tr>
<tr>
<td>Shrewsbury</td>
<td>84</td>
<td>27</td>
<td>27 per cent.</td>
</tr>
</tbody>
</table>
military service, one hundred are rejected; and that at Rouen one hundred and sixty-six, and at Elbeuf one hundred and sixty-eight, are rejected for every one hundred passed.

Now, when we consider how much of the present power and glory of this country has been obtained through the instrumentality of the superior strength and bodily endurance of its working classes, as exerted in the factory, in the colonies, or in the naval and military services, this physical deterioration of the lower orders is to be viewed with the greatest concern. If the chief means upon which our present superiority over other nations rests, fails us, it is certain that at the first struggle we shall be brought down to their level. These fears have been frequently entertained and expressed by authors of established credit and reputation. The late Dr. J. Johnson, when alluding to the evils proceeding from millions of the poor being pent up during a large portion of their time in crowded manufactories, workshops, and similar places, inhaling alike the physical as well as moral poison, observes, "I think it is far from improbable that, some ten or twelve centuries hence, when Australia shall have become a powerful nation—Asia be governed by limited monarchies of native birth—the Antilles a swarm of independent republics, of all hues between jet white and black—when America shall exhibit a long series of disunited states, stretching from
Terra del Fuego to the barren coasts of Labrador—when British dominion shall not extend beyond the British Isles, if so far—then, probably, some contemplating philosopher may stand on the banks of the Thames, as Gibbon stood on the tower of the Capitol, musing and meditating on the "decline and fall" of a great empire, and on the degeneracy of a people, whose arms, arts, and commerce, had long been the theme of universal admiration and envy, * * * and when surveying the stunted beings composing the mass of a degenerated manufacturing population, will be likely to exclaim—

"'Twas not the sires of such as these,
That dared the elements and pathless seas,
That made proud Asian monarchs feel
How weak their gold 'gainst Europe's steel,
But beings of another mould,—
Rough, hardy, vigorous, manly, bold."

But a still more distressing and equally certain consequence of adverse physical circumstances lowering the standard of health amongst the community, is the depressing effects they produce on the mind. In this stage of our existence the mind and body, though perfectly distinct existences, are united in the closest possible manner, and each is dependent upon the other for its qualifications. When the mind is distressed by adverse circumstances, or is worn down by care and anxiety, or long-continued
application, the bodily powers never fail speedily to participate in the derangement, and the strongest arm becomes as powerless as a child's. On the other hand, when the body is weakened by disease, or debilitated by long-continued and perpetually recurring exertions beyond its natural powers of endurance, the mind loses its natural vigour, and becomes weak, vascillating, and capricious. This dependence of mind on matter, and of matter on mind, is in accordance with the laws of the human constitution, and there cannot possibly be any exception to it. The effects of the bodily condition on the mind, you have probably all of you experienced, on a small scale, in your own persons, when the strength has been lowered by illness, or any unusual bodily exertion or fatigue. It has been at these times, I am sure you will readily admit, that you have felt the least capable of bearing up against any obstacle which may have lain in your path, the most apt to complain of your lot, the most inclined to give way to temptations. Now, consider how unfortunate is the condition of those who live habitually under such depressing influences; and to what injurious consequences it must lead. In the opinion of those persons who have been engaged in the late investigations of the state of towns, and in tracing effects to their causes, it is to the depressing effects of this physical deterioration on the mind that a very large proportion of the apathy and indifference
to improvement, of the vice, dissipation, and crime, so fearfully prevalent in our large manufacturing towns,—the real extent of which is known to but few,—is attributable. Hear what Dr. Southwood Smith says on this subject:—“There is evidence,” he says, “that as they have not the bodily vigour and the industrious habits of a healthy independent peasantry, so they have not the intelligence and spirit proper to such a race. One of the most melancholy proofs of this is in the quiet and unresisting manner in which they succomb to the wretchedness of their lot. They make no effort to get into happier circumstances; their dulness and apathy indicate an equal degree of mental as of physical paralysis; and this has struck other observers who have had opportunities of becoming acquainted with the real state of these people. In the Poor Law Commissioners' Report on the Sanatory Condition of the Labouring Population, there is the following statement, which impressed my mind the more, because it recalled to my recollection vividly similar cases witnessed by myself:—‘In the year 1836,’ says one of the medical officers of the West Derby Union, ‘I attended a family of thirteen; twelve of them had typhus fever, without a bed in the cellar, without straw or timber-shavings,—frequent substitutes. They lay on the floor, and so crowded that I could scarcely pass between them. In another house I attended fourteen patients:
there were only two beds in the house. All the patients lay on the boards, and during their illness never had their clothes off. I met with many cases in similar conditions; yet amidst the greatest destitution and want of domestic comfort, *I have never heard, during the course of twelve years' practice, a complaint of inconvenient accommodation.* Now, this want of complaint under such circumstances appears to me to constitute a very melancholy part of this condition; it shows that physical wretchedness has done its worst on the human sufferer, for it has destroyed his mind. The wretchedness being greater than humanity can bear, annihilates the mental faculties—the faculties distinctive of the human being. There is a kind of satisfaction in the thought, for it sets a limit to the capacity of suffering, which would otherwise be without bound."

Again, he observes, "It is remarkable that the districts we have been speaking of," (meaning the unhealthy districts in the east of London) "are not only the seats of disease, but the great seats of crime. I mean those places are the haunts and abodes of the greatest criminals; so that the seats of the most terrible diseases and the haunts and abodes of the greatest criminals of the country are identical. The worst place I know, in the parish of Whitechapel, is the place where the most dishonest and profligate portion of the community live."
But the most melancholy reflection arising out of the foregoing fact is, that this mental apathy, dulness, and proneness to vice—the result of physical deterioration—is not confined to those in whom they are originally induced. Physiology teaches, and experience confirms the fact, that the mental as well as the bodily endowments and peculiarities of the parent are, to a very great extent, perpetuated in the offspring. The uniform testimony of the teachers at parish schools is, that the minds of the children of a physically depressed population are torpid; it is comparatively difficult to gain their attention, or to sustain it; it requires much labour to irradiate the countenance with intelligence, and the irradiation is apt to be transient. As a class, they are comparatively irritable and bad-tempered. The most experienced and zealous teachers are gladdened by the sight of well-grown healthy children, which presents to them better promise that their labours will be less difficult, and more lasting and successful. On one occasion, it is reported, a comparison was made between two sets of children in Glasgow,—the one set taken from the wynds and placed under the care of the most skilful and successful infant schoolmasters, the other a set of children from a more healthy town district, and of a better physical condition, placed under the care of a pupil of the master, the master himself having charge of the children from the wynds.
After a trial for a sufficient time, the more experienced master acknowledged the comparative inferiority of his pupils, and his inability to keep them up to the place of the better bodily-conditioned children.*

Lastly, in enumerating the evils proceeding directly from sickness, there are to be mentioned—the pain, misery, and distress, both mental and physical, caused by such an immense mass of disease, to which being added the numerous evils resulting to all families indirectly from the premature removal of the parents—many thousand instances occurring annually: these, when put together, form no inconsiderable item in the general sum of misery and distress to which all persons in this stage of their existence are subject.

Now, to sum up in a few words the foregoing account of the effects of sickness, it is not an exaggeration to say that its withering influence is extended to, and entwined around, every part of the great fabric of human society, cramping its action, and undermining its stability. It creates an enormous expenditure, which might otherwise be appropriated to the purchase of the conveniences and necessaries of life, or applied to other useful purposes or means of improvement. It substitutes a young, irritable, passionate, reckless population,

* Mr. Chadwick on the labouring population of Great Britain.
dangerous to the internal peace and prosperity of the country, for a more staid and experienced one, which preserves instruction and is steadily progressive; it depresses the physical qualifications of the population, thereby abridging the amount of productive power in the country, and undermining the very means through which, in great measure, we have obtained our present proud position amongst the other nations of the world. And, lastly, conjointly with depressing the physical qualifications of the population, it impairs their mental power, thereby placing obstacles in the way of education and moral advancement, alike destroying and abridging their social and domestic happiness.
LECTURE II.

Are the misery and distress produced by the prevalent diseases in Towns capable of remedy? Proof afforded by extensive and varied evidence that a large proportion of prevalent disease is preventible. Verification of proof by reference to present exemption of towns of Western Europe from the plagues and pestilences of the Middle Ages. The Black Death. The Sweating Sickness. The Great Plague of London. Cause of these scourges mainly attributable to filthy habits, and modes of life, and dearth of food. Ravages of Scurvy in the British Navy during the eighteenth century. Progressive and striking improvements attending introduction of preventive and sanitary measures into the British Navy—shown in Statistical Tables of Dr. Wilson. Contrast between the former and present state of Prisons in England. The Jail Fever. Bad air and unwholesome food the chief causes of contagious diseases. Philosophical explanation of the foregoing facts. Two primary laws of the Creator infringed in our present institutions and general habits of life. Investigation of the causes to which prevailing diseases owe their origin. Mortality of towns and rural districts contrasted. Excessive mortality of towns owing chiefly to impurity of atmosphere. Increase of mortality attendant upon increase of population. Cellar and alley populations of Birmingham, Manchester, and Liverpool. Physical causes of disease press most heavily on the working classes. Diagram illustrating the great difference in the probabilities of life between the three classes of the community. Longevity.
The greatest proportion of centenarians among the labouring classes. Distinctive influence of noxious agencies in towns not confined to the lower orders. Application of foregoing facts in illustration of the principle, that whatever injuriously affects one portion of society, is extended, sooner or later, to all classes.

In my last Lecture I directed your attention to the prevailing diseases of towns, and attempted to prove to you that they tend in a variety of ways to the production of misery and distress, and both the physical and mental deterioration of those who suffer from them. This point being arrived at, the next question which naturally suggests itself for our consideration is this,—Have we it in our power to remedy these evils?

On this point of inquiry it is of the greatest importance that we should be fully satisfied. Because, if it should be found that we are unable to remedy the evil, the wisest course is to cease complaining, and submit ourselves to them with the greatest Christian endurance we can command. But if, on the other hand, it should appear certain, upon satisfactory evidence, that there is a remedy within our reach, it is surely the very height of folly not at once to use our best efforts to apply it. In what has gone before, I have several times incidentally mentioned, that, in the minds of those who had given up their attention to the investi-
gation of this subject, there is but one opinion, which is,—That the means of improvement are within our reach, and are not indeed difficult of application. This I doubt not all are willing to believe; but inasmuch as a conviction arrived at, as the result of argument and personal investigation of the subject, is much more satisfactory, and, in this instance, more likely to be attended with beneficial results than the mere tacit acquiescence in an opinion formed by others (and of the evidence upon which that opinion rests, the individual himself is ignorant), I shall now attempt to lay before you the proofs of the truth of the proposition I have advanced,—that a large proportion of the diseases now prevailing amongst the community is preventible. The evidence upon which that conviction is founded is extensive and varied, affording us numerous ways of arriving at the same conclusion; but, on the present occasion, want of time will compel me to confine myself to one description of evidence,—that derived from the experience of the past. The argument I shall pursue, briefly stated, is simply this,—that we are in possession of facts to show, that, at a former period of our history, certain diseases, analogous in nature to those we are now suffering from, were exceedingly prevalent and fatal in certain districts and amongst certain classes of the
community; that those diseases were invariably coexistent with certain agencies, which agencies, differing only in intensity, are also invariably found in joint existence with the present prevailing disorders; and that the removal or diminution of these agencies was invariably followed either by the disappearance or mitigation of their accompanying disorders:—whence I shall adduce the inference, that the removal or diminution of the agencies attending our present prevailing diseases will also be, in like manner, followed by the removal or mitigation of the consequent disorders. For the verification of this assertion, I shall refer to the present exemption of the towns of this country, and those of Western Europe, from the plagues and pestilences which are known formerly to have fearfully afflicted them; and to the expulsion, within the last century, from our navy and prisons, of some contagious and epidemic disorders, which previously to that time produced dreadful havoc amongst their respective inmates.

First, as to the disappearance of plagues and pestilences from the towns of the Northern and Western parts of Europe.

It is a well-recorded matter of history, that, some centuries ago, it was seldom that any large town, or even the small villages, remained many years together exempt from the attacks of some
plague or pestilence, the effects of which were often disastrous in the extreme, to the extent, in some instances, of rendering the places they had visited almost without an inhabitant.

The great severity of these visitations will appear from the recital of the following extracts from the annals and histories of the times. In 1093, the quick could scarcely bury the dead. In 1196, a fierce pestilence broke out, in the form of an acute fever, which destroyed such numbers that scarcely any were left to minister to the sick. The customary funeral services ceased. In many places large ditches were made, into which the dead were thrown. In 1257, the inundations of autumn destroyed the crops. This pestilential year gave birth to fatal fevers. In the summer, and principally the dog-days, two thousand dead bodies were carried to the cemetery of St. Edmunds. In the following year, about the feast of the Trinity, the pestilence grew intolerable; 15,000 perished in London alone; in England and elsewhere, many thousands died. In 1348, the Black Death, which broke out at Southampton, destroyed half the population. According to another estimate, one-tenth part of the people did not survive. In a royal edict, of December 1349, it is said, "non modica pars populi est defuncta;" in another, of 1350, a stronger phrase is used, "magna pars populi est defuncta." In 1352,
scarcely a fourth part of the people had survived the plague. It spared the great, to fall with redoubled fury upon the workmen and servants. Crowded cities were depopulated. In 1379, a plague broke out in the northern part of the island. Villages and cities crowded with warlike, wise, and rich men, were reduced to a solitude and a desert. In this extremity, the Scots fell upon the country; and, before making their incursions, prayed, "God, and St. Mary, and St. Andrew, shield us this day from the foul death that Englishmen die from." In 1477, the pestilence which occurred after the death of the Duke of Clarence, was so fierce, that the past 15 years' war consumed not the third part of the people, that only four months miserably and pitifully despatched and brought to their graves. In 1484, shortly after the 7th of August, a disease appeared among the people, lasting the rest of that month; and all September, "which for sudden sharpness, and unwonted cruelty, surpassed the pestilence. It killed some in opening their windows; some in playing with children in the streets; some in one hour, many in two it destroyed; and at the longest to them that merrily dined it gave a sorrowful supper." If half in every town escaped, it was thought a great favour. This was the sweating sickness, which recurred in 1506, 1517, 1528, and 1551. Owing to the want of any systematic registration of
ON THE DISEASES OF TOWNS.

deaths in these days, we have no means of forming more than a conjecture of the probable number that fell victims to these desolating pestilences, either in this country or abroad; but their great fatality may be judged of from the following record of deaths from the plague in London during the 17th century: at which time, it must be remembered, a considerable abatement had taken place in their severity.

Table of Deaths in London, from the Plague, during the 17th century.*

<table>
<thead>
<tr>
<th>Years</th>
<th>1593</th>
<th>1603</th>
<th>1625</th>
<th>1636</th>
<th>1665</th>
</tr>
</thead>
<tbody>
<tr>
<td>Died of plague</td>
<td>26,005</td>
<td>36,269</td>
<td>35,417</td>
<td>10,400</td>
<td>68,596</td>
</tr>
<tr>
<td>Died of other diseases</td>
<td>15,764</td>
<td>5,773</td>
<td>18,848</td>
<td>12,959</td>
<td>28,710</td>
</tr>
<tr>
<td>Total deaths</td>
<td>41,769</td>
<td>42,042</td>
<td>54,265</td>
<td>23,359</td>
<td>97,306</td>
</tr>
</tbody>
</table>

In the other towns of Europe, the pestilence has been described by the historians of the age as being generally more destructive than in those of this country.

But listen to the following description, given in Ranken’s History of France, of the condition of the towns of Western Europe at about this period of history, and you will then cease to be surprised at the destructiveness of the epidemics. “The

* M’Culloch’s Statistics of Great Britain.
floors of the houses being commonly of clay, and strewed with rushes or 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, grease, fragments of bread, flesh, bones, spittle, excrements of dogs, cats, &c."

It is also known that the diet of the common people at that time was as meagre and unwholesome as their habits were uncleanly and indolent. Vegetables, fruits, and the numerous foreign luxuries, as tea, coffee, sugar, &c., which we now have in abundance, and which, while they gratify the palate, tend also to the preservation of the health, were at that time hardly known, even to the upper ranks. Severe and extensive famines were very common, from which the poor suffered excessively, thousands of them frequently dying of hunger: and the examination of the public records proves that these famines were generally quickly succeeded by some devastating pestilence.

In the course of the 17th century, however, a very great improvement gradually took place in the habits and manners of the people, both as regards personal and general cleanliness, and in the nature of their food. Sanitary measures were better enforced in the towns,—the streets were better kept,—ventilation promoted, and some of the chief sources of atmospheric impurity, to some
extent, removed. Vegetables, especially the potato, and foreign articles of food, entered more largely into the diet of the common people. About this time, also, the great fire of London took place, destroying a large portion of the worst-constructed and densely populated parts of the town, which, being afterwards rebuilt upon somewhat improved principles, ameliorated, to a considerable extent, some of the worst defects under which the town had formerly laboured.

Now, since these desirable changes were effected in the habits of the people and the state of the metropolis, the country has been entirely free from these desolating visitations. During the whole of the 18th century, indeed, there were frequent outbreaks of fever, small-pox, scarlet fever, and other epidemics, which committed considerable havoc, especially in London, where one or other of them frequently cut off from 8,000 to 10,000 in an outbreak; but on no occasion since the great plague of 1665 has the mortality of the metropolis been raised by any epidemic above 30 per cent. The epidemic of the greatest importance which has occurred since the great plague of London is the cholera of 1832; but the deaths occasioned by this disease were trifling compared with those which resulted from the pestilences of former days. In London and its vicinity the number of deaths from cholera was estimated at 5,000, that for the entire
country at 65,000; but had the same rate of mortality prevailed from this epidemic as in the plagues of the 17th century, the deaths in the metropolitan district alone, it has been computed, would have exceeded half a million.

Next as to the Royal Navy. So lately as the middle of the last century, the ravages from disease were so great amongst the common sailors of the navy as not unfrequently to render unfit for service, or even to destroy, the crews of whole fleets, and that before the vessels had been very long at sea. Of this we have a fearful example in the fate of the expedition of Admiral Hosier in 1726. He sailed with seven ships of the line for the West Indies, and so destructive were the effects of disease, that he buried his ships' companies twice, and afterwards died himself of a broken heart. Deaths, we are told, in a moderate ship's company, occurred to the amount of eight and ten daily, and bodies were seen sewn up in hammocks, and washing about the decks, for want of strength and spirit on the part of the miserable survivors to throw them overboard.

Scarcely less fatal was the expedition of Anson, in 1740. He sailed, on the 18th of September, with a fleet of five ships, carrying twelve hundred and fifty men. So early as the 20th of November, when they had been but little more than two months at sea, on their passage from Madeira to
St. Catharine's, the ships' companies became very sickly, in consequence of which the Commodore ordered six scuttles to be cut in each ship, to admit more air between the decks, and took other measures to correct the "noisome stench on board," and destroy the vermin,—which nuisances had become "very loathsome;" "and besides," observes Mr. Walton, the chaplain, who wrote the account of the expedition, "being intolerably offensive, they were doubtless in some sort productive of the sickness under which we had laboured." (This statement will afford you some idea of the state in which the vessels were kept at that time, and also of the ideas which then prevailed respecting the causes of the diseases which depopulated the navy. It was thought that the state of the vessels was only slightly concerned in their production.) But, notwithstanding these precautions, disease continued to increase amongst the sailors, so that many died, and numbers were confined to their hammocks, and, on arriving at St. Catharine's, the Centurion, one of the vessels of the expedition, whose crew, on leaving England, amounted to 506 men, alone sent eighty sick on shore, of whom about one-third died. They sailed from this port on the 18th of January, and, after having beaten about Cape Horn for three months, the scurvy had increased to such an extent amongst the sailors that there were but few of them who
were not in some degree affected with it; and in the month of April no less than forty-three died of it on board the Centurion; and during the succeeding month the loss amounted to nearly double that number. On the 9th of June, on coming in sight of Juan Fernandez, such was the helpless condition to which the vessel was reduced, that out of a crew of two hundred men, "the Lieutenant," Mr. Walton narrates, "could muster no more than two quarter-masters, and six foremost-men capable of working; so that without the assistance of the officers' servants and the boys, it might have been impossible for us to have reached the island after we had got in sight of it; to such a wretched condition was a sixty-gun ship reduced which had passed the Straits Le Maire but three months before with between four and five hundred men, almost all of them in health and vigour.

The united crews of the three vessels, the Centurion, the Tyrol, and the Gloucester, which reached Juan Fernandez, were reduced, at the period of their arrival there, from 960, their original number, to 335. Thus, within a period of twelve months, very nearly two-thirds of the crews of these three vessels had perished.

At Juan Fernandez, however, in consequence of the fresh food they were able to obtain, together with the pure air and more healthful occupation, the health of the men was restored; but on cross-
ing the Pacific, disease again broke out amongst them, the daily number of deaths sometimes amounting to eight and ten; and before the expiration of the ensuing twelve months, not more than one-half of the remaining 335 men were left alive.

But, when we come to inquire into the condition of the sailors at that time, this fearful mortality will not appear at all surprising to us; indeed, we shall rather feel inclined to express our astonishment that it was within the power of any human being to resist for any length of time together such a combination of injurious and loathsome circumstances. Dr. Johnson, in the year 1778—nearly forty years after the period of Anson’s voyage, and when in many respects the condition of the common sailor had been considerably improved—thus describes a sea life:—“As to the sailor, when you look down from the quarter-deck to the space below, you see the utmost extremity of human misery—such crowding, such filth, such stench. A ship is a prison with the chance of being drowned: it is worse, worse in every respect; worse air, worse food, worse company.”

Thus, the seamen were deprived of the two most essential elements of life, viz. good food and pure air; which, aided by the injurious effects of constant exposure to the inclemencies and vicissitudes of the various and opposite climates through which they passed, excessive fatigue, and the absence of
measures for amusing and cheering the mind, will readily to us account for the frightful mortality to which they were then subjected. But at this time the most lamentable ignorance prevailed on all points relating to the nature of diseases and the animal economy. It was then the prevailing opinion, that the scurvy and fever, which created this wholesale slaughter amongst the sailors, were the necessary consequences of a sea life, and had little or nothing to do with the bad air and loathsome atmosphere in which the common sailor lived.

But, as knowledge increased, and the nature of the human body came to be better understood, the origin of the sailor’s maladies was traced to its real sources; and in consequence of the excellent sanitary measures which, as the result of that discovery, were from time to time introduced, the common sailors of the navy, at the present time, it has been computed, are not subject to a greater mortality than men of the same class living under ordinary circumstances on land.

We have a striking example of the truth of this statement in the British squadron employed in South America, which, during a period of seven years, from 1830 to 1836, lost by disease of every description only 115 men out of 17,254 composing the squadron. Contrast this with the fate of the Centurion, which, a century before, in about the same latitude, lost within a few months 200 out of
400 men. Other examples to the same effect are afforded us in the voyages of Cook, Franklin, Parry, and Ross, who, owing to the attention they paid to the diet of the sailors, the ventilation of the vessels, and other preventive measures, lost no more than from one to five men during periods varying from one to three years.

The progressive and striking improvements attending the introduction of preventive and sanitary measures into the Royal Navy is shewn in the following statistical return of Dr. Wilson*:

In 1779 the proportion dying was 1 in 8 of the employed.
" 1811 " 1 in 32 "
From 1830 to 1836 " 1 in 72

The other example I referred to as illustrating the truth of the proposition I am attempting to prove,—that a large proportion of the diseases at present prevailing amongst the poor is preventible, is the present state of the health of the inmates of prisons, as contrasted with what it was in former years. It is not necessary, however, to go into any details in regard to this example, as in doing so I should only be relating to you facts similar in principle to those I have just mentioned as occurring in the navy. It will be sufficient for my present purpose to state, that, in former years,

* Report on the sanitary state of the labouring population of Great Britain, by Mr. Chadwick, p. 220.
the state of the prisons was as bad as it is possible to conceive. The cells in which the prisoners were confined are described as being dark, damp, excessively close, and filthy in the extreme. Their food was of the worst description, scanty; and even a sufficient quantity of water was not always provided for them. In consequence of this state of things, aided by the depressing effects of imprisonment, a species of fever, of an excessively virulent nature, called the gaol-fever, prevailed amongst the prisoners, and committed fearful ravages. The excessively virulent nature of this fever may be judged of by an account given in Baker’s Chronicle of an assize held in Oxford Castle in 1577, (called, from its fatal consequences, “the black assize,”) in which all who were present died within forty hours,—the Lord Chief Baron, and about 300 more. This, by Lord Chancellor Bacon and Dr. Mead, was ascribed to a disease brought into court by the prisoners. Other instances are mentioned of whole fleets and armies being infected by a single person coming from a jail. Indeed, they were universally regarded as the common centres from which epidemics and fevers were diffused through the country.

But what a contrast does this form with the state of the generality of prisons at the present time!

Mr. Chadwick states that the medical practitioners who are well acquainted with the general state of health of the population surrounding the prisons in
Edinburgh and Glasgow, concur in vouching to the fact, upon their own knowledge, that the health of the prisoners is generally much higher than the health of almost any part of the surrounding population,—that the prisoners, as a class, are below the average health when they enter the prisons,—that they come from the worst districts,—that many of them come from the lodging-houses, which in those towns are the constant seats of disease,—that they are mostly persons of intemperate habits,—that many of them come in, in a state of disease from intemperance and bad habits; and notwithstanding the depressing influence of imprisonment, the effect of cleanliness, dryness, better ventilation, temperance, and simple food, is almost sufficient to prevent disease arising within the prison, and to put the prisoners in better working condition at the termination than at the commencement of the imprisonment.

Now, in the three foregoing examples, (and numerous others of a similar kind, if it were necessary, might be adduced,) we find disease and pestilence connected with two main circumstances, viz., 'bad air, and bad and insufficient food'; and in each case the diseases and pestilences disappeared in proportion as these circumstances were removed; hence the obvious inference,—that the vitiated air and unwholesome and scanty food were the chief causes of the complaints. The same may be said of the prevailing diseases of the present day,—those we
considered in our last lecture. Without a single exception, wherever disease and epidemics are prevailing extensively, there these same agencies, namely, bad air and bad and insufficient food, either singly or collectively, but generally the latter, are in extensive operation. The real truth is, that the causes which produced the pestilences of old, and those which generate our present disorders, are identical in their nature, the only difference being one of intensity; and hence it is that the epidemics of the present day are less virulent than those of former years, in proportion to the less active nature of the causes which produce them. Now, if this statement is correct, the following inference is, I think, fairly deducible from it,—that, as the plagues and pestilences of former years were removed by reducing the activity of the causes which produced them, so will the epidemics of the present day (being similar in their nature, and arising from similar causes, the only difference being one of intensity), be in like manner removed by the requisite reduction in the activity of the causes which now produce them; or, making the same statement in other words, that by providing the population with good air and a sufficiency of wholesome food, there is fair reason for entertaining the belief, that diseases and epidemics, in the fatal form we now see them, would be entirely banished from the country.
But, in making these observations, I wish you to understand that I do not mean to assert that *bad air and bad food* are the only causes of our present diseases and epidemics. Minor causes of disease exist, doubtless, almost without number; but what I maintain is, that they are the main causes, and that if the whole population were abundantly provided with these two necessary elements of life, the less powerful deleterious influences would be rendered comparatively innoxious, and the amount of disease comparatively trifling.

The deficiency of wholesome and nourishing food is almost universal amongst the lower orders in this country; their diet is very far from being sufficient to supply the wants of the system under the great amount of bodily labour they have to undergo. The effects of a vitiated and close atmosphere are confined to no class or district. They are experienced in the houses, bed-rooms, and places of public resort of the rich; but in their fullest intensity in the over-crowded, dirty, and ill-constructed dwellings of the labouring population of towns. Thus, in my opinion, the chief causes of disease may be expressed in four words, viz., *bad air and bad food*.

The philosophical explanation of the foregoing facts is neither difficult of attainment, nor beyond the ability of the most ordinary minds to understand; and as such an explanation would contri-
bute materially to the elucidation of the general subject under our consideration, I shall make a few observations upon it. These, however, shall be short, and, if not founded in truth, must fall to the ground.

It is a matter not so much of the deduction of the understanding as of common experience, that the Almighty, in forming man, and placing him in his present position, has subjected his system to certain laws or conditions the fulfilment of which is a necessary preliminary to the enjoyment of health and happiness. Amongst a variety of these laws and conditions, there are two which stand pre-eminent amongst the rest for the vast extent to which they are concerned in the maintenance of animal life; they form, indeed, as it were, the main pillars upon which animal life is supported, and without which it cannot be maintained for a single minute. The two conditions to which I refer are—1st, the continued ingestion into the body of organic matters from without, which are called food, for the purpose of supplying the detritus or disintegration which the system is constantly undergoing; 2dly, the continual reception of pure air into the lungs, for the purpose of purifying the blood, which, in the course of its circulation through the system, is perpetually undergoing a process of deterioration. And when we consider that the air is everywhere around us, and is to be had only for
the breathing, and that the earth is calculated when subjected to the requisite culture, to bring forth in abundance all things necessary for our support, we cannot but admire the beneficence and goodness of the Creator, who has thus, with such a liberal hand, supplied all our wants. But it has pleased the Creator, in decreeing that, while the fulfilment of these laws shall be invariably attended with the reward of health and happiness—in so far, at least, as health can contribute to happiness (and it does so very powerfully, for there can be no real enjoyment of this world without it)—that the neglect of these laws shall, with the same certainty, be visited with pain and misery. Not for the sole purpose, as some assert, of inflicting punishment for contempt of His authority, in the same way that a revengeful and petulant person would do under similar circumstances, but with the beneficent intention of compelling, as it were, obedience to those laws best calculated to promote our happiness and prosperity: and it must not be forgotten, in considering this question, that he has provided us with ample powers of reason and observation to discover those laws, and means to obey them.

Now, in this view of the Divine government of the world, every philosopher finds a satisfactory explanation of the ultimate cause of our present sufferings in regard to the presence amongst us of diseases and pestilences.
In our present institutions and general habits of life, we have to a fearful extent infringed and neglected these two primary laws of the Creator. There are millions of individuals in this country, shut up in densely-populated, dirty, and badly constructed towns, and scattered over the country, to whom pure air and a sufficiency of wholesome food are utterly out of reach. The punishment which has fallen upon us for this breach of the Divine laws and institutions are disease, pain, suffering, and shortened life; the only way, therefore, by which we can possibly rid ourselves of these evils, is to render obedience to those laws.

There is an opinion still very prevalent in society—and one which is entertained by many excellent and pious individuals, and I therefore approach it with the greatest respect and diffidence—that disease and pestilences are sent by the Almighty as judgments for moral and religious delinquencies. That such has been the case in a few remarkable instances, signalised by some unusual interposition of the Divine influence, every one who has read, and who believes the Bible, must admit; but I contend that in the ordinary course of events, pestilences, epidemics, and diseases in general, are but the natural results of the infringements of the organic laws—the punishment which the Almighty has decreed shall fall upon all those who neglect his institutions, and solely for the purpose of
forcing them to obedience. In proof of this assertion, there is the universally admitted fact, that, with the exception of the extraordinary occasions formerly alluded to, pestilences and epidemics have invariably been co-existent with the infringement of the two primary conditions of life, viz., those relating to nutrition and respiration, and have never made their appearance in places where they have been fully complied with. Take, for instance, the great plague of London in 1665, which, at the time was attributed to the judgment of heaven on the excessive wickedness and profligacy of the age. But the court of Charles II.—from which, as from a common centre, flowed everything that was base and corrupt, contaminating by its example all the streams of society down to the very lowest—completely escaped. Not one individual belonging to it, I believe, perished; while the lower orders, certainly the least culpable of the two, died by thousands. Had the plague been sent as a punishment for the then prevailing wickedness, it is but consistent with the commonest idea of justice to suppose that it would have fallen the heaviest upon the guiltiest party. But the real explanation of the facts of the case is, that the upper orders were living in comparative obedience to the organic laws, and therefore existed in comparative security under their protection; while by the lower orders the organic laws were in every way fearfully infringed,
and they therefore suffered the natural penalty of that infringement.

These views are in accordance with the doctrine which is now generally admitted to represent the true nature of the Divine government of the world—that the natural laws to which man is subjected in this world are not only invariable and universal, but act quite independently of one another. Each one dispenses its own specific rewards and punishments, quite independent of the rest. By the aid of this doctrine, the obscurity and difficulty which formerly surrounded many of the ways and dealings of Providence are satisfactorily removed, and order and consistency stand out in places formerly occupied with apparent confusion and mystery. Thus, if an individual is born with a sound hereditary constitution, and afterwards lives in accordance with the laws of health, or obeys what are called the organic laws—as the laws of diet, exercise, respiration, &c. &c.—everybody knows that such an individual will enjoy good health, and live to a good old age; though he may break the whole of God's moral law, though he cheat, lie, blaspheme, or steal. On the other hand, if an individual derives from his parents a defective constitution, or if, during life, he neglects the laws of health, though he be the best of men, he will with the same certainty suffer in his physical constitution, and come to an early grave. In such instances the inscrutableness
of the ways of Providence is often commented upon, for allowing the wicked to continue his injurious course upon the earth, while the righteous is prematurely cut off.

But, by the aid of the doctrine of the independent action of the organic laws, the difficulty is satisfactorily cleared up. It shows us that the reason why the former person enjoyed good health, and lived to an advanced period of life, was because he obeyed the instructions of the Creator in so far as they relate to man's physical system. The latter person, on the other hand, suffered in this stage of his existence, because, either in himself or his ancestry, the laws intended for his guidance here were infringed. And it could not have happened otherwise, without some miraculous interference of the Divine power, which it would be unreasonable to expect in every instance, and which, indeed, if constantly occurring, would introduce confusion and discord into the universe.

The punishment for the neglect and contempt of, and the reward for obedience to, the far more important laws which have reference to man as a moral and responsible being, will be awarded in the next world.

I will now terminate this part of the subject, by stating to you my firm conviction, formed as the result of much patient observation and research, that disease and sickness are not inherent in the human
constitution,—formed no part of the original design of the Almighty, and are not, as some are inclined to believe, a necessary consequence of the fall of man,—but have been brought on entirely by faults of our own, in having ignorantly and maliciously forsaken the paths of life designed us by the Creator, and chosen others which are extraneous and adverse to the system. If I am correct in this statement, it follows that there is but one remedy for our present evils, and that is, to trace out, and afterwards to conform to, nature's law and nature's institutions. Without for an instant meaning to imply that such a change in our present habits and modes of life can ever be effected,—but, I say, supposing it possible that every poor person in the country could be provided with the common necessaries and conveniences of life,—supposing each could obtain a sufficiency of wholesome food, to recruit the exhausted strength after the toils of the day,—could be provided with pure air, to cleanse the vitiated humours of the system, a sufficiency of clothing to protect him from the weather, a house and home adapted for the reception of a moral and religious being,—supposing the rich could be persuaded to throw off their present artificial and effeminate mode of life in exchange for one more simple and natural; would adapt their diet to the climate and habits of life; expend in actual exercise the energies of the system; admit
light and air into their rooms, and, above all, avoid that perpetual round of mental excitement, anxiety, care, and disappointment, (the necessary consequences of that constant straining after ambitious objects and personal aggrandizement, "of striving," as the late Dr. James Johnson has observed, "to raise themselves in the world instead of getting through it"), — the cause of one half of the present disorders of the upper orders, — and substitute in its place a more contented, cheerful, and dependent frame of mind, — I say, supposing all this could come about, there is, in my mind, ample reason for entertaining the belief, that in the course of time all diseases would be entirely eradicated; that each generation, in the order in which it appeared on the stage of life, would grow up, flourish for a stated time in its natural health and vigour, and lastly decay and die at about the same time, each individual dropping into his grave hand in hand with the companions of his youth, to make way for succeeding generations of men; and so on in a regular and connected order of events, until the time arrived that the earth shall vanish away, and humanity cease to exist. But setting such a doctrine aside as enthusiastic and visionary, it is a proposition to which few will refuse concession, that most of our present evils, in regard to disease, are the results of unnatural and vicious habits of life, and that accord
ingly in proportion as we improve in this respect, so will beneficial results follow.

Having now, I hope, seen reason for entertaining the belief that a large proportion at least of the diseases at present prevailing amongst the poor in towns admits of removal, our next step is to investigate the causes to which they owe their origin. But I wish you particularly to understand, that this investigation does not extend to the causes of diseases generally, but only to the causes of the excess of disease in towns over country districts. Respecting the causes of diseases generally, I have already given you my opinion.

Before, however, proceeding to this investigation, it is desirable, perhaps, that you should be made acquainted with the extent to which the mortality of towns exceeds that of country districts, as I have yet said but little on that point; and though everybody knows that towns are more unhealthy than the country, there are few who have really any accurate conception of the full extent of the difference in this respect between the two.

For the purpose of illustrating this point, I shall avail myself of some valuable calculations of Dr. Guy, framed from materials obtained from the
reports of the Registrar-General. From these it appears that, in a million of population, the mortality of towns exceeds annually that of the country districts by 7,773. This fact is shown in the following table:

<table>
<thead>
<tr>
<th></th>
<th>Country Districts</th>
<th>Town Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population to a square mile</td>
<td>19·9</td>
<td>5·108</td>
</tr>
<tr>
<td>Annual deaths in 1,000,000 living</td>
<td>19·300</td>
<td>27·073</td>
</tr>
<tr>
<td>Rate of mortality</td>
<td>1 in 52</td>
<td>1 in 37</td>
</tr>
<tr>
<td>Annual excess of deaths in town districts</td>
<td></td>
<td>7·773</td>
</tr>
</tbody>
</table>

Estimating the population of towns in England and Wales at 4,500,000, which is considerably under the actual number, as this estimate includes only the metropolis and the chief provincial towns, the excess of deaths in the towns of that portion of the country, as contrasted with the mortality of rural districts, amounts annually to 34,378; that for the United Kingdom, on the supposition that the amount of town populations, and the rate of mortality amongst them, is the same in other parts of Great Britain as it is in England and Wales, to more than 60,000 annually. Thus, as compared with the rate of mortality in healthy rural situations, there is in the towns of the United Kingdom, at the lowest computation, an annual sacrifice of more than 60,000 lives.

But a more correct way of estimating the mortality of our large towns is, to ascertain the sum
total of deaths which occur in them over what may be considered a healthy standard. This has been computed by sanitary reformers at a mortality not exceeding 2 per cent., and to which it is considered possible to reduce the rate of mortality in all towns; there being a great many towns in the kingdom, some of them of considerable size, in which the average mortality does not exceed that amount. According to this view, therefore, all the deaths which occur in any town above this rate of mortality, are to be considered as sacrificed to the neglect in them of sanitary measures. Now, it has been ascertained by Dr. Guy, that the excess of deaths over 2 per cent. in thirty-six of our large towns, taking the average of three years,—1841, 1842, and 1843,—amounted to 20,100. The population of the metropolis at the period of the census was 1,873,817, and the average annual excess of deaths above 2 per cent. for the same three years was 8,404, which, when added to the preceding number, makes the excess of deaths amount to 28,505.

But there are several large towns, not included in this calculation, which also suffer from a high rate of mortality, and if they were added, the total excess of deaths would be raised to considerably more than 30,000.

If the sanitary state of the entire population of England and Wales were raised to 1 annual death in 50, instead of its present rate of 1 death in 45, there would be an annual saving of life in that por-
tion of the country of no less than 35,000 lives; and in the United Kingdom, on the supposition that the mortality in Scotland and Ireland is only equal to that of England and Wales, (it is, in fact, much greater) there would be an annual saving of upwards of 60,000 lives.

But to be able to realise the whole of the evils consequent upon the neglected state of our towns, in addition to the actual waste of life thereby occasioned, there must be taken into the calculation the attending amount of unnecessary sickness, and the various other evils formerly detailed as being the natural result of a high rate of mortality. We are not in possession of the requisite data from which to ascertain the proportion which the number of cases of illness bears to the number of deaths, but taking Dr. Lyon Playfair’s estimate of twenty-eight cases of sickness to one death, which must be somewhere near the truth, the number of cases of unnecessary sickness in England and Wales will amount to 1,000,000, and in the United Kingdom to 1,700,500.

“If you find it difficult,” observes Dr. Guy, “to realise so enormous a waste of health and life, you have only to imagine a town of 35,000, or 60,000 inhabitants, annually swept away from the face of the earth, above those who would die in the course of nature, if sanitary measures were in universal operation. To form a vivid idea of
the amount of unnecessary sickness in the United Kingdom, you must imagine, that in a city the size of the metropolis, every man, woman, and child it contains is the subject of one attack of sickness every year, over and above the sickness which would occur in the course of nature, under a wise system of preventive measures."

Another mode of illustrating the difference in the degree of salubrity between town and country districts, is to compare the average age attained by the respective populations; (see Tables, p. 29.) The average age attained by the labourers in the county of Rutland is thirty-eight years, that by the labourers in Wiltshire (the county of the lowest wages) is thirty-three years. Taking the latter as our standard of comparison, the lower orders in Liverpool lose eighteen years of life, in Bethnal Green seventeen years, in Manchester sixteen years, in Bolton Union fifteen years, in Leeds borough fourteen years, in Derby twelve years, in Whitechapel Union eleven years, in the Strand Union nine years, in Bath eight years, in Kensington Union seven years, in Truro five years.

The extent of the excess of mortality in towns over country districts being now ascertained, we shall be able to proceed with greater satisfaction to the investigation of the causes to which that unfortunate state of things is owing. And I may here be permitted to remark, that I consider this question
one, of the greatest importance, and its solution essential to the successful application of the remedies; for how is it possible, except by mere accident, that the causes of diseases can be removed, unless we know what those causes are. And in what possible way can diseases be got under, except by destroying the causes which produce them? The comparatively trifling effect which our labours have hitherto had in ameliorating the condition of the poor, is unquestionably chiefly owing to this circumstance,—that we set about attempting to remedy the evils without having previously sufficiently ascertained their nature. We have expended vast sums in the erection of hospitals, dispensaries, and numerous other institutions for the relief of sickness when it is formed, but we have never attempted to do any thing with the view of preventing sickness. Hence it has happened, that the relief which such means have afforded to the poor has been very trifling and temporary. If successful in curing their maladies, the patients no sooner return to their homes and occupations than the diseases again return upon them; which goes on year after year, until the constitution is entirely broken up, and they become confirmed invalids,—a burthen upon their friends or upon the parish, or they sink into premature graves. But too frequently their unfavourable condition of life counteracts entirely the effects of medicine, no relief whatever can be
afforded them; the medical man is blamed, when, indeed, the fault rests not with him or his art, but arises from circumstances over which he has no possible control. Had one-tenth part of the money which has been expended in this country for the relief of sickness, after it is formed, been applied scientifically and judiciously to the means of prevention, I venture to affirm, that long before this the health of the lower orders in towns would have been in an infinitely better state than it is at present; and that there would not have been one half the same necessity for hospitals, dispensaries, and other similar charities.

In tracing out the various causes to which the excess of mortality in towns over country districts is attributable, I am inclined, after a careful analysis of the evidence bearing on the subject, collected by the recent investigations made by order of government into the sanitary state of towns, and from the results of my own observation and experience, to come to the conclusion that it is owing mainly to two circumstances—namely, atmospheric impurity, and vice and dissipation. That it is in no way owing to poverty and destitution, or the wants of the common necessaries of life, is evident from the fact, that, though the country poor are worse fed, worse clothed, and worse housed than the inhabitants of towns, they enjoy a far greater immunity from disease, and attain a greater
age. Take, for an example, the condition of the labouring population of the western counties, Dorsetshire, Somersetshire, Wiltshire, Cornwall, &c. as contrasted with the population of Lancashire, the great manufacturing county. Now, the condition of the labourers of the west, the badness of their dwellings, the lowness of their wages, the consequent scantiness of their food and clothing, has been the subject of public animadversion. In Lancashire, on the other hand, the rate of wages is higher than in any other county in the kingdom, and the labouring population accordingly more abundantly provided with the necessaries of life. In a return presented by Mr. Chadwick to the Manchester Statistical Society, and obtained in the year 1836, it appears that the consumption of butchers' meat, exclusively amongst the factory population of that town, was not less than 105lbs. each person annually, man, woman, and child, or 450lbs. yearly per family, exclusive of bacon, pork, fish, and poultry. What a striking contrast would this exhibit to a similar return from country districts, in which the generality of the labouring poor hardly taste meat from one week's end to another!

The proportion of paupers in the eighteen principal agricultural counties is 1 in 8; in the twelve principal manufacturing counties it is 1 in 13; in Lancashire it is 1 in 11.
But notwithstanding this great inferiority on the part of the labourers of the agricultural counties in Wiltshire, the county of the lowest wages, the deaths are 1 in 49; in Lancashire 1 in 36. The average age at death in 1841, was in Wiltshire 38 years, in Lancashire 22, Liverpool 20; that of the labourers in Wiltshire 33, in Manchester 18, Liverpool 15.

Poverty and destitution are certainly one of the chief causes concerned in the production of disease and premature death in towns and cities, as in all other places; but what I am now contending for is, that they are not the cause of the excess of mortality in towns. This cause of disease consequently does not come within the compass of our present consideration, and we may, therefore, lose sight of it entirely.

Of atmospheric impurities, and vice and dissipation,—the two main causes of the excess of mortality in towns,—though the former is unquestionably the most largely concerned, it is not possible to say, (both being always found in operation at the same time in all places), to what precise extent each, as an individual cause, is concerned in the production of the whole. As regards our present object, however, this is of no practical importance. Both are largely concerned; and in attempting, therefore, to improve the sanitary state of towns, our measures must be directed to the eradication of both. The purifica-
tion of the atmosphere, though this may be perfect, will not affect the object we have in view, if vice and immorality are allowed to abound; neither will the establishment of the most perfect religious and moral principles amongst the poor, drive away disease and sickness, if the causes which deteriorate the atmosphere are allowed to remain in active operation.

In regard to the vice and immorality of towns, it is a melancholy fact, that wherever a large number of persons are brought in close communication, there these evidences and consequences of the fallen state of man are seen in their blackest hues. But it may be observed, as connected with our subject, that not only is the wickedness of our towns more extensive, and of a deeper dye, than that of rural districts, but that the peculiar tendencies of the practices of the former have a much more injurious effect in debilitating and destroying the vigour of the constitution, and in the consequent production of disease, than those of the latter. For instance, while the inhabitants of the country indulge chiefly in malt liquors, those of towns drink ardent spirits,*

* "Amongst young artisans, who were earning from 16s. to 18s. per week, I was informed that there were very few who made any reserves against the casualties of sickness. I was led to ask the provost what number of bakers' shops there were? 'Twelve,' was his answer. 'And what number of whiskey-shops may the town possess?' 'Seventy-nine,' was the reply. If we might
which are ten times more destructive to the constitution than the former beverage. And the same observation may be extended to almost all the

rely upon the inquiries made of working men, when Dr. Arnott and I went through the wynds of Edinburgh, their consumption of spirits bore almost the like proportion to the consumption of wholesome food. We observed to Captain Stuart, the superintendent of the police at Edinburgh, in one inspection of the wynds, that life appeared of little value, and was likely to be held cheap in such spots. He stated, in answer, that a short time ago, a man had been executed for the murder of his wife, in a fit of passion, in the very room we had accidentally entered, and where we were led to make the observation. At a short distance from that spot, and amidst others of this class of habitation, were those which had been the scenes of the murders by Burke and Hare. Yet amidst these were the residences of working men, engaged in regular industry. The indiscriminate mixture of work-people and their children in the immediate vicinity, and often in the same rooms with persons whose character was denoted by the question and answer, more than once exchanged,—‘When were you last washed?’ —‘When I was last in prison,’ was only one mark of the entire degradation to which they had been brought. The working classes living in these districts were equally marked by the abandonment of every civil or social regulation. Asking some children in one of the rooms of the wynds, in which they swarmed in Glasgow, what were their names, they hesitated to answer, when some of the inmates said they called them ——, mentioning some nicknames. ‘The fact is,’ observed Captain Miller, the superintendent of the police, ‘they really have no names. Within this range of buildings I have no doubt I should be able to find a thousand children who have no names whatever, or only nicknames, like dogs.’ There were found amidst the occupants, labourers earning wages undoubtedly sufficient to have paid for comfortable tenements, men and women who were intelligent, and, so far as could be ascen-
other habits and failings peculiar to town populations.

It was now my intention to have made a few brief remarks on education and district-visiting, as a means of raising the moral condition of the lower orders, but owing to the number of other topics of great importance requiring notice, and more intimately connected with our subject, and the briefest consideration of which will fully occupy our time, I am compelled, but unwillingly, on the present occasion, to forego that intention.

I now, therefore, proceed to bring under your notice the evidence upon which the opinion I have stated to you,—that the excessive mortality of towns is owing chiefly to the impurity of the atmosphere,—is based. This is contained in a mass of facts recently elicited from the numerous inquiries that have been instituted into the state of towns, and which in my opinion put the question beyond all reasonable controversy. My confined limits will compel me, on the present occasion, to make use of but very few of them. I shall first read to you

tained, had received the ordinary education, which should have given them better tastes and led to better habits. My own observations have been confirmed by the statement of Mr. Sheriff Alison, of Glasgow, that in the great manufacturing towns of Scotland, 'in the contest with whiskey in their crowded population, education has been entirely overthrown.' —Mr. Chadwick on the Labouring Population.
the testimony of Dr Southwood Smith on this point, which may be received as representing, more or less faithfully, the statements of nearly all medical men who have either written, or given their evidence before the Sanitary Commissioners, on the subject:—

"The records of the London Fever Hospital," he says, "prove indubitably that there are certain localities in the metropolis and its vicinity which are the constant seats of fever, from which this disease is never absent, though it may prevail less extensively, and be less severe in some years, and even in some seasons of the same year, than in others; but still, in which it is still committing its ravages. In former years I have found, on my personal examination, some localities in which there was not a single house in which fever had not prevailed; and in some cases not a single room in a single house in which there had not been fever. I observed this particularly in certain localities in Bethnal-Green and Whitechapel."—The following is a description he gives of these districts: "In every district in which fever returns frequently, and prevails extensively, there is uniformly bad sewerage, a bad supply of water, a bad supply of scavengers, and a consequent accumulation of filth; and I have observed this to be so uniformly and generally the case, that I have been accustomed to express the fact in this way: if you trace down the fever districts on a map, and then compare that map with
ON THE DISEASES OF TOWNS.

the map of the Commissioners of Sewers, you will find that, wherever the Commissioners of Sewers have not been, there fever is prevalent; and, on the contrary, wherever they have been, there fever is comparatively absent."—"It is not possible for any language to convey an adequate conception of the poisonous condition in which large portions of both these districts always remain,—winter and summer, in dry and in rainy seasons,—from the masses of putrifying matter which are allowed to accumulate."

But by far the most valuable description of evidence is that derived from the statistical facts contained in the reports of the Registrar-General, or which have been obtained from private sources. By the aid of these, it has been fully demonstrated that the mortality invariably increases as the density of the population increases, or, in other words, that the mortality increases with the intensity of the operation of the causes of atmospheric impurity, and that where the density of the population is the same, the rate of mortality depends upon the efficiency of the ventilation, and of the means which are employed for the removal of impurities.

For the purpose of illustrating this fact, I must direct your attention to these tables. (See page 29.) They exhibit the average age at death of the three classes of the community,—the upper, middle, and lower classes,—in some of our principal towns, and
districts of the metropolis; and they are arranged in the order of their unhealthiness, commencing with Liverpool, which is the most sickly town in the country, and terminating with Truro, which is the healthiest of these towns. Now, without possessing any knowledge of the rate of mortality in these towns, if you were to read the reports which have been published of them, after personal inspection, by men of strict integrity, respecting the prevalency in them of noxious agencies affecting the purity of the atmosphere, and arrange them in order according to the degrees of intensity in them of these agencies, you would find that they would hold pretty nearly the same relative position that they do at present. Thus you would find that Liverpool was the most densely populated, contained the worst description of houses, and was the worst kept, in regard to cleanliness, of any. Truro, on the other hand, the healthiest of these towns, you would find was free from many of the evils incident to them. It is smaller, less densely populated, and, moreover, it has been stated, has a good system of drainage.

For the purpose of illustrating the intimate relation that exists between the state of the atmosphere in towns, and the amount of sickness and rate of mortality in them, Dr. Duncan has instituted a comparison, in these particulars, between Liverpool, Manchester, and Birmingham. The rate of mortality in these towns stands thus:
**ON THE DISEASES OF TOWNS.**

<table>
<thead>
<tr>
<th>City</th>
<th>Deaths</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birmingham</td>
<td>1</td>
<td>in 36.79</td>
</tr>
<tr>
<td>Manchester (Union)</td>
<td>1</td>
<td>in 29.64</td>
</tr>
<tr>
<td>Liverpool (Parish)</td>
<td>1</td>
<td>in 28.75</td>
</tr>
</tbody>
</table>

The proportion of fever deaths to population annually in these towns is—

<table>
<thead>
<tr>
<th>City</th>
<th>Deaths</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birmingham</td>
<td>1</td>
<td>in 917</td>
</tr>
<tr>
<td>Manchester</td>
<td>1</td>
<td>in 498</td>
</tr>
<tr>
<td>Liverpool (Parish)</td>
<td>1</td>
<td>in 407</td>
</tr>
</tbody>
</table>

The relative intensity of the operation of the causes of atmospheric impurity in these towns corresponds precisely with the rate of mortality in them. Thus, Liverpool has 100,000 inhabitants to the square mile, Manchester 83,000, while Birmingham has only 33,000. The cellar population in Liverpool has been estimated, after careful investigation, at 20 per cent.; in Manchester at 11\(\frac{3}{4}\) per cent., while in Birmingham there are no cellar residents. The number of courts in Liverpool is 1,982, of the worst construction, and containing a population of 55,534 souls. In Manchester, it has been stated, the proportion of the population inhabiting courts is somewhat less than in Liverpool. In Birmingham the courts are numerous, but far superior in construction to those of Liverpool and Manchester. The drainage and cleansing of the streets, and other circumstances affecting the purity of the atmosphere in these three...
towns, Dr. Duncan has shown, likewise hold the same relative position in regard to efficiency.

This intimate relation which I am attempting to prove to exist between the health of the inhabitants of towns and the state of the atmosphere in them, receives further corroboration from the diminution of sickness and decrease of mortality which have been distinctly shown to follow upon improvements for removing the causes of atmospheric impurity in the districts. Thus Mr. Holland, of Manchester, ascertained that the mortality in twenty streets in Charlton-on-Medlock, after having been properly drained and paved, fell from 1 in 32 to 1 in 39, or the deaths in these streets were diminished more than 20 per annum by putting them into proper condition.

I shall now terminate this Lecture with the exposition of two or three general truths, arising out of the general subject we are discussing, and respecting which, I think, it is very desirable that you should be accurately informed. The first is, that the physical causes of diseases press the most heavily upon the labouring classes, who are the most exposed to their influences; after them, upon the middle classes, or tradespeople; and the least so upon the upper orders, or gentry. With this fact, in a general way, I dare say most of you are already acquainted, but I doubt if the full extent of the difference in this respect, which exists between the different classes, is so generally known; and it is on
The Streams of Life in Preston.

Showing the periodic diminution of the sum of Vitality, from birth to the latest term of existence, in the respective classes of Gentry, Tradesmen, and Operatives. The curves formed from the registers of deaths in the 6 years ending June 30th 1843. (Rev. J. Clay.)
that account that I have thought it advisable to bring the subject in a prominent form under your notice. This information we shall obtain from these Tables, (see page 29), in which are shown the mean ages at death of the three classes of the community in some districts of the metropolis and principal provincial towns. But I must remind you that I have stated that I do not pledge myself to the exact accuracy of these returns, though I believe that they are sufficiently correct for general use, and for the formation of general conclusions. The mean age ascribed to the lower orders is probably by a year or two in many of them too low; but as the ages now stand, the difference between the mean ages at death of the upper and lower orders is in Liverpool 20 years, in Bethnal Green 29 years, in Manchester 21 years, in Bolton Union 16 years, in Leeds borough 25 years, in Derby 28 years, in Whitechapel 23 years, in the Strand Union 19 years, in Bath 30 years.

In order to illustrate to you more fully the great difference in the probabilities of life between the three classes of the community, I have had this diagram prepared, which, presenting this fact to the mind through the eye, may produce on some a more correct and forcible impression than could be done in any other way. It represents the streams of human life as they flow in the three classes of the community in Preston; the calculations being founded on the ages at death during a period of six
years, and more or less accurately depicts the same circumstances in all other large towns. Each stream at its commencement represents a hundred individuals at birth: the upper stream is that of the gentry, the middle is that of those engaged in trade, and the lower one is that of the operatives. The mortality occurring in each class is represented by the diminution in its respective streams; so that the dark parts of the diagram represent the living, the light parts those who have died. We shall now trace out each stream to its final termination. Commencing with the first, we find, that before reaching the line representing the fifth year of age, it has diminished nearly one-fifth part of its volume; showing that nearly 20 per cent. of the children of the upper orders perish before the fifth year of age is attained: the exact number is 18 per cent. This is a very heavy mortality, and cannot fail to convince every reflecting mind that even the most favoured classes in the kingdom are living in circumstances exceedingly adverse to the health, and exposed to numerous removeable causes of diseases, —for it would be contrary to all that we know of the goodness and beneficence of the Creator, to suppose that it is a part of his providence that so many of his creatures should be born merely to die.∗

∗ In 1842 the deaths were 349,516, of which 139,035 were those of children under 5 years of age.
1841 . . . . 343,847 . . . 133,583 ,
1839 . . . . 356,622 . . . 140,089 ,
But in the next stream, that of the tradespeople, the diminution of its volume up to this point is much greater; it amounts to considerably more than one-third of its original volume, showing that that proportion of the children of this class die during the first five years of life: the exact number is 38 per cent. But in the lowermost stream, the diminution of volume it has undergone in passing through this part of its course considerably exceeds that of the former. The diminution amounts to more than one half of its original size. The exact number of deaths before the fifth year of age amongst children of this class is 55 out of the hundred, or treble the mortality of that to which the children of the upper orders are exposed. This single fact must afford conclusive evidence to all of the depressing and destructive, but removeable, influences to which the poor are exposed, and of the consequent duty incumbent upon the upper orders, the natural protectors of the poor, of providing means for the removal of such influences. After the fifth year, the stream of the upper orders continues to diminish very gradually until about the fortieth year, after which period it falls off more rapidly, and finally terminates at the ninety-second year. The rapid falling off in volume does not cease in the middle stream until the tenth year, when only fifty-six out of the hundred are left alive; after this period, the
diminution it sustains is pretty equable, and it finally ceases at the ninty-sixth year. The stream of the lower orders likewise continues to fall off rapidly until the tenth year, when only thirty-nine out of the hundred remain; after this it proceeds on its course with a regularity exceeding that of the other streams, and finally attains a point considerably beyond their utmost limits.

Now, the foregoing facts entirely disprove the opinion formerly universally entertained, and still believed by a great many, that the hardy and simple habits of the poor, as contrasted with the debilitating influences of the anxieties and luxurious modes of living of the rich, are conducive to health and longevity. It is indeed true, though this applies chiefly to the inhabitants of the country, that health, strength, and instances of longevity, are not unfrequently on the side of the lower orders; but this arises, I think, mainly from the circumstance that amongst the lower orders only the strongest survive the period of infancy; while amongst the rich, owing to the greater care which is bestowed upon the infants, and the greater command they possess of the necessaries and conveniences of life, a larger proportion of the delicate are preserved, who, being devoid of that essential condition of health, a sound hereditary constitution, are always delicate, constantly suffering from attacks of illness, and thereby tend to lower the general standard of
health in the class of the community to which they belong.

When examining the diagram of the streams of life, we saw that the stream of the lower orders extended to a point considerably beyond the utmost limits of the stream of the upper classes: and this brings us to the second general truth I am to demonstrate to you, which is, that very aged persons are often found in situations where the average duration of life to the whole population is very low. This circumstance has been noticed by several writers. Mr. Chadwick says: "It is a singular fact, as yet unexplained, that the greatest proportion of centenarians are of the labouring classes; and that instances of them have from time to time appeared amidst the crowded populations in some of the worst neighbourhoods in London, where the average duration of life is the lowest." I think the fact may be partly accounted for, in the far greater number of persons passing through the lower ranks, thereby affording far greater chances for the attainment of old age. And out of this number it is reasonable to suppose that some will appear with peculiarly-formed constitutions, capable of resisting the effects of the noxious agencies to which the mass fall ready victims; in the same way, for instance, that some constitutions are found which resist vaccine matter and inoculation. In this way I think the circumstance may be partly explained, but not
entirely, for it has been found in some places, as at Geneva, that a prolonged duration of life for the whole community has been attended with a falling off, instead of what we should, à fortiori, expect,—an increase in the relative number of aged persons. Mr. Mallet remarks, that in Geneva extreme old age has not participated in the prolongation of life which has taken place in the less advanced ages. In the periods of from 60 to 70 years of age the amelioration is inconsiderable; after 70 there is no perceptible improvement; after 80 years the aged have indeed a little less probability of life, at the present time, than they had in the 16th century. Centenarians, who were not rare in the 16th and 17th centuries, now disappear; during the last 27 years Geneva has not produced a single one.

Now, it is of some importance that you should be acquainted with this fact, because these instances of longevity are often referred to as conclusive evidences of the salubrity of those very circumstances under which generations have fallen and been buried around them.

This reminds me of a story I have somewhere read, of a discussion which took place amongst a party of individuals as to whether ardent spirits were or were not injurious to the constitution.

After a great deal had been said on both sides of the question, an elderly person, somewhere between 80 and 90 years of age, got up, and instanced his
own person as a conclusive proof that spirits were not only not injurious, but actually conducive to health. He said that from an early age he had belonged to some drinking club, the regulations of which required every person to drink a certain quantity of spirits daily; which regulation, up to the present time, he had duly attended to; and that, notwithstanding, he enjoyed better health, and was more robust for his age, than the generality of individuals. This quite staggered his opponents, and they were about to relinquish their argument, when a quiet-looking person, who hitherto had said nothing, but who probably thought more correctly than all the company besides, got up and asked this individual how it had fared with his companions? This question completely turned the argument, for the dram-drinker was compelled to confess that he had lived out several generations of them. Thus, there is no prevailing habit in society, however injurious to the health it may be, that some peculiarly-formed constitutions are not found to resist.

The last general fact of this kind to which I am anxious to draw your attention, is one which perhaps more nearly concerns you as individuals than either of the two preceding. It is this,—that though the noxious agencies in towns exert their most destructive influences upon the lower orders, they are far from being confined entirely to that
portion of the population, but extend with equal certainty, though diminished force, to all ranks and orders of society above them. This fact is fully exemplified in the Tables at page 29.

In casting your eye along them, you will observe that, as a general rule, a low average life amongst the lower orders is attended with a corresponding diminution of the years of life amongst the upper and middling classes; and a high average of life amongst the poor, with the same amongst the rich; though in several of the towns some very obvious circumstances have served to vary this relation to the extent of several years. Thus in Bolton Union and Liverpool, the probability of life amongst the upper orders is less than that enjoyed by the lower orders in Rutlandshire. In Manchester, the probability of life amongst the higher orders is the same as that of the lower orders in Rutlandshire.

The rich, indeed, not excepting even the nobility, suffer much more from the present excessive sickness prevailing amongst the poor than they are aware of, or perhaps inclined to admit. The experience of Dr. Southwood Smith, physician to the London Fever Hospital, is, "that when fever prevails in any one district no place is safe; it sometimes breaks out unexpectedly in the best families in the large open squares, and, although such places are not its common abode, they are by no means exempt from its visitations." It is a no-
torious fact, that there are some first-rate houses in London, inhabited by the aristocracy of the country, and I could point to analogous instances in this town, in the immediate vicinity of which are some wretched districts, inhabited by the lowest description of poor, and the constant abodes of fevers and epidemic diseases; and in this manner these diseases are often propagated to the rich without they themselves having the least suspicion of the source whence they came. In numerous instances undoubtedly contagious diseases are contracted by the rich in walking or driving in their carriages through, or even past, infected streets.

Now, the foregoing facts may be set forth as illustrating in a striking manner the great and important principle, in theory admitted by a great many, but in practice lost sight of by most,—that the different classes of the community composing the great machinery of human society, though occupying different positions, and having different functions to perform, are, like the different members of the animal system, intimately knit together into one compact body by means of an inseparable band of connexion; by which means, whenever the working of one organ is disordered, the disordered action is propagated first to those in immediate connexion with it, and, through them, to those at a greater distance, until the whole fabric is disordered, and a series of injurious actions and reactions
established between its different parts, which, unless checked, are sure to end in its decay and disruption. So is it with human society. Whatever injuriously affects one portion of it is sure to be extended, sooner or later, to all classes, whether above or below it; the whole nation suffers, and may finally be ruined by it.

Now, applying this principle to our present subject, it may be laid down as a well-ascertained truth, that, in allowing the present diseases to prevail amongst the poor, we are indirectly inflicting numerous and serious evils upon ourselves, and accordingly, that in raising them to a healthful condition of life, we shall, in a proportionate degree, ourselves be participators in the good accruing to them.
LEC T U R E  I I I .


HAVING seen, in our last lecture, that a large proportion of the present unhealthiness and diseases of towns arises from the close and vitiated condition of their atmosphere, our next obvious step is to ascertain, with the view to removal, the various circumstances which contribute to that
state of it. These circumstances, though varying to some extent in different towns, according to the nature of the soil and climate, the condition of the inhabitants, and the arts and manufactures carried on in each, present necessarily a close similarity in all, the difference being rather one of intensity than of kind. For the purpose of submitting them to more convenient consideration, they may be classed under three heads: the first, containing all animal and vegetable collections which it is the object of scavenging and drainage to remove; the second containing what may be called social nuisances, as pigsties, slaughterhouses, and the noxious matters generated in the trades and manufactures; the third, all such circumstances in the arrangement and disposition of the streets and buildings as serve to obstruct and impede the currents of air through the town, thereby preventing the frequent renewal of the air which is necessary for the maintenance of healthy respiration. The various circumstances included under these several heads we shall now proceed to take into separate consideration. And first, as to the animal and vegetable refuse of towns.

These matters are inseparable attendants on human society, and the relative amount generated in any town increases with the density of the population. According to the peculiar laws of organic life, these matters, when exposed to the influence of the air, heat, and moisture, pass rapidly into decomposition,
and generate large quantities of gases, which, it has been clearly demonstrated, when respired by human beings, act in a most destructive manner, either as predisposing or exciting causes of fevers and epidemic diseases.

This point being admitted by all parties, we may, without fear of contradiction, assume as one of our primary positions, that it is an essential preliminary to the health of the inhabitants of towns that all such refuse matters should be removed, as fast as they accumulate, to places beyond the sphere within which their noxious influences can be exerted. Now, surprising as it may appear, the inquiries which have lately been instituted into the state of towns have established the lamentable fact, that there is scarcely a single town throughout the kingdom in which the arrangements made for the removal of this description of refuse are not lamentably defective, and in which, accordingly, there are not large quantities of animal and vegetable matters, in a state of putrefaction, allowed to collect within its precincts, the noxious emanations from which, it is admitted by all parties, form one of the chief causes of that excessive amount of disease and high rate of mortality which we have already shown to prevail so generally in town districts*.

* The condition of large rural districts in the immediate vicinity of the towns, and of the poorest districts of the towns themselves,
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The arrangements made for the removal of animal and vegetable impurities from towns are of two kinds,—scavenging for the removal of the solid portions, and drainage and sewerage for the removal of all such portions of it as are either held in sus-

presents a singular contrast in the nature of the agencies by which the health of the inhabitants is injured. Within the towns we find the houses and streets filthy, the air fetid, disease (typhus, and other epidemics) rife amongst the population, bringing in their train destitution, and the need of pecuniary as well as medical relief; all mainly arising from the presence of the richest materials of production, the complete absence of which would, in a great measure, restore health, avert the recurrence of disease, and, if properly applied, promote abundance, cheapen food, and increase the demand for beneficial labour. Outside the afflicted districts, and at a short distance from them, as in the adjacent rural districts, we find the aspect of the country poor, and thinly clad with vegetation, except rushes and plants, favoured by a superabundance of moisture; the crops meagre, the labouring agricultural population few, and afflicted with rheumatism and other maladies, arising from damp and an excess of water, which, if removed, would relieve them from a cause of disease, the land from an impediment to production, and, if conveyed for the use of the town population, would give that population the element of which they stand in peculiar need, as a means to relieve them from that which is their own cause of depression, and return it for use on the land as a means of the highest fertility. The fact of the existence of these evils, and that they are removable, is not more certain than that their removal would be attended by reductions of existing burdens, and might be rendered productive of general advantage, if due means, guided by science, and applied by properly qualified officers, be resorted to.—Mr. Chadwick on the State of the Labouring Population of Great Britain.
pension, or chemically dissolved in water. It will be necessary for us to consider each system separately: and first, as to the scavenging, or cleansing of towns.

The reports of the Visiting Commissioners, and those from private sources, are uniform in the complaints they make of the large quantities of solid animal and vegetable decaying matter which is allowed to accumulate in the public streets and other places adjacent to the dwellings of the inhabitants; and I am sorry to say that this town forms no exception to the general rule. Any one walking through our main streets, squares, and places, occupied by the upper orders, could not fail being struck with their excessive neatness and cleanliness. They are, indeed, in every respect, all that can be desired. But on turning aside into the districts inhabited by the working classes, a very different state of things would present itself. With but very few exceptions, the streets are invariably seen strewed with all kinds of refuse,—as cabbage-stalks and leaves, potato-parings, turnip-tops, bones, and other animal and vegetable matters; and here and there the carcase of a dead cat or dog presents itself. The courts, alleys, and places of the poor, are generally in a worse condition than the streets; for, in addition to being subject to all the evils of the streets, large quantities of refuse are deposited by the inhabitants against the walls and in the
corners, where it is allowed to remain during considerable periods of time, and to pass into rank putrefaction. The emanations proceeding from these sources are, as may readily be imagined, excessively injurious, and contribute in a material degree to the general impurity of the atmosphere, and to the generation and propagation of epidemic and contagious diseases. The worst streets in this town in regard to cleanliness,—and, indeed, it may be said in all other respects,—are those leading out of and adjoining Edward Street, including Nottingham Street, Essex Street, Paradise Street, Egremont Street, Dorset Street, and numerous others; and the examination of the books at the Dispensary would show you that these districts are the unhealthiest in the town, and the almost constant seats of fevers and epidemics. No one accustomed to fresh air can walk through these streets, especially in hot and moist weather, without being completely nauseated by smells proceeding from these sources.

In no town throughout the kingdom, I believe, do cleanliness and filth meet in such extremes as in this. Our first-rate streets are not surpassed, if equalled, in cleanliness and general neatness of appearance, by any in the world. The streets and districts of the poor, both in filth and general untidiness, and the squalor of the inhabitants, are a disgrace to any civilized people. I am surprised,
considering how much the prosperity of the town depends upon the purity of the atmosphere, that the inhabitants and local authorities have not paid greater attention to the preservation of cleanliness in all parts of it; for when one part of a town is in an uncleanly state, it is not the atmosphere in that immediate vicinity alone which suffers, but the deterioration is extended in a degree to every part. I should like to see this town a pattern to all others in the cleanliness and neatness of its districts inhabited by the poor, as it is now in respect to those inhabited by the rich. No town probably in the world combines so many advantages: it has position, climate, riches, and intelligent inhabitants.

The main obstacles in the way of the efficient scavenging and drainage of towns are threefold. The first arises from the defective powers vested in the hands of the administrative bodies by the local acts.

In many towns, the courts, alleys, and places not public thoroughfares, which, being occupied by the lowest description of poor, require the strictest superintendance to keep them in proper order, are beyond the control of the local authorities. The scavenging committees accordingly are not required to extend their services to them, nor are there any enactments for enforcing the cleansing of such places. They are considered private property, and the cleansing of them is left
to the proprietors or occupiers of the houses, who sometimes, as has been observed by a gentleman at Norwich, cannot agree on the point of having them kept clean. The consequence is, that these places are, as a general rule, in a most filthy condition; and in those towns in which the courts and alleys are numerous, it proceeds to a very serious evil. In Liverpool, for instance, there are 2,398 courts, containing a population of 68,365 persons; and in Birmingham 2,000 courts, containing 50,000 inhabitants—all excluded from the jurisdiction of the scavenging committee, and which, in consequence, according to the report of the different inspectors, are in a most disreputable condition. Dr. Reid states, in his report on the towns he had visited in the north, that in some of the private courts he noticed accumulations of filth amounting occasionally to twenty or fifty tons, all in a state of putrefaction, and penetrating largely into the apartments of the adjoining dwellings. Such being the condition of these towns, how can any one be surprised that the cholera of 1832, or, at the present time, fever, should prove so destructive to the inhabitants? It would be, indeed, nothing short of a miracle if such were not the case.

These remarks respecting the defective powers given to the municipal authorities in the local acts do not apply to this town, for I find that the Commissioners interpret the wording of their act as
giving them the necessary power of enforcing cleanliness in every part of the town. But, at the same time, owing either to the courts and alleys being less exposed to public view, and therefore receiving less attention from the scavenger, or to the greater difficulty attending the cleansing of such places, the consequence of their peculiar construction, or to the more uncleanly habits of the inhabitants, they are certainly, as a general rule, in a worse condition than the streets. The first step, accordingly, towards the formation of a general and efficient system of scavenging and cleansing, is the extension of the authority of the local authorities to every inhabited part of the town.

The second powerful obstacle in the way of the efficient cleansing and scavenging of towns, is the bad habit the poor have of throwing their refuse into the public streets before their doors, instead of depositing it in properly provided places. To such an extent does this custom prevail in this town that it is next to impossible to keep the streets clean; for they are no sooner swept, than, before the expiration of many hours, they are in as bad a condition as ever. Now, there is a clause in the local act of this town forbidding, under a penalty, the throwing of any kind of objectionable refuse matter into the public thoroughfares; and I suppose the same clause exists in all other local acts, but it does not appear to be anywhere enforced.
Any one who is in the habit of walking through the streets of this town may see that the poor habitually make use of the public streets as places of deposit for their refuse, and do so with the greatest unconcern, most of them probably not knowing that there is any law against it. I would therefore suggest to the public authorities the propriety of enforcing from the poor, attention to this law, and if they can succeed in doing so, I am firmly convinced that they would find the labour of keeping the streets in cleanly condition materially diminished. I think that, under such circumstances, with the streets properly drained, the present amount of cleansing prescribed in the act—viz., twice a week—would be quite sufficient to effect all that is required.

In putting this law in force, however, I think it is but a matter of common justice to the poor that the public authorities should see that they are provided with proper places for depositing their refuse matters; as, at the present time, a large proportion of the dwellings of the poor have no such places attached to them; and consequently the only way the inhabitants have of disposing of their refuse matters is by throwing them into the streets. The fairest and most efficient mode of carrying out such a plan would be to pass a law requiring the addition of these conveniences to all houses; but in the absence of any such regulation, and the difficulty
there might be in enforcing attention to it, I would take the liberty of suggesting to the public authorities of the town, whether it would not be a matter both of economy and good order to have proper places for the deposit of refuse provided at the public expense, and distributed over those parts of the town in which it should be found that such places are chiefly required, and which all persons may be allowed to use. This is a plan which has been recommended in other places by practical and experienced individuals, and I therefore do not hesitate to mention it here.

If such places should be constructed, however, it is necessary, in order to render them efficient, that they be provided with proper coverings, to prevent the escape of the effluvia proceeding from the substances contained in them; for without this provision they would be rendered comparatively of little value. I have reason to believe that the purity of the atmosphere surrounding the houses of the better classes is frequently destroyed for want of attention to this necessary precaution.

But the third and most powerful obstacle in the way of effectively cleansing the streets, is the great expense attending the present system applied for the removal of the refuse. In this and other towns it is performed by means of hand-sweeping and cartage. The refuse and surface mud is collected together into heaps by men with brooms,
after which it is lifted into carts and removed to the places of deposit, which are often some distance off. Now, the expense attending these several operations is necessarily very great.

In Manchester, the annual expense for cleansing is about £4,700. In Liverpool it is £4,820. In this town, I am informed, it is £996.

The remedy for this obstacle is to be sought in the application of means calculated to shorten these tedious and expensive operations; and experience has shown, that by the means which the knowledge and science of the day have placed at our disposal, this may be done to a very considerable extent.

The tediousness and expense of the first part of the process, namely, that of hand-sweeping, may be considerably diminished by the use of machines moved by horse power—several descriptions of which have been invented. Some of them scrape the mud in ridges to the sides of the streets, where it remains until it can be lifted and carried away. But this is objected to by the shopkeepers as inconvenient; and the scavengers object that it is no convenience to them, inasmuch as raking it in heaps prevents the evaporation of the liquid, and increases the cartage; and moreover, that the process of sweeping by hand is as quick as the carts can return for its removal.

The most efficient machine of this description is that of Mr. Whitworth, and which has now been in
use for some years in different parts of the metropolis, and in Manchester. Its use has lately been extended to Birmingham, Leeds, and other places. It possesses the additional advantage of removing the refuse and liquid mud from the surface of the streets, and depositing it in a cart attached to the vehicle,—thus dispensing with the tediousness of hand-sweeping, and shifting the collections into the cart. The apparatus used for this purpose consists of a series of brooms suspended from a light frame of wrought iron, hung behind a common cart, the body of which is placed near the ground for the greater facility of loading. As the cart-wheels revolve, the brooms successively sweep the surface of the ground, and carry the soil up an inclined or carrier plate; at the top of which it falls into the body of the cart. This machine, it is stated in the reports of the Health of Towns Commission, will execute at considerably less cost twice the work that can be done by ordinary hand labour. In Manchester, where the machine has been for some time in use, the inventor states that he and his partners have entered into an agreement to sweep the streets oftener than under the old system, at an actual saving to the town of £500 per annum; or in other words, they are to receive, for doing twice the amount of cleansing, £500 less than the former expenditure. And Dr. Lyon Playfair states, upon personal inspection, that the streets of Manchester have been in a much more cleanly state, since this
machine has been in operation, than they were under the old system of cleansing.

I have seen this machine in use in London, and was struck with the efficacy of its operation, which with the decided testimony given by others of its utility, I do not hesitate to recommend it to the attention of the commissioners of this town.

By means of this machine a considerable saving might be effected in the first part of the present process—that of hand-sweeping and loading; but still the most expensive part of the operation—that of carting—remains. This, however, it has been confidently stated, may be entirely got rid of by sweeping the surface refuse from the streets at once into the sewers, and discharging it through them by means of large and frequent supplies of water. This scheme is considered practicable by men of science and experience, provided there is a good sewer, proper gully-holes and shoots, and ample supplies of water. Mr. Roe, indeed, has stated in evidence before the sanitary commissioners, that it has already been put into practice in the Holborn and Finsbury division, where the scavengers, at every opportunity, sweep all the refuse into the gully-holes, and it is carried away without any inconvenience.*

* The following is Mr. Roe's evidence on this point:—

"Have you any doubt of the practicability of carrying all the surface cleansing of the streets in the sewers, and removing it by
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The advantage of such a means of getting rid of the refuse surface of streets must be obvious. It would not only save the whole of the expense of cartage, but by affording a ready means of disposing of the refuse, it would avoid the inconvenience attending the present mode of cleansing, which allows the wet refuse to remain on the surface of the streets for a considerable period of time, during which a large portion of the moisture evaporates from it, to the detriment of the atmosphere and the health of the inhabitants, as well as to the deterioration of the value of the refuse itself.

In arranging the plan for the drainage of this town, therefore, it is incumbent on the parties concerned in it to take into consideration the practicability of this scheme, and if approved of, to have the sewers made in relation to it. If carried into execution, it would save the town, I should think, at least £700 a-year, in addition to being a very great convenience.

conveyance in water, as was proposed at Paris, instead of by hand labour and cartage?"

"I entertain no doubt whatever that it might be done, where there is a good sewer and proper gully-holes and shoots, with a good supply of water; these would carry away rapidly all the surface refuse; the experience of the sewerage in the Holborn and Finsbury divisions proves it."

"How does it prove it?"

"At every opportunity the street-sweepers sweep all they can into the gully-holes, and it is swept away without inconvenience."
PLAN OF SEWERAGE

BY CAPTAIN VETCH.

A B. First Class Sover or Main Drain
C D. Second Class Sover or District Drain
E F. Third Class Sover or Street Drain
G H. Fourth Class Sover or House Drain
M M. Blocks of Houses.
atmosphere containing \( \frac{1}{3} \) part. It is even sufficiently powerful to destroy life when applied only to the surface of the body. A young rabbit died in ten minutes after being enclosed in a bag containing the gas, though it was left free, so as to allow its breathing the pure atmosphere.

Such being the nature of this refuse, it is obvious that it is an essential pre-requisite to the health of the inhabitants of towns, that it should be conveyed away from the vicinity of the dwellings as fast as it is formed, and by means calculated to prevent the escape of the effluvium during its transit. Hence the necessity of underground drains passing through every street and district, and communicating with every house; and so arranged that they shall at all times be effectual in carrying out that object. The accompanying diagram shows the distribution of the drains in a town supposed to be built upon a regular plan, and in which the drainage is complete.

But notwithstanding the obvious and pressing necessity there exists for such a system of drainage, it is a remarkable but well-ascertained fact, that there is scarcely a town in the kingdom in which the drainage is not lamentably deficient. The report of the Health of Towns' Commissioners is, that the densest portions of towns,—those which contain the poorest population,—are in general altogether unprovided with underground drainage,
particularly those portions which consist of courts and alleys, and other places not intersected by any leading thoroughfare. And that even in parts of towns in which the inhabitants have been put to heavy expense for the formation of drains and sewers, owing either to the absence of the requisite knowledge and skill, or the want of a proper combination of means in the execution of the works, such is their faulty construction, that in but few instances have they been found to act perfectly in carrying off the moisture, while in many instances they have been found rather to aggravate the evils they were intended to remedy; and I regret to be compelled to add, that this statement, both as regards the entire absence of underground drainage in the most densely populated parts of the town, (those inhabited by the lower orders), and the defective execution of the existing works, applies with considerable accuracy to this town.

The length of streets having a common sewer is $6\frac{1}{2}$ miles.
Do. without a sewer . . 26 "

The number of streets having a sewer is . . 32 "
Do. without a sewer . . 154 "

Now, the evils proceeding from the entire absence of underground drainage in towns are very serious; these, accordingly, we shall first consider, and afterwards proceed to notice the chief defects in the construction of the existing sewers.
In the absence of underground drainage, the means resorted to for the removal of the refuse moisture are gutters or open drains running along the sides of the streets, which carry a portion of the liquid; while another portion, and, in some instances, the whole, is conveyed into holes dug in the earth, called cesspools; to both of which arrangements there are many serious objections.

In the case of the open gutters, the refuse fluid, containing large quantities of animal and vegetable matters, is exposed to the action of the atmosphere and heat of the sun during the whole of its course down the street,—giving out large quantities of noxious gases, which are allowed to rise freely into the atmosphere.

The amount of evil, however, proceeding from this system of drainage varies with the rapidity of the flow of the fluid along the gutters. When the gutter is in good order, and there is a good natural inclination of the surface of the street, the evil is comparatively trifling; but when the surface of the street approaches to a level, or the gutters are out of repair, (which, by the way, it may be remarked is generally the case), the refuse moisture is detained in them; the fluid portion evaporates, while the solid portions are left behind to putrify and choke up the gutters until ultimately removed by the scavenger. Under these circumstances, the deterioration accruing to the atmosphere, as will be
readily understood, is very great; and, from the close proximity of the gutters to the houses, the gases penetrate largely through the doors and windows into the interior of the apartments, rendering the atmosphere in them very offensive and injurious to the health. The general state of the gutters in the streets occupied by the poor of this town, may be judged from the annexed sketch, which represents a street called Carlton Row, leading out of Carlton Hill, and to the condition of which all the other streets of the poor more or less closely approximate. The street is on a perfect level, the gutter is very much out of repair, thrown into large holes in many places, in which there is a constant collection, several inches deep, of putrifying matter, which is thrown into it by the inhabitants. This street is very unhealthy.

I may here be permitted to remark, that the materials which are generally used for making gutters are about the worst that could be selected. They are made generally of flint stone, which, from the inequalities they cause on the surface, tend to impede and detain the moisture, and, consequently, to the formation of solid accumulation; and, from the impossibility of having them closely united at their edges, the fluid passes through the drain into the surrounding soil, impregnating it with organic matters, and rendering the houses damp and unhealthy. The best materials for this description of
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Drain are bricks or hewn stone, and they should be as closely set together as possible, to prevent the passage of the water through them.

Next, as regards cesspools, as a means of disposing of the refuse liquid from the houses. These, I have already remarked, are places dug in the earth, into which the moisture is conveyed in the absence of underground drainage. In the crowded districts of the poor, especially the courts and closes, several houses are permitted to drain into the same cesspool; amongst the better description of dwellings, there is generally a cesspool attached to each house.

Now this means of drainage has been universally condemned by men of science and experience as a mere remnant of barbarism, to be endured only by persons devoid of all skill, and indifferent alike to their health and comfort. They are very objectionable for the three following very obvious reasons:—In the first place, instead of the refuse being at once carried away out of the town, as by proper underground drainage, it is collected in these places in the immediate vicinity of the houses, where it undergoes fermentation, giving out a variety of offensive and noxious gases, which become incorporated with the atmosphere, and are in that state breathed by the inhabitants in the vicinity, to the destruction of both their health and comfort. Instances abound in all towns of open cesspools
being situated in the centre of courts and closes, and other densely populated districts, which are constantly pouring out volumes of noxious emanations, and which, owing to the confined nature of the situations, become fearfully concentrated in the atmosphere. I know of several courts in this town with open cesspools in the centre, often full to overflowing, and the inhabitants have frequently complained to me of the smells proceeding from them, though in general they have no idea that they are injurious to the health. In such cases, how can it be otherwise than that disease and premature death should be rife amongst the inhabitants? But the authorities have no power to interfere in these matters.

The same objections, to a considerable extent, apply to the private cesspools. Under the best contrivances, the gases generated in them are constantly forcing their way into the interior of the houses, infecting the atmosphere from bottom to top, and causing that unpleasant smell which is so generally observed in houses unprovided with proper underground drainage.

A second serious objection to the use of cesspools is, that in gravelly porous soils, the fluid contents are constantly draining away into the surrounding soil, thereby becoming a constant source of contamination to the neighbouring springs. This evil has been pointed out by Dr. Jeucks as occur-
ring in this town, where the inhabitants, to save the inconvenience of frequently emptying the cesspools, dig below the hard concrete rock till they come to the shingles, where all the fluid filth drains away! And, considering the number of such places there are in this town,—for hardly one house in twenty has a communication with the street-sewer,—there cannot be a question that the springs in the lower part of the town are very much contaminated.

Instances have, indeed, come under my notice of private cesspools being found emptying themselves into the adjoining wells. Indeed, there is every reason to believe, that in all instances, especially in porous soils, in which there is a cesspool in close vicinity to a well, that some of the fluid contents of the cesspool will find their way into the well. It has been stated by experienced and scientific individuals, that it is impossible to render brick and mortar perfectly impervious to fluids, and that consequently there is a constant escape of the fluid through the porous mortar, which soaks into the surrounding soil, saturating it with organic matters, which decompose there; and experience has shown that such gases will permeate the soil to the extent of twenty or thirty feet. These gases consequently rise through the flooring of the houses, and are, I believe, a perfectly unsuspected cause of the unpleasant and unhealthy state of many houses. In-
stances have come under my notice of the atmosphere of the lower parts of houses being so thoroughly contaminated by the gases proceeding from this source, as rapidly to taint meat and other provisions kept in them. This was proved by the fact, that on the cesspools being removed, this effect on the meat ceased. Indeed, it is a primary object with many builders to have the cesspools so made that the fluid portion of their contents may escape, which prevents the necessity of having them so frequently emptied.

A third objection to the use of cesspools is the constantly recurring expense and annoyance of having them emptied, and which frequently causes the operation to be delayed until they are full to overflowing. The most grievous complaints have proceeded from many towns, of the neglect in this respect of the cesspools used for the drainage of courts and districts occupied by the lower orders. The contents of them are described as being allowed frequently to overflow the courts and districts, and even to penetrate the walls of the houses. Such are some of the consequences of the present defective state of the legislation of towns. In the majority of towns, the authorities have no power to compel the proper emptying of these places.*

* Evidence of Henry Austen, Esq., Architect, before the Health of Towns Commissioners, on the effect of cesspools on the sub-soil. (vol. 11, p. 348) :—"In what condition did you find the sub-soil
I now pass on to the consideration of the defects in the construction and formation of the existing drains and sewers, and to point out the alterations which are required to render them effective.

The objection to the present system of drainage in towns is, that it detains and accumulates the solid matters which are passed into them. The evidence of Mr. Roe, a civil engineer of great skill and experience, on the state of the sewerage in London, is, "that in the sewers constructed and managed in the common way, great accumulations of deposit take place, and that, from the sewers containing the refuse that was at one time deposited in the cesspools, this deposit is now more noxious than it was formerly: the generation of noxious on foundations in the line of district where the Blackwall Railway was constructed?"—"It was the state of that soil that first drew my attention to the necessity of abolishing cesspools in towns. I found that theecal matter, or soakage, from the cesspools, had in some cases actually joined from house to house."

"Then the population were living on a vast dung-heap, were they not?"—"The soil in immediate connection with the houses, and surrounding the foundations, was so saturated from the cesspools, as to be, in my opinion, in a worse condition than in dung-heaps; it was exceedingly offensive to remove, and it was constantly a matter of remark how any human beings could be found to do it. When exposed, it drew forth the complaints of the neighbours at some distance. I have no hesitation in expressing my opinion that in all town districts, and in all districts wherever any drainage can be got, the use of cesspools ought to be entirely prohibited."
gases, consequently, is more considerable, and it escapes more extensively into the streets, and into the houses where the drains are not well trapped.” Now, I believe that this description of the state of the sewerage in the metropolis may be received as representing more or less accurately the state of the drainage of most provincial towns, and our own amongst the number. The proportion of houses, I believe, that are not occasionally troubled with smells from the drains is small. Such, indeed, is the defective manner in which the sewers perform their office in many places, that it is not an exaggeration to say that they are converted into extensive chemical laboratories, in which gases are generated on a large scale, to be afterwards conveyed into the interior of the houses, or poured into the streets through the gully-holes; thus becoming the means of generating and diffusing the very poison the formation of which it is their object to prevent.

The annexed sketch (Fig. 1) will afford an idea of the state of the drainage in many places. It represents a section of a sewer, 5 feet 6 inches high, by 3 feet wide, which had been built in a court in Long Acre, under the authority of the Westminster Commission of Sewers, for the purpose of draining the court, but, when opened, was found to contain “an average depth of three feet of soil;” and it
consequently acted only as an extended cesspool.
"And not only," observes Mr. Philips*, "is almost every house infested with one or more cesspools somewhere within or about the premises, but probably the inhabitants and the public generally are not aware of the existence of such enormous cesspools under the streets. If the whole of the sewers of this description could be uncovered and seen, their horrible condition, I feel assured, would almost stagger belief that such a state of things could be, and that the authorities having control over them could allow them to continue for a single day longer.

The four adjoining diagrams (Figs. 2, 3, 4, and 5) exhibit the solid accumulations forming opposite the house-drains. It goes on increasing by degrees until it arrives at the point represented

* Evidence before the Metropolitan Sanitary Commissioners.
in the last diagram (Fig. 5), when the house-drains are quite stopped up, and the scent in the houses becomes too powerful to be borne any longer, and complaints consequently are made to the authorities.

Then commences the offensive process of emptying the drains by hand-labour and cartage. The streets are obstructed, the pavements broken up, and men descend into the sewers, scoop up the deposit into pails, which are raised by a windlass to the surface of the street, where it is often allowed to remain during several hours, to the annoyance and injury of the public, until the carts return to take it away.

The practice also involves considerable expense. The yearly expense of cleansing the sewers in the metropolis has been—

For London about ... £ 500
" Westminster ... 2,000
" Tower Hamlets ... 600
The number of loads of deposit removed yearly by carting is—

<table>
<thead>
<tr>
<th>Location</th>
<th>Loads</th>
</tr>
</thead>
<tbody>
<tr>
<td>London</td>
<td>about 1,500</td>
</tr>
<tr>
<td>Westminster</td>
<td>&quot; 6,000</td>
</tr>
<tr>
<td>Tower Hamlets</td>
<td>&quot; 1,800</td>
</tr>
</tbody>
</table>

In some sewers this operation has to be performed about every five years, in others every ten, during a large portion of which time the public are subject to the evils of having the atmosphere of their houses tainted by the foul gas which is sure to be generated by the decomposing accumulations.

It is, moreover, a dangerous operation to the men employed. Numerous instances are on record of the men being taken seriously ill after working in the sewers; and in one instance, about four years ago, it is stated by Mr. Horslet, Clerk to the Westminster Court of Sewers, that in Wardour Street, a man, whilst cleansing out a drain, was taken suddenly ill, and died in three hours, and that the medical man attributed it to the noxious effect of the work he had been engaged in. And Mr. Roe states, that, owing to the gases now contained in the sewers being more offensive than formerly, the general health of the men who work in the sewers has become worse; they are more pale and thin, and lower in general health, than formerly.

Now, all this is so much evil gratuitously inflicted upon the public, and might be avoided by
resorting to the improvements which the science and experience of the day have suggested.

In regard to the evils arising from the escape of gas from the sewers into the interior of the houses and into the streets, there is much evidence to show how injurious are its effects upon the health; and this you will readily conceive, if you recall to mind the account I gave you in a former part of this lecture of the poisonous nature of the gas which is evolved from the refuse matters contained in the sewers when in a state of decomposition.

Dr. Southwood Smith states, "I have been struck with the number of cases of fever in houses opposite gullyholes. I have observed, that when fever attacks any one member of a family in such a situation, it commonly attacks several individuals, and that the disease is generally severe; that is, it becomes in its progress typhoid." Another medical witness, examined before the Health of Towns Commissioners, states, "that of all cases of severe typhus he had seen, eight-tenths were either in houses in which the drains from the sewers were not trapped, or which, being trapped, were situated opposite gullyholes." Instances are on record in which servants, sleeping in the lower rooms of houses so situated, are invariably attacked with fever; and Dr. Southwood Smith states, that "servants who have slept in such rooms are constantly coming to the fever hospital, and often no other
member of the family has been attacked." Other instances are adduced where it had been found necessary either to trap or to remove gullyholes in the vicinity of butchers' shops, to avoid the injurious effects of the effluvia upon the meat; and if those effluvia are sufficiently powerful to taint meat, we may be sure that they are powerful enough to injure the human system.

Such being the serious evils resulting from accumulations in the sewers, it becomes a matter of the first importance that they should be constructed in such a manner as shall render them channels through which the refuse matter is carried away, not reservoirs in which it is detained and accumulated. The defects in the construction of the existing sewers are numerous. I shall bring under review some of the most important.

One of the main faults at present committed in the construction of main lines of sewers, is the deficiency of fall or inclination often given them. It must be understood that, other things being equal, in accordance with an hydraulic law, the flow of fluid through a tube is rapid and effectual in proportion to its declination. In laying down a system of sewerage, accordingly, one of the first principles to be attended to, is to give the sewers as great an amount of fall as the nature of the ground permits.

But, in the present state of things, instances
abound in which sewers have been constructed on perfect levels; indeed, strange as it may appear, there are not wanting instances in which the sewers have been found with some part of their course actually lower than the outlet; and I am sorry to have to state that we have not to go far to meet with an instance of this kind. I am informed on good authority that the sewer passing down the King's Road (Brighton) has this egregious fault in its construction.

Now, sewers thus formed either cannot act at all, or they act so imperfectly, that great accumulations of solid deposit form in them; and this is the cause of the bad smells which, it is well known, infect the houses in this town in the line of the King's Road sewer. Now, though this fault in the construction of the sewers has arisen, doubtless, in some instances, from the limited jurisdiction of the local authorities not enabling them to carry the outlets to the most convenient lowest point, in the majority of instances it has arisen from the absence of the requisite knowledge and experience of the parties to whom the superintendence of their construction has been entrusted; or from extending the drainage of the towns, bit by bit, without reference to extended levels, or the probable future wants of the district.

To ensure the public against the repetition of such faults in the future construction of drains,
before any extensive plan of drainage is carried out in any district, it is necessary that there should be a complete survey made of the entire area to be drained, the relative levels of the streets, with the other necessary details, ascertained, and the plan of drainage formed upon the knowledge thereby acquired, embracing the probable future as well as the present wants of the district.

Secondly, it is requisite, for the prevention for the future of the existing defects in drains, that security should be provided for the appointment of officers of competent skill and experience. The local authorities of towns, as at present constituted, are necessarily dependent upon their officers for the necessary acquirements for the performance of such works. But in the present local acts no provisions whatever are made for ensuring the necessary qualifications in the persons who are appointed to the office of surveyor; nor, indeed, do they even allude to the necessity of skill and experience. The consequence of this has been, that the persons appointed to the office are notoriously deficient in the qualifications necessary for enabling them to perform their duties properly. The persons filling these appointments at the present time are generally broken-down builders and tradesmen—persons, of course, quite devoid of all scientific attainments.

There cannot be a doubt that no person ought to be appointed to any such office without either
having previously produced satisfactory proofs of his qualifications, or having been subjected to a proper examination.

By an Act for Regulating Buildings in the Metropolis, candidates for the office of District Surveyor are required to undergo an examination, and their appointments are subject to the approval of the Secretary of State. These appear to be regulations that may be beneficially extended.*

Another serious defect prevailing in the present system of drainage is the form which is usually given to the sewers. With but few exceptions, those at present in use are constructed with flat or segment-shaped bottoms, and upright sides. These forms of sewers are represented in these diagrams. (Figs. 6, 7, 8.)

Fig. 6.

Fig. 6 represents the old flat-bottomed sewer which formerly was in exclusive use, and of which Mr. Roe has stated, in evidence, he believes a large proportion of the sewerage of the metropolis still consists. Those of more recent date are made of

this shape (Figs. 7 and 8), with semicircular bottoms, but still with upright sides.

Fig. 7.—First Size.

Now, there are several formidable objections to these forms of sewers.

In the first place, the upright sides are, from the
nature of their construction, deficient in strength. However strongly they may be built, in clayey or slippery ground they are liable to give way under the external pressure.

Mr. Roe mentions an instance which came under his notice of three hundred feet of sewerage being forced in in this manner; and Mr. Williams, an eminent engineer, states that he has seen an instance near Notting Hill where the upright sewer had fallen in, been rebuilt, had again fallen, and was rebuilt a third time with extraordinary precautions of piling and strutting to resist lateral pressure from a slip which was forcing in the upright side-walls*: and examples of similar failures have been adduced as occurring in other places.

Secondly, though deficient in strength, they are the most expensive form of sewer: they require a large quantity of brickwork, and the expense of construction is one of the most serious obstacles to the extension of drainage in towns.

But the chief objection to these forms of sewers is the great extent of the surface in them over which the water has to flow.

This has the effect of diffusing the stream of water, and rendering it shallow; by which means its force is diminished, and proportionately as this

occurs is it rendered less capable of carrying down the solid refuse. This is one of the chief causes of the formation of solid accumulations in sewers of this shape.

These defects in the construction of the sewers were fully demonstrated some years ago, and led to the adoption of the oval, or egg-shaped sewer (Figs. 9 and 10), which is far superior to the old forms.

**Fig. 9.—First Size.**

![Diagram of first size oval sewer](image)

- Level of ordinary flow.
- Level of flow in greatest storm.

**Fig. 10.—Second Size.**

![Diagram of second size oval sewer](image)

- Level of ordinary flow.
- Level of flow in greatest storm.

By presenting the form of an arch to the external
pressure, it combines the greatest strength with the smallest consumption of material; thus adding efficiency to economy. As compared with upright sewers with footing, the difference in the expense of construction is two shillings in first-size sewers, and four shillings per foot lineal in sewers of the second size, in favour of the curved sewers—(Mr. Roe).

As regards their superior strength, not an instance is known of one having been forced in. But the chief advantage of this form of sewer is, that by diminishing the extent of surface over which the water has to flow, it contracts the stream, and renders it deeper, thereby increasing in the same proportion its power of carrying down the solid deposits. It is stated by Mr. Roe, that with the same flow of water the liability of the egg-shaped sewer to accumulate solid deposits is diminished one-half.

Another common fault in the present system of sewerage is the practice of joining the sewers at right angles.

**Fig. 11.**
When two streams, A B and C B (Fig. 11), meet at right angles, the resulting stream is carried in the direction of D E, and, impinging against the sides of the sewer, will have its velocity diminished by the resistance offered, which will likewise cause it to deflect from the longitudinal direction of the sewer, and expend part of its force in eddies. This gives rise to the formation of solid deposits above the point of meeting.

Mr. Roe ascertained by experiment that the time occupied in the passage of an equal quantity of water along similar lengths of sewer with equal falls was—

Along a straight line . . . . 90 seconds
With a true curve . . . . 100 "
With a turn at right angles . . . 140 "

The Commissioners of the Holborn and Finsbury division agreed to require that the curves in sewers

![Fig. 12.](imageurl)
passing from one street to another shall be formed with a radius of not less than twenty feet (Fig. 12); it is also required that the inclination or fall shall be increased at the junctions, in order to preserve an equal capacity for the passage of water, and of effect in sweeping away the deposit.

Another material fault in the existing sewers is their great size. You will observe, from the diagrams (Figs. 7, 8, 9, and 10) that, during even the heaviest thunder-storms, not one-half the internal capacity of the main sewers is occupied by the run of water; while the flow of water when there is no rain is a mere dribble compared with the size of the sewer; and, in the upright-sided sewers, hardly rises above the inverted segment at the bottom of the sewers. In the secondary sewers the proportion of the run of water to the size of the sewer is still less. Now, the general effect of this great disproportion between the size of the sewers and the run of water through them, is to impede the stream and create deposits. The object of making the sewers of this large internal capacity is to enable men to get into them, and remove the accumulations.

The above fault in the present system of sewers has been pointed out in the Report of the Metropolitan Commissioners, who strongly recommend the substitution of a much smaller system of sewers, to be kept in action by regular
supplies of water. The general principle they advance is, that the size of the sewers should be so adjusted as to keep them as full of water as possible; and it is contended by men of experience and science, in accordance with this principle, that the drainage and sewerage of a city might and should be so constructed as to give rise to as little occasion for men to go through the main drains as there is for men to go through the main pipes for conveying supplies of water.

The extent of diminution recommended is—for the main sewer, from 4 feet 9 inches by 3 feet, to 3 feet 9 inches by 2 feet 5 inches: for the second-class sewers, from 4 feet by 2 feet 5 inches, to 3 feet 4 inches by 2 feet.

But, while a more efficient sewer will be thus introduced, another considerable advantage will be gained in the reduction of the cost. The expense will be reduced from 14s. 2d. per foot run for the first class sewers, to 7s. per foot run; and in the second class sewers, from 12s. per foot run to 6s. per foot run.

In localities where artificial supplies of water cannot be obtained, the principle of flushing may be advantageously introduced. This consists in fixing in the sewers cast-iron gates, which, when closed, cause the ordinary flow of water to accumulate above them; and when a sufficient quantity is collected, they are thrown open, and the rush of
water so caused is sufficient to sweep off the deposits. This plan was invented by Mr. Roe, Surveyor to the Finsbury and Holborn division of the metropolis, where it has been in operation for several years with marked benefit, both as regards expense, and in keeping the sewers free from accumulations.

Mr. Roe has stated in evidence, that the annual cost of cleansing the portions of the Holborn and Finsbury district now supplied by flushing apparatus, by the old mode would be £326. 17s.; that by the present system of cleansing by flushing, £106: making a saving of £220 per annum, or about one-third of what it used to be.

We now come to the consideration of the important subject of house-drainage. These drains, if possible, are generally more faulty in their construction than the main lines of sewerage; and it is to them, unquestionably, that a large proportion of the nuisance complained of is attributable. The evidence of Mr. Phillips on the house-drains in the metropolis is, that "it would seem, from the form, arrangement, and construction of the house-drains, that they had been built expressly for retaining matter rather than carrying it away. More than two-thirds of the existing house-drains in old localities require to be periodically broken into to clear out the soil. I am of opinion, that not one-half of the entire filth of the metropolis finds its
way into the sewers, but is retained in the cesspools and drains in and about the houses; where it lies decomposing, giving off noxious effluvia and poisonous sulphuretted hydrogen and other gases, which constantly infect the atmosphere of such houses from bottom to top, and which, of course, the inhabitants are constantly breathing. In thousands of cases, I have no doubt, fevers and a large class of diseases result from this cause."

I am particularly anxious to direct your attention to this part of the subject, because, as the law now stands, every person has the superintendence of his own drain; and, unless he is acquainted with the principles of their construction, he is at the mercy of persons (often common bricklayers) who are far from being noted for scientific acquirements of any kind, and who go on, year after year, constructing the same description of works without any attempt at, or desire for, improvement.

I consider that every person ought to be as careful in seeing that his drain is in good order as he is in seeing that he is supplied with wholesome provisions. The breathing of an atmosphere charged with poisonous gases is quite as injurious as the eating of unwholesome food. In either case the poison is carried into the circulation, the only difference being that in the former case it is conveyed directly into the circulation through the
lining membrane of the lungs, while in the latter case it has to take a more circuitous route.

The faults in the construction of the present system of house-drains are the following:—

1. Deficiency of fall or inclination. This essential condition to the proper acting of drains is not sufficiently attended to by the generality of builders. In some instances, however, the fault has arisen from the street-sewers not being placed at a sufficient depth. There is a sewer in this town (that running through Edward Street) which is actually higher than the basement-floors of the houses, which of course renders it useless for the purpose of draining the houses. This sewer will have to be taken up and relaid at a greater depth. Now, this is the penalty we have to pay for having imperfectly qualified officers appointed to the superintendence of works requiring skill and experience for their proper construction. It may be safely averred, that no expense is saved, but, on the contrary, that expense is created, by attempting to diminish the salaries of public officers to such a point as virtually to exclude the services of properly educated persons.

The second fault in the construction of existing house drains is their large size compared with the quantity of water they have to convey away. The forms of house-drains at present in use are represented in these two diagrams. (Figs. 13 and 14.)
11d. per foot run, exclusive of digging.

Fig. 14.
12 inches diameter—1s. 7d. per foot run.

(Bottom joints without mortar or cement.)

The square form is generally used for the smaller description of houses, the round or barrel drain for the larger houses. Their internal capacity varies in size from nine to twelve or eighteen inches, being frequently sixty times the capacity of the small one-and-a-half inch leaden pipes of kitchen sinks, through which the water is conveyed into them. The consequences of this great disproportion between the size of the drain and the flow of water, are the same as those I have pointed out as
occurring in the main sewers from the same circumstances,—the stream is diffused, and deprived of its power of carrying down the soil, which accordingly collects in the drain and ultimately chokes it. The soil becomes indurated, undergoes decomposition, and inundates the houses from bottom to top with the noxious gases evolved; the drains have then to be broken open, and the soil removed. The truth is, that a large proportion of the filth from the houses never finds its way into the sewers, but is retained in the house-drains, where it lies decomposing for weeks and months together, until the most virulent portion of the gas has passed off,—literally converting the drains into extensive cesspools.

Thirdly, the house-drains are made of improper materials,—bricks and mortar. Along the bottom portion of the drains, the bricks are generally put in without mortar, the object of which is, it is stated, to let in the water of the land drainage. But the real effect of this is to let out through the sides and bottoms of the drains, instead of the ends, a large proportion of the sewer water, which permeates the sites and foundations of the houses, rendering them close and unhealthy, and diminishing, consequently, the run of water in the drains.

Another objection to the use of bricks and mor-
tar for the construction of house-drains, is their highly porous character, which permits the escape of gas through the sides of the drain into the interior of the houses. In addition to this, they are constantly falling into disrepair, and being worked into holes by the rats, when of course the escape of gas through them is more considerable.

The foregoing defects in the size and materials of the existing house-drains were pointed out several years ago by men of science and experience, and are now universally admitted by all parties whose unbiased and earnest attention has been directed to the subject. The principles of amendment, consequently, are a reduction in the size of the drains, and the substitution of impermeable and imperishable materials in the place of bricks and mortar.

These objects may be obtained by using well-burnt earthenware tubular tiles, glazed in the interior, and varying in diameter from three to six inches, according to the size and requirements of the houses, and which are coming into use in the metropolis and in some other large towns.* The

* The following on the above subject occurs in the First Report of the Metropolitan Sanitary Commissioners:—Now it is proved, that whilst house-drains of such size and construction as have been enforced by the Commissioners of Sewers, accumulate deposits, drains of a much smaller size keep perfectly clean. Thus, whilst a twelve-inch drain, as is required by
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glazed interior has the effect of facilitating the flow of water through the tube, and diminishing the liability of solid matters to adhere to it.

To this system of house-drainage it is desirable that there should be some provision made for introducing into the drain, from time to time, a large body of water, for the purpose of washing them out, after the principle of flushing; and with such an apparatus, properly used, experience has shown that perfect cleanliness would be secured, and every kind of annoyance avoided.

the Kent and Surrey, and the Tower Hamlets, and the City Commissioners, accumulates deposit and generates noxious gases, a tubular earthenware drain, of nine times less capacity, or of four inches in diameter, as here represented, or proportional to the house of from three to six inches, keeps perfectly clear. Even three-inch drains convey away the refuse from middle-sized houses, and keep perfectly clear, whilst the larger permeable brick drains, which are usually charged three times the price, are choked up.

Mr. Roe, the surveyor of the Holborn and Finsbury division of sewers, who led the way in systematic improvements in the form of construction of main lines of sewers in the metropolis, recently, at our suggestion, made experiments on the rate of flow of water through the common brick drains for houses, as compared with the rate of discharge through earthenware drains, of the same capacity, and the same run of water. The general results which he gives are, that through the earthenware tubes the rates of discharge are increased to an important extent,—in the smaller and more fre-
The following is a plan recommended by Mr. Guthrie for the attainment of the above object:—

"A water-tank, or reservoir, of dimensions suited to each individual case, is to be erected in such a situation that its contents, when suddenly evacuated, may sweep the whole length of the private sewer, filling completely its interior, and thereby effectually carrying every impurity before it on to the street or common sewer. Houses having water laid on, need not be subjected to additional water-rates for a supply to its flushing tank, for if the rain water were conducted to it in the manner represented in this diagram, the purposes of flushing would be perfectly attained.

sequent forms to the extent of more than one-third. In other words, an economy of one-third the quantity of water to obtain the same result effected by them, and the general efficiency of the drainage in ordinary proportionately augmented, as will appear, at a greatly reduced price. The following are examples:—

Table of Comparative Time of Run of Water through Brick Drains and Glazed Pipes.

<table>
<thead>
<tr>
<th>Inclination</th>
<th>Depth of Water</th>
<th>Time through Glazed Pipes</th>
<th>Time through Brick Drain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level.</td>
<td>Inches.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 inches in 50 feet</td>
<td>5</td>
<td>38</td>
<td>50</td>
</tr>
<tr>
<td>1(\frac{3}{4})</td>
<td>4(\frac{1}{2})</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>2(\frac{1}{4})</td>
<td>5(\frac{1}{2})</td>
<td>19</td>
<td>27</td>
</tr>
<tr>
<td>1(\frac{3}{4})</td>
<td>3</td>
<td>18</td>
<td>26</td>
</tr>
<tr>
<td>3(\frac{1}{4})</td>
<td>3(\frac{1}{2})</td>
<td>25</td>
<td>36</td>
</tr>
<tr>
<td>2(\frac{1}{4})</td>
<td>4</td>
<td>15</td>
<td>22</td>
</tr>
<tr>
<td>6</td>
<td>13(\frac{1}{2})</td>
<td>21(\frac{1}{2})</td>
<td></td>
</tr>
</tbody>
</table>
Let the water from the roof enter the cistern at A, as represented in the woodcut. Should the fall of rain be greater than the cistern is calculated to contain, the surplus may be carried off by the waste pipe C, on which a valve of simple construction should be placed, to prevent the effluvia rising from the drain tube DD. The flushing operation is effected by suddenly depressing the lever B, thereby elevating the plug P at the apex of the conical reservoir, the whole contents of which would immediately rush out with such force, as to sweep every thing through the house-drains on to the main. This operation will be best understood by a glance at the diagram."

I will now conclude this lecture with a few words respecting what I consider to be the chief defect in the present state of the law relating to the drainage of towns. It is the absence of the requisite control on the part of the local authorities
over the house-drains. As the law now stands, the local authorities have no power to compel parties to communicate with the street-sewer; the effect of which is, that the street-sewers are rendered comparatively of trifling service, owing to the very few who drain into them. In regard to the disinclination existing on the part of private persons in many towns to communicate with the street-sewer, I may mention, that in some parts of this town, even where the sewer is conveniently placed and in good condition, there is scarcely one house in twenty that drains into it. I am informed, on good authority, that when the large northern sewer, which runs from the top of the London Road to the sea, and through, consequently, a populous part of the town, occupied by the upper orders, was first laid down, out of several hundred notices which had been sent to the different parties, apprising them of the opportunity thereby afforded them of having their houses properly drained, not twenty took advantage of it. And even at the present time, this large sewer, I have been told, does little more than carry off the surface moisture. The inhabitants prefer retaining the old and injurious mode of drainage by cesspools. The town, indeed, abounds with cesspools, to the contamination of the springs, the deterioration of the atmosphere, and the consequent injury and annoyance of the public.
It has been stated in evidence before the Health of Towns Commissioners, that in some districts of the metropolis not more than one-third of the houses have communication with the street-sewer; and even into sewers lately built in new districts, very few drains have been inserted.

It is evident, therefore, that before any system of drainage can be rendered effectual, that private communication with the sewer must be rendered compulsory; and the authorities in all towns will find that they will stand more in need of this power when they come to drain the districts inhabited by the poor, as probably scarcely one in a hundred of the owners of houses of this description would go to the expense of communicating with the street-sewer, unless they were compelled.

But the mere ordering the private drains to be made, would not suffice for the attainment of the desired object. Experience has shown, that in such a state of the law, the construction of the drains would be intrusted to persons not properly qualified for the perfect execution of such works, and they would accordingly become the source of a foul nuisance. To avoid this, it has been strongly recommended, by persons of experience, that the construction of the drains, as well as their after management, should be subject to the superintendence of the public surveyor who has charge of the street-sewers; and I think parties would consult
their own interest in intrusting the erection of their drains entirely to the public surveyor, who would employ his own men accustomed to that kind of work. It will appear evident, on the slightest reflection, that the house and main drains forming parts of the same system, ought to be placed under one common management.
LECTURE IV.


In the latter part of my last lecture, I attempted to take you a walk underground through the sewers, and to point out to you the masses of corruption which exist there—fertile sources of disease, pestilence, and death—a very unpleasant duty, doubtless, to have to perform, but probably still more unpleasant to those who beheld such things for the first time; but with which it is desirable that all should be acquainted, as it is certainly very bad policy
for people to shut their eyes to the dangers which beset them. And having fully satisfied ourselves on these points, we shall now re-ascend to the surface, with the view of considering certain evils existing there, and which, wherever they do exist, are equally destructive to both the health and comfort of the surrounding population. The class of evils to which I allude are those called nuisances—as slaughterhouses, pigsties, smoke, &c. Some of these nuisances are observable only in particular towns, and may depend either upon some peculiarity in the soil, climate, or habits of the people, or upon the particular trades or manufactures carried on in them. But by far the largest proportion are common to all towns, though they differ materially in different places in the intensity of their operation and effects, according to a variety of contingent and collateral circumstances. Want of time, on the present occasion, will compel me to confine my observations to those only which are in general operation, or to such as are peculiar to this town.

Amongst this class of evils there are none which operate more powerfully in destroying the health and comfort of the community than the presence of slaughterhouses in the centre of densely populated districts. These places, free from all superior control, present grievous instances of the extent to which the comfort and health of the public may be destroyed by the caprice, indolence, or ignorance
of private individuals, and of the necessity there is for the introduction of regulations more stringent than those which at present exist for preventing the health and comfort of the public being encroached upon from such sources. In nearly all places from which sanitary reports have been received, the slaughterhouses have been condemned as nuisances highly destructive to the health as well as to the comfort of the inhabitants, and as striking examples of the present defective systems of town regulations.

I shall not offend your senses by entering into any detailed description of the condition of these places. It will be sufficient for my present purpose to state that, owing to the absence of any authoritative regulations for enforcing cleanliness, the remnants of the slaughtered animals are allowed to accumulate within the precincts of the buildings until putrefaction is frequently very far advanced, giving rise to offensive emanations not only destructive to the health of the neighbouring population, which is generally very dense, but, in a more remote degree, vitiating the general atmosphere of the town; becoming, consequently, a latent source of disease and ill-health to the entire population.

But this is not the whole, nor the worst part, of the evils attending them in many instances. I know of one in this town, where, owing to the want of the requisite internal drainage for carrying off
the refuse moisture, the blood and other impurities, mixed with water, are allowed to pass into the open gutters of the adjoining streets, where they stagnate and putrefy under the very doors of the inhabitants.

This description of the slaughterhouses is taken from my personal observation of some existing in this town. There are some slaughterhouses in Paradise Street—a densely populated neighbourhood. The neighbouring poor have complained to me of the scents proceeding from them, especially in summer, and in hot and dry weather. This district is the almost constant seat of fever and contagious diseases, as may be seen from an examination of the books at the Dispensary: many cases have occurred in the immediate neighbourhood within the last two or three months.

Several slaughterhouses are situated in Vine Street. I have seen the open gutters of this street loaded with putrefying blood and other impurities, which, with the scents proceeding from the premises themselves—more particularly in hot and dry weather, when decomposition proceeds more rapidly, and the drains are less frequently washed by the rain-falls,—render the atmosphere of this street so noisome that it is impossible to pass through it without experiencing a sensation of faintness and disgust, from which it may take some time to recover. These scents, in the summer,
attract swarms of loathsome flies, which infect the houses of the inhabitants, and become very troublesome and offensive. This street, during the time that I had the superintendence, as Dispensary Physician, of that district of the town, was, I remember, seldom or never free from fever or contagious disorders, and the general health of the inhabitants was sensibly affected by it.

There are other slaughterhouses in Aire Street, the state of which has been, for several years past, the subject of public animadversion; but as I have never had any opportunity of witnessing personally their effects on the surrounding population, I shall pass them over without further comment.

Now, in giving this account of the state of the slaughterhouses in this town, and of their injurious effects upon the surrounding population, I am but repeating the statements, and echoing the opinions, of all competent medical men, and other reflecting persons, whose attention has been directed to the subject; and, with such a mass of concurrent testimony before us, it is impossible to resist the conviction, that it is essential to the health and comfort of the inhabitants of towns, and more especially of the lower orders, that such nuisances should be removed. The question, accordingly, now before us is, what steps is it necessary to take in order to ensure their satisfactory removal?

Now, some persons are of the opinion that this
object might be satisfactorily accomplished by subjecting them to the regular and repeated inspection of proper officers, appointed by the local authorities, with the view of enforcing the requisite attention to cleanliness; and that such a regulation would serve in a most material degree to abate the nuisance, there can be no doubt. But, independently of the improbability of any such power being stringently and effectually exerted, and the consequent partial continuance of the present evils,—even supposing the most perfect cleanliness compatible with the nature of the employment to be observed, the blood and carcases of the slaughtered animals would still, in my opinion, render these places very objectionable; and their presence in any densely populated district incompatible with the due enforcement of proper sanitary measures. From these considerations, I have no hesitation in giving it as my firm opinion, that slaughterhouses should be forbidden altogether within certain distances of inhabited dwellings. In the Act for Regulating Buildings in the Metropolis it is provided, that no new slaughterhouses shall be established within fifty feet of any dwelling-house, and that those at present existing shall be removed at the end of a certain period; and in the second report of the Health of Towns Commission it is recommended that similar regulations should be extended to the provincial towns. The period within which the
removal of the existing slaughterhouses should be required would probably have to vary in different places, but I should myself prescribe four or six years as the very furthest limit.

Another serious and prevalent nuisance in towns is the practice, among the humbler classes, of keeping pigs. It is very common amongst the poor of this town; and, from what has come under my own observation, I believe it to be a much more prolific source of fever and general impairment of the health amongst that class of the community than the public generally have any idea of. A little attention, indeed, to the circumstances attending the keeping of pigs in towns cannot fail to convince any reflecting person of its pernicious tendency. The places generally appropriated to these animals are the small court-yards—in many instances hardly a dozen feet square—attached to the backs of the houses, and enclosed by a wall. The necessity of observing cleanliness seldom enters the conception of the owners; or, if it does, they are too idle to attend to it. Manure is allowed to collect in large heaps in the corners of the sties, and the bottoms are frequently several inches deep in liquid filth. It is hardly necessary to remark, that such a state of things cannot fail to give rise to the most offensive and injurious emanations; which, owing to the confined nature of the localities, penetrate largely into the interior of the houses,
rendering the atmosphere in them quite unfit for healthy respiration, and the habitual breathing of which cannot prove otherwise than highly detrimental to the health.

Several instances have come under my notice in which I have had reason to attribute the presence of typhus fever in families to the effluvia proceeding either from their own or their neighbours' pigsties. I have in my memory, at the present time, a house in Woburn Place, which was subject to a combination of these evils. There were several pigsties behind the dwelling, and the cellar was used as a stable for donkeys, which together rendered the atmosphere in it exceedingly impure. During the time I had charge of that portion of the town, as Dispensary Physician, this house was hardly ever free from fever, or some description of illness; and I was informed by the house-surgeon that the same had been the case for some time previously. It was occupied by a succession of families, who were compelled to leave, one after another, owing to its extreme unhealthiness. In one instance six or seven members of the same family were attacked in succession with typhus fever, of whom one died. The only individual who escaped was the father of the family, whose occupation carried him much into the open air.

Similar complaints have proceeded from many other towns of the injury resulting to the health of
the inhabitants from this practice. The Sanitary Committee at Sunderland complained that, during the prevalence of the cholera, these were the spots most visited by that scourge. It is stated, that in Birmingham Parish there were more than 1,600 pigsties; in which place, as well as in Manchester, they have been the subject of repeated complaints on the part of the inhabitants.

I have, therefore, no hesitation in stating my opinion, that it is essential to the comfort and health of the poor that no pigs be allowed to be kept in the vicinity of inhabited dwellings in towns. The power now possessed by the Commissioners of this town of ordering such places to be removed or remedied, upon complaint being made to them by an inhabitant, is not sufficient. In the first place, the poor are not alive to the injury caused to themselves or their neighbours by the practice; or if they are, they do not like to complain of their neighbours for fear of incurring ill-will: and secondly, the Commissioners cannot always agree as to whether such places are nuisances or not, and, in some instances, may have some compunction in depriving a poor man of his pig, which is considered an assistance to him. This power, therefore, is quite ineffectual for the attainment of the object in view. Nothing short of forbidding the practice altogether, will, in my opinion, remedy the evil. And this I have less hesitation in recommending, because I
believe that the poor in general lose rather than gain by their pigs; and, moreover, that they not unfrequently hold out inducements for pilfering and dishonesty.

A third prevailing nuisance in towns is the volumes of smoke emitted from the fires of steam-engines and the furnaces of the different manufactories. This evil exists in its greatest intensity in our large manufacturing towns—as Manchester, Derby, London, &c.—but there are few or no towns of any size quite free from it. It may be considered in two points of view: as a cause of injury to the health, and a source of discomfort and annoyance to the public. As regards the effects of a smoky atmosphere on the human constitution, though it is unquestionably far less injurious than an atmosphere loaded with the putrid miasms generated by animal and vegetable matters in a state of decomposition, yet, as the breathing of pure unadulterated air every physiologist can prove is an essential condition of the health, it follows that every degree of vitiation of it must, in a proportionate degree, be subversive of the health. Nor is this deduction of theory devoid of practical support. Several instances could be pointed out of excessive sickness and high rate of mortality prevailing amongst the population of localities which, with the exception of a smoky atmosphere, are favourably circumstanced as respects the various conditions necessary for the preservation of health;
and also by the well-known fact, that delicate persons removing from such localities to others possessing a pure atmosphere, very frequently experience a striking and rapid improvement in their health and strength—not unfrequently remaining entirely free from ailments to which they are invariably subject when living in a smoky atmosphere. The fact, also, that many vegetables will not live in a smoky atmosphere, may be adduced as a further powerful inference corroborative of the same conclusion.

But, whatever may be the real state of the case as regards the effects of a smoky atmosphere on the health, in the light of a serious public annoyance there cannot be two opinions upon it. In this respect I am sure I am more especially expressing the feelings of the fairer portion of the community, to whose light and delicate articles of dress and embellishment the blacks floating in the atmosphere prove a serious cause of destruction. A month's wear in the smoky atmosphere of London and other manufacturing towns, I am told, proves far more destructive to some descriptions of bonnets and other articles of dress, than six months' wear, or longer, in the clear air of the country. This, of course, involves additional expense.

But this effect of smoke on the dress, to the lower orders in towns, proves a serious impediment to the formation of habits of personal and general
cleanliness. In the suburbs of Manchester, for example, it is said, "linen will be as dirty in two or three days as it would be even in the suburbs of London in a week." One person stated, "that on the Isle of Arran, a shirt was cleaner at the end of a week's wear, than at Manchester at the end of a day's.

Lastly, the volumes of smoke issuing from the chimneys of manufactories, to all who live within the range of their influence, operate as a serious impediment to the requisite internal ventilation of the dwellings; for the windows of houses so situated are no sooner opened than the rooms are filled with noisome smells, and the furniture covered with smuts, which is considered a greater evil than the maintenance of a close atmosphere. Under the most careful management, indeed, the destruction to good and delicate articles of furniture by the smoky atmosphere of large towns is very great; which of course operates as a heavy tax upon the inhabitants. There is scarcely a town in the kingdom in which there are not to be found districts of houses the value of which is materially diminished by the presence near them of offensive chimneys, and which are unable, from that circumstance, to obtain respectable tenants.

There is a law, I believe, in existence which was framed for the purpose of protecting the public from this nuisance; but the expense attending
prosecutions of this kind is so great, and the results so uncertain, that few persons are willing to engage in them. In nineteen cases out of twenty, accordingly, the manufacturers of smoke are allowed to continue their operations unmolested.

It is gratifying, however, to know that the smoke nuisance has for some time been occupying the attention of the legislature, and, before long, it is to be hoped that a law will be passed to compel the owners of all furnaces to consume their own smoke, which, according to the testimony of practical and scientific men, may be readily accomplished without entailing any additional expense upon the parties, and in some instances, even with a saving. The strict enforcement of such a law would doubtless have the effect of mitigating the evil to a very considerable extent, and rendering the atmosphere of some of our large manufacturing towns comparatively clear to what it is at present. But it would be very far from proving a complete remedy. Under the best arrangements and most careful management the large furnaces would still give out a considerable quantity of smoke—sufficient to prove a serious public annoyance; and besides the smoke evolved from the chimneys of these furnaces, there are given out large quantities of deleterious gases, which destroy the purity of the atmosphere, and which, of course, it is impossible to prevent. These considerations have wrought in
my mind the conviction of the expediency of removing all such offensive manufactories from towns to such distances in the open country as would insure the atmosphere in the towns against being infected by them. Such a recommendation would seem, at first sight, useless from its apparent impracticability; and, under any circumstances, it would certainly require a good many years to carry it into effect. But I think it might ultimately be accomplished without causing so much inconvenience as our first impression would cause us to believe, by preventing for the future the erection, within certain defined distances, of all fresh offensive or injurious manufactories, and compelling all such as now exist to be removed within certain periods. Certainly, I think that in such places as Brighton—the reputation and prosperity of which depends upon the salubrity and pureness of its atmosphere—such a law ought, and might, be enforced. The propriety of enforcing such a regulation in regard to the large manufacturing towns involves far weightier considerations. But I may here be allowed to express the sanguine hope I entertain, that the time will come when, even as respects our large manufacturing towns, all inhabited dwellings, including those of the poor, will be seen occupying positions distinct from the places of work, and dispersed over the country—each dwelling, moreover, having a small plot of ground
attached to it. In the present state of things, it may seem the height of extravagance to represent such a scheme as possible. But when we consider the vast revolutions which society, in comparatively short periods of time, has been constantly undergoing, the increasing attention now being paid to health, and the probability that before many years there will be attached to it that degree of importance it deserves, and for the attainment of which many changes from our present habits must take place; together with the increasing aid which the advancing state of the sciences, and their more successful application to the arts, is placing within our reach; it must, I think, be admitted, that such a scheme is at least within the bounds of possibility.

There is one agency now in active operation that would greatly facilitate such an arrangement; I allude to the railroads. These could easily be applied for the conveyance of labourers to and from their places of work. Supposing such a change were widely carried out, its effects in raising both the physical and moral condition of the poor can hardly, at the present time, be realized.

Another class of nuisances, more or less prevalent in all towns, is the generation of acrid gases; or the formation of a variety of refuse matters, which generate acrid and noxious gases; from the various trades and manufactures carried on in them. Under this head are included gas-works,
soap and tallow manufactories, chemical works, dying operations, &c. I know an instance in this town, in which the refuse matters from a dyer's premises are allowed to run over the surface of the street, and down the gutter of a close alley. The inhabitants have complained to me of the smells proceeding from them, but they do not like to make a complaint to the authorities of the town, as they say the owner does his best to prevent the nuisance, is otherwise a good neighbour, and if compelled to remove, would suffer considerable loss. But I know, from personal observation, that the health of the inhabitants of the district is affected by it, and I think, therefore, that it is the duty of the town authorities to prevent it.

Another crying evil in the present arrangements of most large towns, and more especially of the metropolis, is the practice of burying the dead amidst the abodes of the living. To be able to realise the full extent of the mischief proceeding from this source, it will be necessary to note the circumstances attending the decomposition of dead animal matter. The animal system, it must be understood, is formed from the inorganic elements composing the physical universe; these, under the influence of the vital principle, the nature of which it is quite beyond our power to understand, are collected together and arranged into new and peculiar combinations, forming the animal structures.
As long as life or vitality remains in them, they are kept in that form, in opposition to the ordinary laws of affinity governing the union of inorganic matters. But as soon as life is destroyed, this power is lost, and the physical elements composing the animal structures become subject to their own peculiar laws. Fresh combinations and arrangements amongst them in consequence ensue, and they are converted into the forms which they possessed before they were subjected to the laws of organic life. In accordance with this general law, no sooner does death occur, than a series of chemical changes commence in the inanimate body,—the ultimate effect of which is, that some portion of it is transformed into gaseous substances, while another and larger portion is converted into the denser forms of matter composing the crust of the earth: the body, indeed, returns to the ground from whence it was taken.

But in the course of these changes which the animal system undergoes in its decay and final disruption, a large quantity of gases are given out, which theoretical deduction, corroborated by ample experience, has proved to be excessively injurious to living animals; and when inspired by them in a concentrated form, cause instantaneous death, and, in a more diluted form, impair the general health, and generate numerous and specific forms of disease.

These gases, it must further be understood, are
of an excessively penetrating nature, and exceedingly difficult to confine; the gas generated from a dead body buried in the soil, has been known to penetrate through it to the extent of twenty or thirty feet. In all cases of interment, therefore, some portion of the gas which is formed will take an upward course through the soil, and be discharged into the atmosphere; while another will diffuse itself laterally and downwards, and become mixed with the surrounding moisture; thus proving a source of contamination to the two chief elements of life,—the air we breathe and the water we drink.

This being the case, common reason and caution point out the necessity of having all interments removed to distances from towns, beyond the sphere within which their injurious effects can be exerted. But what is the actual practice which obtains in this respect in the towns of this country? In the metropolis, on spaces of ground which do not exceed 203 acres, closely surrounded by the abodes of the living, layer upon layer, each consisting of a population of more than 50,000 of adults, youths, and children, is every year imperfectly interred. Within the period of the existence of the present generation, upwards of a million of dead must have been interred in those same spaces, each one of which, in the progress of its decay, is converted into gas, and its escape, as a miasma, of
many times the bulk of the body that has disappeared.*

Now, the effect of such large volumes of gas as must be generated from such an immense mass of animal matter, and discharged into the confined and already vitiated atmosphere of the metropolis, there is ample evidence to show, is highly detrimental to the health of the inhabitants, and a powerfully latent cause of fevers and epidemics.

If time permitted I could adduce numerous well-authenticated instances of disease and fevers resulting from this source of atmospheric impurity; but for information on this point, I must refer you to the report of Mr. Chadwick, "On the Practice of Interment in Towns," in which the manifold and serious evils proceeding from it are ably and extensively set forth. I cannot, however, quit this subject without saying a few words on the practice of interment in vaults under churches; because this practice obtains in this town, and is, indeed, more injurious than interment in church-yards or burial grounds. I have been informed by parties attending a church in this town possessing vaults, that the atmosphere in it, especially in the summer, is frequently very close and oppressive, and has a peculiarly depressing effect upon the system. Not being in the habit of attending that church, I am,

* Mr. Chadwick "On the Practice of Interment in Towns."
of course, unable to speak to the fact on my own experience, but from my knowledge of the circumstances attending the practice of interment in church vaults, I have no hesitation in stating my opinion, that the atmosphere of a church so circumstanced cannot be otherwise than affected by it. It is well known, that it is impossible to prevent the escape of gases from the coffins, and that when made quite air-tight, the coffins are liable to be burst open by them. Some years since, Mr. Barret, surgeon, states a vault was opened in the church-yard of a church in the parish of Stepney, and shortly after, one of the coffins contained therein burst with so loud a report, that hundreds flocked to the place to ascertain the cause. So intense was the poisonous nature of the effluvia arising therefrom, that a great number were attacked with sudden sickness and fainting, many of whom were a considerable period before they recovered their health.

I have now to direct your attention to a nuisance existing in this town, which, I believe, is almost peculiar to it, or, at any rate, I know it is not of common occurrence in other towns; and, as I consider it detrimental to the health of the inhabitants, I shall take this opportunity of mentioning it. The nuisance to which I refer is a lime-kiln, situated on to the hill the east of St. Peter's Church. Now, the effect of heat on chalk or the carbonate of lime, as in a lime-kiln, is the expulsion of the car-
bonic acid, which is diffused through the atmosphere,—thus having the same effect upon it as animal respiration and the combustion of fuel, in rendering it unfit for the purposes of respiration. And, as the quantity of carbonic acid discharged from a lime-kiln in constant operation is very large, (larger, perhaps, than that discharged from the lungs of all the living beings in the town, as well as from the different fires and furnaces in it), it cannot be otherwise than injurious when discharged into the midst of a crowded district. Its injurious effects are more potent than they otherwise would be, from the circumstance that carbonic acid, being heavier than the atmosphere, has a tendency to gravitate to the earth, and does not, consequently, so readily diffuse itself through the air as lighter gases. And supposing the wind to blow either from the north or north-west, or north-east, it is pretty certain that the whole stream of carbonic acid will pass through thickly inhabited parts of the town, destroying the purity of the atmosphere, before it is got rid of. Carbonic acid being devoid of smell, and its effects upon the human system, when largely diluted with atmospheric air, inappreciable to ordinary observation, I do not think that the attention of the authorities of the town has ever been directed to this lime-kiln as a source of deterioration to the health; but I think a little reflection upon its effects, as now stated, must show that it is in-
jurious, and I have, therefore, no hesitation in pointing it out as a nuisance which ought to be removed.

I have now, to the best of my belief, with one exception, noticed all the graver defects in towns which operate as causes of disease and epidemics, and admit of either partial or complete remedy by legislative enactments. The exception to which I allude, is the common lodging-houses of the poor; and to these I am particularly anxious to direct your attention, because, from the evidence respecting them which has been brought under the notice of the Sanitary Commissioners, and from my own observation and experience, I have been led to consider the evils they produce of such magnitude and extent, that were all the other necessary sanitary conditions of towns carried out, they would still, independent of the great moral evils attending them, render the population liable to the continued importation, if not to the generation, of contagious and epidemic diseases.

A little attention to the state of these places will be sufficient to convince us of their highly injurious effect upon the population, both morally and physically.

The houses, as a general rule, are of the worst possible description, devoid of any proper means of ventilation, and situated in the most densely populated parts of the town; in the courts, alleys, and
lowest description of streets. The class of persons resorting to them consists of the most vicious and profligate part of the inhabitants of both sexes, and of that degraded portion of the population who obtain their living by begging, and who are constantly roving about from one district of the country to another. To these places this description of people resort, and crowd together, without any distinction of age, sex, or condition; and in such numbers as would, under the most favourable circumstances, render the atmosphere in the rooms quite unfit for healthy respiration, but which, under the circumstances in which it does occur, amounts to a most destructive evil.

To any one who has not personally inspected these places, it is almost impossible for language to convey an adequate conception of the overcrowding, and consequent filth and vice, which prevails in these dens of misery and profligacy. I will read to you the description which Dr. Duncan gives of them in Liverpool. "With regard to individual dwellings," he says, "it is in the lodging-houses that the overcrowding of inmates is carried to the highest pitch. The worst description of houses of this kind are kept by Irishmen, and are resorted to by the migratory Irish, among others, who may, perhaps, not remain more than a night or two in the town, as well as by vagrants and vagabonds of all descriptions. In every room of such houses,
with the exception of the kitchen or cooking-room, the floor is usually covered with bedsteads, each of which receives at night as many human beings as can be crowded into it, and this too often without any distinction of sex or regard to decency. But there are cellars, usually double cellars, which are used for the same purposes; and here the overcrowding is carried still further, if that be possible, and is certainly more prejudicial to the health of the inmates, from the still more defective ventilation of these dark and miserable abodes. At night, the floor of these cellars,—often the bare earth,—is covered with straw, and there the lodgers,—all who can afford to pay a penny for accommodation,—arrange themselves as best they may, until scarcely a single available inch of space is left unoccupied. In this way, as many as thirty human beings are sometimes packed together under ground, each inhaling the poison which his neighbour generates, presenting a picture in miniature of the black hole of Calcutta."

I was myself acquainted with a lodging-house in Edinburgh, in which the beds in one room were placed in tiers one over the other, and were sometimes occupied during the day as well as during the night; and this same room was also used as a day-room by the family and other lodgers.

The lodging-houses in this town are certainly of a better description than the general run of similar
places in Scotland, and the large manufacturing or commercial towns in the north of England; but they are still sufficiently defective in the same particulars to render them a serious evil, and a powerful cause of the generation and propagation of epidemics and contagious diseases. I have seen as many as four or five bedsteads in one room, and so closely packed together, that there was barely space to get between them. The number of persons nightly sleeping in such a room, would not probably be less than from twelve to fourteen. At the time of my visit, one of the beds was occupied by a poor woman ill with fever. The sitting-room through which I passed (it was late in the evening) was crowded with a set of the most abject and degraded persons in rags and tatters, variously occupied, some in cooking their food, others in smoking, eating, or drinking,—a few were engaged in some kind of work; and which altogether formed a spectacle of wretchedness and depravity, the parallel of which it would be difficult to meet with in any other description of places.

Such being the condition of these houses, it cannot be otherwise than that they should be productive of immense evils, both physical and moral; and the common safety of the public earnestly demands some legislative interference for placing them on a better footing. From almost all towns whence sanitary reports have been received, and
which have been the result of careful investigation, these places have been denounced as the foci of disease within the district, and the media through which contagious and epidemic diseases are spread over the country. Dr. Baron Howard, of Manchester, who has had great experience in these matters from his connexion with the Fever Hospital, ascribes the activity and virulence of the infection in the lodging-houses to the filthy condition of the beds and bedding, which are seldom washed, and consist of porous materials, to which contagious vapours are especially liable to attach themselves. Even if a bed has been occupied by a poor patient who has died or been removed, it is often immediately used by fresh lodgers, without having undergone any purification.

Considering the nature of these places, the description of persons who keep them and resort to them, it is obvious that nothing but the most stringent measures would suffice for the abatement of the evils. No measures for their regulation have yet been put in force in any of the towns of England, but such powers have been granted for some places in Scotland, where they have been exercised with great advantage. The local authorities of the borough of Calton have the power of licensing all the lodging-houses, and of enforcing such regulations as are necessary for insuring cleanliness and ventilation. Under these provisions, no keeper of
lodging-houses can receive inmates without the house having been inspected and approved of by the superintendent of police, who has the power to prescribe the number of lodgers each house may accommodate. The regulations further require the floors and walls of the houses to be periodically cleansed and whitewashed, the blankets to be thoroughly cleansed and scoured four times in the year; and in the event of any person in such houses being taken ill of fever, or other disease, the keepers are bound to give intimation thereof to the superintendent of police. These regulations and provisions have been very judiciously enforced by the magistrates of Calton and their superintendent of police, with much benefit in the diminution of fever, and the suppression of many ill-conducted lodging-houses, formerly a great nuisance to the place.

These happy results point out the propriety of extending similar regulations to all other towns in the kingdom, and which, it is to be hoped, will be accomplished by Lord Morpeth's Bill.

I have now concluded all that I have thought it necessary to say to you on the defects existing in our towns, and I propose to finish the course with a few observations on the kind of government which is required for towns.

The numerous and serious evils I have pointed out as existing in our towns, must, I think, render
it evident to every one that the present laws relating to the government of large towns are ineffectual in carrying out the necessary sanitary objects. The laws, indeed, at present in force in towns, speaking generally, were framed for the purpose of facilitating business and general convenience, and obviating circumstances which might prove offensive or annoying to the inhabitants; while that which ought to be the first object of legislation,—the care of the public health,—was either altogether lost sight of, or made a very subordinate consideration. The defective principle, according to which the present local acts for the government of towns were framed, will appear evident from the fact, that in the act for this town there is a clause forbidding the emptying of those matters into the public sewers, which it is the main object of sewerage to remove. Few, therefore, at the present time, have the boldness to deny that extensive changes are required, or that government has a right to interfere.

It is the height of folly, indeed, when more than 51,000 persons are annually destroyed in the towns of this kingdom from the present system of neglect and mismanagement in them, to question the right of the state to interfere, when it is only through the state that the requisite changes can be accomplished. Such is only the cry of ignorant, prejudiced, and interested parties, who regard their fellow-creatures only in the light of so many inani-
mate machines, to be applied to any purpose that will bring the largest amount of profit to their employers; and it must not be forgotten, that a few such active and interested persons will often defeat the projects for improvement of a multitude of individuals who are comparatively passive and indifferent.

Now, what is manifestly required from government—and what the public have, I think, a right to expect—is the framing of some general act, applicable to all towns, that would be effectual in carrying out those objects in them which, according to the concurrent testimony of scientific and experienced individuals, have been considered necessary for ensuring the health of the community. The main objects essential to be carried out in towns, and for which competent provisions should be made in the act, are—1st, the enforcement of cleanliness in every part of the town over which it is possible to extend the jurisdiction of the authorities; and 2dly, such a structural arrangement of the town as would best facilitate the currents of air through it.

To effect the former of these objects, stringent regulations must be enforced for preventing the public thoroughfares being made, as at present, the general receptacle for refuse matters, and for removing such as are unavoidably formed. 2dly, There must be a perfect system of street and house
drainage enforced in every part of the inhabited town; and, 3dly, the existence of every kind of trade or manufactory which has a known tendency to destroy the purity of the atmosphere, or those circumstances in towns which have been termed nuisances, must be forbidden within certain prescribed distances of inhabited dwellings.

The second object could be obtained by a general building act, the regulations of which should prevent any such arrangement of the streets and buildings as experience and undoubted testimony prove to be injurious to the general welfare of the town, and also the erection of any description of houses for the poor that did not contain the requisite accommodations and conveniences.

The administration of these sanitary measures would have to be placed in the hands of bodies similarly constituted to those at present existing in towns for the government of their respective districts, and who ought to be chosen entirely by their fellow-townsmen, who are much more likely to know who are the fittest persons for such an office than parties at a distance, and, consequently, comparatively unacquainted with the requirements of the district, and the individuals composing it.

But, inasmuch as numerous instances have occurred throughout the country—and I here beg to disclaim entirely all local allusion; my observa-
tions are intended to apply to the local administrations of towns taken as one body—in which, either from neglect, prejudice, or interested motives, these bodies have neglected their obvious duties, much to the injury of the health, as well as to the discomfort of the inhabitants; and the same system of negligence and activity is liable to recur—in order to ensure the safety of the public from the repetition of such neglect, it is, I think, necessary that these bodies should be subject to the supervising and controlling authority of the Crown, which, on complaints being made by a certain number of the inhabitants of any kind of defect in any part of the town, should have the power of ordering inquiries to be made by competent persons into the state of the districts, and order that to be done which the general welfare of the inhabitants should require. To such a supervintending authority I believe the present local bodies would not generally object to be subjected. It would ensure the enlightened portion of them from being overruled—as is often the case at the present time—by the numerous interested and prejudiced persons who often gain admission into these administrative bodies. And, in conclusion, I must here beg to make the very obvious remark, that, however zealously and intellectually the duties of the local authorities may be performed, their plans must fall far short of producing the desired beneficial effects,
unless the general body of the inhabitants join with them in carrying out the sanitary objects. I would remind the public, that, in their own country, amongst their own nation, within a few yards of their own dwellings, there are millions of individuals in a state of both moral and physical degradation, hardly surpassed, if, indeed, equalled, by the savage nations, in whose general welfare they take such a praiseworthy interest. While we are thus distributing our charities abroad, common justice demands that we ought not to neglect those of our own nation. Nor do I see what right we have to call ourselves a civilized nation—using that word in its proper and extended signification—while so large a proportion of the population is scarcely raised above the condition of savages.

THE END.
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