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THE
LIVERPOOL
HEALTH OF TOWNS' ADVOCATE,

PUBLISHED UNDER THE SANCTION OF THE COMMITTEE OF

THE LIVERPOOL HEALTH OF TOWNS' ASSOCIATION.

PART I.

EDITED BY

JOHN SUTHERLAND, M.D.,

SENIOR PHYSICIAN TO THE LIVERPOOL DISPENSARIES.

LONDON:
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1846.

THE LIVERPOOL HEALTH OF TOWNS ADVOCATE

D. MARPLES, PRINTER, LIVERPOOL.

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The principles expounded in the following pages have more than a merely local interest, and may be beneficially applied in all towns. Arrangements have therefore been made by the Committee for the more extensive circulation of the periodical in future. In subsequent numbers the development of the subject will be continued, so as to give as complete a view as possible of the whole bearings of the sanitary condition of the people on the public welfare, and the various means whereby existing evils may be remedied and that condition improved.

LIVERPOOL,
SEPTEMBER 1st, 1846.

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THE LIVERPOOL HEALTH OF TOWNS' ADVOCATE.

PUBLISHED UNDER THE SANCTION OF

THE COMMITTEE OF THE LIVERPOOL HEALTH OF TOWNS' ASSOCIATION.

No. I.

MONDAY, SEPTEMBER 1, 1845.

PRICE 1D.

At a Public Meeting of the Inhabitants of this Borough, convened by his Worship the Mayor, in compliance with a requisition, and held in the Sessions House, Chapel-street, on Wednesday, April 23, 1845, the Mayor, JAMES LAWRENCE, Esq., in the Chair, It was resolved to form a Health of Towns' Association, for the furtherance of certain benevolent objects, embodied in a series of resolutions passed by the Meeting; and a Committee was appointed, subject to annual election, and with power to add to its numbers, to frame rules and regulations for the government of the Society, and to procure subscriptions to carry out the objects in view.

The Committee then appointed has, in the exercise of its powers, held monthly meetings, added to its numbers, formed certain sub-committees for the greater facility of carrying out its objects, and framed rules for its guidance. The following is a list of the present Members, along with the Laws which have been adopted:—

Presidents,

The MAYOR OF LIVERPOOL,	}	For the time being.
The SENIOR RECTOR,		
The SENIOR CHURCHWARDEN,		

GENERAL COMMITTEE.

Chairman.

Adam Hodgson, Esq.

Vice-Chairman.

Thomas Blackburn, Esq.

Treasurer.

Mr. James H. Macrae.

Secretaries.

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The Presidents and Senior Physicians and Surgeons of the Liverpool Infirmary, of the Fever Hospital, of the Northern Hospital, of the Southern and Toxteth Hospital, of the Dispensaries, and of the Eastern Dispensary

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Dr. Reynolds,
Dr. Sutherland,
Mr. Bulley,
Mr. H. J. Webster,
Mr. F. Archer,
Mr. H. G. Harbord,
Mr. James Mulleneux,
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Mr. John Grantham,
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Mr. Harwood Banner,

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Rev. F. Barker,
Rev. H. Carpenter,
Rev. Thos. Nolan,
Mr. J. A. Picton,
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Rev. W. Parker,
Mr. H. P. Horner,
Dr. Timmon,
Mr. Ellis Jones,
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Mr. Harwood Banner, Mr. Wm. Rathbone, Mr. W. J. Tomlinson,	Mr. John Cropper, Mr. Jas. Mulleneux,	Mr. Joshua Henshaw, Mr. Thos. Heyes.
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Publication Sub-Committee.

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Lecture Sub-Committee.

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Mr. W. Andrews, Mr. H. C. Beloe,	Mr. John Stewart, Mr. Joseph Boumphrey,	Mr. S. Holme, Mr. J. B. Yates.
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Apparatus and Diagrams Sub-Committee.

Mr. Samuel Holme, Mr. J. Grantham, Mr. H. Neill,	Dr. Inman, Mr. W. Tarbet,	Mr. Thos. Moore, Mr. A. Higginson.
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RULES.

1.—This Association shall be called and known by the name of "THE LIVERPOOL HEALTH OF TOWNS' ASSOCIATION."

2.—All persons subscribing Half-a-Guinea and upwards annually, or presenting a donation of Five Pounds and upwards, shall be members of the Association. The annual subscription shall be considered due, in advance, on the 1st of January in each year.

3.—A General Annual Meeting of the Members shall be held in the month of February in each year, to receive a Report of the proceedings of the Committee, together with a statement of the Funds of the Association; and to elect a General Committee, a Treasurer, and two Secretaries.

4.—The Committee shall consist of fifty members, with power to add to their number. At their first meeting yearly they shall elect a Chairman, Vice-chairman, and two Auditors of the Treasurer's accounts. The future meetings of the Committee shall be held on the second Wednesday in each month, to receive the reports of Sub-committees, and to transact the general business of the Association.

5.—The Committee shall have power to appoint from among its number Sub-committees, each consisting of not more than seven members (exclusive of members *ex officio*) for the investigation of particular branches of sanitary inquiry, or for such special objects as may from time to time be thought necessary or desirable; but no sum exceeding two pounds shall be expended without the previous sanction of the General Committee. The Chairman, Vice-chairman, Treasurer, and Secretaries shall be *ex officio* members of all Sub-committees.

6.—Seven members of the General Committee, and three members of a Sub-committee, shall be considered a quorum of these bodies respectively.

7.—All questions shall be determined by a majority of the members present at any meeting, and by a show of hands, unless a ballot be demanded by two or more of the members present. In case of an equality of votes, the Chairman of the meeting shall have a second or casting vote.

8.—The Chairman or Vice-chairman shall have the power at any time to call a special meeting of the Committee, and special general meetings of the Association may be called on the requisition of twenty members, addressed to the Secretaries, stating the object.

9.—All balances exceeding ten pounds shall be paid into the Bank chosen by the Committee.

ADDRESS.

WITHIN the last thirty years the wealth and resources of this country have increased in an unprecedented degree; but by a strange anomaly, the physical condition of the people has deteriorated. The fact is placed beyond all doubt, by the rate of mortality of the two periods. We learn from the most authentic sources, that thirty years ago, 1 in 50 died annually, while at present the deaths are 1 in 45. When we examine more closely, we find that in those districts where wealth has increased most rapidly, death has also increased, so that wealth and death may be said to go hand in hand. The mortality of Lancashire, thirty years ago, was 1 in 46. The amount of property in the county has increased since then 136 per cent., and now the deaths are 1 in 36. The highest rate of mortality is, however, to be found in the towns; and amongst these, Liverpool occupies the bad pre-eminence of being the most unhealthy town not only in Lancashire, but in the kingdom. Its annual rate of mortality, when the last average was taken, was 1 in 28, while in London, with a population six times as large, it was 1 in 37. These few facts are sufficient to show that there must exist causes of mortality that have hitherto been almost unsuspected; and we may form some idea of the fearful extent to which they operate from the circumstance, that in England and Wales, the deaths from epidemic diseases, the causes of which are to a great extent removable, are equivalent to the annual depopulation of the whole county of Westmoreland. Of one single disease, Mr. Chadwick states, "the annual slaughter in England and Wales from preventible causes of typhus, which attacks 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."

This dreadful mortality is only one of the many evils which arise from the present mal-arrangements in our towns and dwellings, especially such as are inhabited by the poorer classes. From the same class of causes it happens that the average health of the com-

munity is far below what it ought to be. Let any one go into our poorer districts, and he will there find masses of disease, of which our tables of mortality give no return. This is well known to members of the medical profession, who are in the daily habit of meeting with constitutions ruined beyond hope, and slow lingering diseases, with all their attendant sorrows and sufferings—a great part of which bid defiance to the healing art—while they mostly arise from local causes capable of removal.

It is a sad consideration that the actual amount of slaughter arising from such causes gives but an inadequate idea of the whole evils they produce. Poor men are compelled by circumstances to labour hard for their subsistence, while it is well known that their physical energies are often so reduced as to render them incapable of earning a fair day's wages. The stamina of our town populations is sunk far below that which belongs to the human race, and as a consequence, we have growing up around us a gradually deteriorating population, which threatens to overwhelm the land with pauperism. It is known that a regiment raised in our towns lasts a much shorter time than one raised in the country, and perhaps no better proof of the decay of physical power could be given.

The moral considerations arising out of the subject are scarcely less important. We dare not defile these pages by the recital of crimes, which are the result of temptations peculiarly the lot of the poorest and most neglected classes, and with the miserable consequences of which those alone are familiar who have paid attention to the subject. A great proportion of these can be traced to the gradual weakening and final destruction of every feeling of delicacy and virtue, flowing, as almost necessary consequences, from the construction of dwellings, in which the claims of common decency cannot be complied with. It is in vain to expect great results from our efforts at the religious instruction and education of the people, so long as there exist causes at home, the tendency of which is to undo in one hour the lessons of the preceding day.

This state of things is not necessarily a part of what is considered the common lot of humanity. It is true there always will be poverty, so long as the world lasts; but it does not follow as a consequence that the poorer classes should suffer such an amount of misery, or that they should be given up to neglect and ruin. There are certain things intended by the beneficent Creator to be enjoyed

by all; and it matters not whether we deprive the poor man of these by shutting him up in the dark and noisome cells of a prison, or by giving him no other option than to rent a dwelling, in which he will be compelled to live equally without them: the result is the same in either case, so far, at least, as he is concerned. Light, air, and water ought to be within the reach of all, without cost; and proper legislation would prevent the very existence of unwholesome dwellings. It is astonishing to find with what perseverance we have constructed our towns, in defiance of natural laws. It seems to have been taken for granted that, under any possible circumstances, human beings will grow and live equally well. But nature has vindicated herself: none of her laws can be transgressed with impunity: the poor-rate and the fever hospital are her arguments. It is in vain to shut our eyes to the facts of the case, for they are sure to return to us in another form. We may even try to convince ourselves that things are not so bad as they have been represented; but the increase of rates for the support of the widows and orphans of those who have been cut down in the prime of life by fever, (for fever generally chooses its victims at that period,) will compel us to listen to the truth. The poorer classes ought also to consider these things. A comfortable dwelling is always the cheapest in the end. If a poor man remove from a good house of £10 a-year rent, to a bad one of £5, he can never save the difference of rent, because loss of health to himself and family is certain to cost more than that difference.

These facts have been abundantly established. There is hardly a circumstance connected with this important subject which has not been minutely investigated. The evil is thoroughly known, and so are the remedies: and here, again, we learn that by one of those systems of compensation, which we meet with every where, it will actually be cheaper in the end to make the needful changes, than to leave matters as they are at present. Our space will not permit us to enter into detail, but we shall give an illustration or two in proof. It has been estimated that buildings can be erected for the poorer classes, in a certain locality in London, containing more accommodation and every desirable improvement, water-rate included, and to pay an interest of 10 per cent. on the outlay, at exactly the same rent as is now paid for the vilest and most abominable habitations in the neighbourhood. We shall take another example, from the sewerage and cleansing of towns. Although great improvements

have been made recently, these subjects are still imperfectly understood; but by the application of proper scientific principles, it has been demonstrated that, with an adequate supply of water, sewers may be laid down of a much smaller size, and consequently less expensive—that their forms may be vastly improved—and that a great part of the clumsy and expensive process of cleansing streets by carts may be dispensed with, and the cost saved.

Another illustration most forcibly exhibits the necessity of enlarged views, and disregard of minute present interests, in the building of towns:—After the great fire of London, Sir Christopher Wren submitted a plan for rebuilding the city, which was rejected for some petty reason, and the consequence has been, that the loss incurred in carriage traffic alone, in two lines of streets, Holborn and Ludgate Hill, amounts to £100,000 a-year; while, in the words of a competent witness, “The penalty of this short-sighted yielding to ignorance has been an excess of at least one-third of disease and death above what would have been the probable rate of mortality had the plan of this great man been fairly carried out.” The dictates of economy are thus shown to coincide with those of humanity.

It is with the view of awakening attention to these great questions that the “LIVERPOOL Health of Towns’ Association” has been formed, and surely a *prima facie* case has been made out sufficiently strong to recommend its labours to the support of all who take an interest in the well-being of society. It is proposed to bring the whole subject under the notice of every class of the community—to diffuse sound principles as widely as possible, by meetings, lectures, and publications; and especially to give information on all points connected with the sanitary condition of Liverpool, and the means of improving it. The work is one in which all must co-operate, high and low, rich and poor, for it is one in which all have an interest either directly or indirectly. The fact cannot now be disputed, that disease and death, with their attendant sorrows, are taking place around us to a fearful extent, not in the ordinary course of nature, but from causes which we can remove, if we have only the will to do so; while from the same causes there exists, as a consequence, an amount of moral degradation equally fearful. It is with these things we have to deal, and we know of none more worthy the attention of the philanthropist or the Christian.

FACTS PROVED BY THE HEALTH OF TOWNS' COMMISSION.

"IT IS PROVED, that the rate of sickness and mortality of the working classes, in our populous towns, is much greater than that of the same classes in country districts, and much greater than that of those classes in the same towns whose dwellings are better drained and better ventilated.

"IT IS PROVED, that the greater liability of the working classes to the most afflictive and painful disorders does not arise from deficiency of food and clothing, but from their living, usually with no alternative, in narrow streets, confined courts, damp dwellings, and close chambers, undrained, unventilated, and uncleaned.

"IT IS PROVED, that they suffer the most severely in those cases where they spend the day in crowded workshops, or where they live in cellars, or sleep in rooms on the ground floor, or in chambers that have no chimney flue or other vent for the vitiated air.

"IT IS PROVED, that in such situations the average duration of human life is at least twenty years less than it otherwise might be; and that during this curtailed period of existence the working power of those who live is seriously diminished, and much more their capacity for enjoyment, by a constant depression of health and spirits, and by the active attacks of fever, cholera, scrofula, and consumption.

"IT IS PROVED, that this excess of mortality falls most heavily, first on the infantine portion of the community, and next on the heads of families between twenty and thirty years of age.

"IT IS PROVED, that in the Metropolis alone from twenty thousand to thirty thousand lives are thus wasted in each single year, with all the attendant misery of sickness, and sorrow, and want, owing to causes which may be easily obviated or removed.

"IT IS PROVED, that the burden which is thrown by this excess of sickness and mortality on the poor's rates, to say nothing of infirmaries and dispensaries, of friendly societies, and of private almsgiving, is such as to exceed the cost of effecting those improvements, which would suffice to make the average health of the working classes nearly equal to that of the rest of the community.

"IT IS PROVED, that in the mere article of wasted manures, the refuse of a town, if duly collected and carried off, might in most cases be so applied, as to repay the whole cost of sewerage, increasing the produce of the surrounding country, instead of saturating with pernicious moisture the ground on which the dwellings of the poorer classes stand, and defiling the air they breathe with pestilential vapours.

"AND FINALLY IT IS PROVED, that besides the waste of money, health, and life incurred by the system now usually pursued in erecting the lower classes of dwellings in great towns, where comfort, cleanliness, and decency are either not thought of at all, or are sacrificed to a short-sighted greediness of gain, there is also an incalculable amount of demoralization attributable to the same causes; and that, to say the least, an effectual bar is thereby put to the intellectual, moral, and religious improvement of this large portion of the community."

REV. C. GIRDLESTONE, RECTOR OF ALDERLEY.

MEETING OF COMMITTEE.

The usual Monthly Meeting of the Committee was held in the Clarendon Rooms, on Wednesday, August 13th,—Adam Hodgson, Esq. in the Chair. The chief business before the Committee was the consideration of certain improvements in small tenements, with the view to make them less unhealthy. A variety of plans were discussed by Mr. Blackburn, Mr. Samuel Holme, Mr. J. A. Picton, Mr. J. B. Yates, and others. The Speakers admitted the difficulty of making satisfactory alterations with the present extent of drainage; and that although it was extremely desirable to do the utmost to meet present exigencies, and to allow Builders to exercise their ingenuity in carrying out the intentions of the Health Committee of the Town Council, yet the expedients proposed could only be of a temporary nature, and that an adequate system of drains for the smaller tenements could alone accomplish the objects aimed at in a satisfactory manner. On the motion of Mr. MACRAE, seconded by Mr. BLACKBURN, it was resolved to appoint a Sub-committee, to take into consideration the proposed Government Bill for the Improvement of Towns. By adopting the recommendation of the Publication Committee, it was resolved to publish a Monthly Periodical, to be entitled "The Liverpool Health of Towns' Advocate." A vote of thanks was given to Mr. Harbord for his lecture, recently delivered, with a request that he would divide it into parts, and repeat it at convenient opportunities.

DONATIONS.

	£.	s.	d.		£.	s.	d.
William Brown Esq.	10	0	0	Thomas Ripley, Esq.	5	0	0
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The late Mr. Joshua Henshaw ..	1	0	0	Rev. Thomas Raffles, D. D.	0	10	6
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THE LIVERPOOL HEALTH OF TOWNS' ADVOCATE.

PUBLISHED UNDER THE SANCTION OF

THE COMMITTEE OF THE LIVERPOOL HEALTH OF TOWNS' ASSOCIATION.

No. 2.

WEDNESDAY, OCTOBER 1, 1845.

PRICE 1D.

SANITARY CONDITION OF LIVERPOOL.

I.—MORTALITY AND DISEASE.

Liverpool was, until lately, considered to be a very healthy town. Its elevated situation, and its proximity to the River Mersey, appeared to afford all the benefits of a sufficient drainage and a fine atmosphere, while the absence of any local sources of malaria, such as exist in other less favoured districts, seemed to insure every advantage that position could bestow. The prevalent opinion as to the superior healthiness of Liverpool was, therefore, apparently well founded, and any one who dared to question its accuracy had some chance of being treated in rather an unceremonious manner. At times, however, there were deep misgivings on the subject. Facts of a very dark character forced themselves on public attention, chiefly through the instrumentality of the medical profession; but they were soon forgotten, amidst the bustle of every-day pursuits. So long ago as 1788, the physicians of the town brought the matter under the notice of the mayor and magistrates, but apparently without effect. In the year 1802, however, the corporation applied to parliament for a local improvement act, and, previous to their doing so, requested information from the medical officers of the Infirmary and Dispensaries. A long and interesting report, drawn up with great care by Dr. Currie and others, was presented to the corporation. The existing evils were clearly pointed out, and remedies for improving the sanitary state of the town suggested; and we have no hesitation in expressing our conviction, that, had the suggestions in that report been adopted, many of the evils which have afflicted the town for the last forty years would have been avoided. It is highly honourable to the municipal authorities of the time, that they did all in their power to discharge their duty. A bill was brought into parliament, containing many excellent provisions, but the parishioners took alarm at its supposed interference with the rights of property. In a matter of vital importance, the public good for long years to come was sacrificed to a comparatively insignificant present interest. The bill was opposed and defeated. Those causes of the alarming increase of fever, which it would have to a great extent removed, were allowed to continue, and the same parties who triumphed over the corporation were compelled at the same time to lay a rate of ninepence in the pound on themselves, for the express purpose of erecting

a Fever Hospital, and providing a new Cemetery for the parish poor. No clearer illustration of cause and effect could be given than this. Habitations well drained and ventilated are necessary for the health of man. A great part of the town had been built without attention to either requisite. A fundamental law of creation had thus been transgressed, and contagious disease followed as an infallible consequence. The parishioners decreed that, in spite of the contagious fever, no change should be made, because such change would interfere with property. (The question never seems to have arisen, as to whether any member of a civilised community could consistently found a right of property on what led to disease and death in that community.) The retributive law must nevertheless take its course, and, in the words of Dr. Currie, the "extraordinary increase of mortality" * * * "excited considerable attention and alarm;" and then followed the fever hospital and the grave-yard. But the compensation was not yet complete. No steps were taken to remove the source of the evil, and, since that bill was defeated, upwards of 40,000 human beings have died before their time,—an incalculable amount of misery has been entailed on the community,—the rate-payers have been taxed to an extent of which they have little idea,—and even to this hour we are suffering under the scourge of retribution, for Liverpool is now the most unhealthy town in the kingdom, and it will continue to be so, unless we learn from the past, and recognise the deep responsibility that attaches to us in regard to the future.

COMPARATIVE MORTALITY. — It is a matter of extreme importance that the whole question of mortality should be distinctly understood, and we shall, therefore, explain shortly the principles of the investigation, before applying them. The fundamental facts are, 1st, That the number of deaths, among any given number of people, varies in different localities; 2nd, That the ages at which death occurs vary considerably. Let us take an example of the first fact. In the country districts of England and Wales, 1 person in every 55 dies annually. This is called the average mortality of these districts. Now in the town districts, 1 person in 38 dies every year; and if we compare these numbers, we perceive at once that towns are much less healthy than the country. Evidence of the same circumstance is afforded by the second fact: thus, in the country, 20 people in every 100 live to be 70 years of age; while in towns only 9 in every 100 live till 70. On the same principles, the comparative mortality of towns with regard to each other is also ascertained. The following table exhibits this, in seven of our principal towns, on an average of three years, 1838, 1839, 1840.

	<i>Deaths.</i>		<i>Deaths.</i>
Metropolis	1 in 37.38	Sheffield	1 in 32.92
Birmingham	1 in 36.79	Bristol	1 in 32.38
Leeds	1 in 36.73	Manchester (Union).....	1 in 29.64
Liverpool (Parish) 1 in 28.75.			

The contrast between the deaths in Liverpool, 1 in 28 of the whole population every year, and those of London, 1 in 37, is sufficiently striking; and when we reduce the difference to figures, we find that 1800 people die annually in Liverpool, over and above the number that would die if this town were as healthy as London. Now it is well known, that there are plenty of causes of excessive mortality even in the metropolis, and we may hence form some idea of the actual sanitary condition of Liverpool.

The registration district of Ulverstone, with a population of 26,746, is the healthiest in Lancashire. From a variety of circumstances, it is perhaps impossible that Liverpool should ever be as healthy; but if we assume Ulverstone as a standard, simply for the sake of comparison, we cannot help being impressed with the awful mortality going on around us. The deaths in Ulverstone district are rather less than 1 in 56; and Dr. LYON PLAYFAIR has shewn that the mortality in Liverpool, as compared with Ulverstone, amounts to an excess of 3,611 deaths per annum. This is the number that dies here every year, not in the ordinary course of nature, but from bad ventilation, deficient drainage, and other peculiar causes, prevalent in Liverpool.

Let us next inquire, what is the average age of death here, as compared with other places. If we add up the ages at death, say of 1000 people, and then divide the sum by 1000, we obtain the average age, and we have, by the result, another indication of the relative health of different districts. In this way, the following table exhibits the results for six localities.

AVERAGE AGE AT DEATH.

	Years.	Months.		Years.
Ulverstone District	41	8	Leeds.....	21
Metropolis, <i>i. e.</i> , Kensington, Whitechapel, and Bethnal Unions	26	6	Manchester	20
			Bolton	19
			Liverpool	17 Years.

The low average of Liverpool proves that a great amount of mortality must take place amongst the young; and hence we find that out of every 100 children born in the town, 49 (in round numbers,) die under the age of 5 years; while in London 32 per cent, and in Surrey only 22 per cent, die under the same age. If again we take the opposite extreme of life, we find that double the number of persons arrive at the age of 70 in London that do so in Liverpool. A large number of deaths taking place under 5 may be thought to prove nothing against the healthiness of the town, as it may be considered that those who survive 5 years may still enjoy good health. With the view of shewing the fallacy of this opinion, we beg an attentive consideration of the following table, shewing the number of people alive at the ages of 10, 20, 30, &c., in Liverpool, London, and Surrey, beginning with a population of 100 at 5 years of age. In order to rear a population of 100 children at that age, however, 196 must be born in

Liverpool, 147 in London, and 126 in Surrey, the difference between these numbers and 100 denoting the deaths under 5 years in the three districts.

TABLE OF THE NUMBERS ALIVE AT DIFFERENT AGES,
Out of a Population of 100 arrived at the Age of 5 Years.

Ages.....	5	10	20	30	40	50	60	70	80	90
Liverpool.....	100	94	88	78	65	51	31	15	4	None.
London	100	94	89	82	74	60	44	23	7	1
Surrey	100	95	89	82	75	65	53	34	13	1

A simple inspection of this table is sufficient to shew the contrast between the localities in point of health.

It is an observed fact, that there exists a remarkable difference in the comparative mortality of *different classes* of the community in the same town, and also in different towns. This we shall afterwards prove to arise chiefly from deficient sanitary arrangements, bearing most heavily on the lower classes. The fact is strikingly exhibited by the following table :

AVERAGE AGE AT DEATH IN PROFESSIONS AND TRADES.

Towns.	<i>Gentry and</i>	<i>Tradesmen.</i>	<i>Labourers.</i>
	<i>Professional Men.</i>		
	YEARS.	YEARS.	YEARS.
Kendal.....	45	39	34
Bath.....	55	37	25
Four Metropolitan Unions.....	44	28	22
Leeds	44	27	19
Bolton	34	23	18
Manchester	38	20	17
Liverpool	35	22	15

We have here evidence of a degree of mortality such as ought to make all who see it pause, and enquire whether such things be true, and what the cause can be to which it is to be attributed. There is surely some other reason than a mere freak of nature, why one man residing in Bath should live twenty years longer than another in Liverpool. This also points distinctly to serious local causes of disease; and that these causes have been increasing in intensity during the present century, we have abundant evidence. Thus, in the period between 1784 and 1810, the average age at death of all classes in the town was 25 years, and we have seen that lately it was so low as 17; while we find, by the following table, a similar loss of life in the different classes of society.

AVERAGE AGE OF DEATHS IN LIVERPOOL AT TWO PERIODS.

Periods.	<i>Gentry.</i>	<i>Tradesmen.</i>	<i>Labourers.</i>
	YEARS.	YEARS.	YEARS.
1784-1810.....	43	23½	18¼
1840	35	22	15

There is thus abundant proof of a gradual deterioration of the public health; and there is no reason why it should not pass from bad to worse, if the causes be left as they are at present. The result of the whole is, that

we are living in by far the most unhealthy town in the kingdom; and, if the facts do not excite us to strenuous exertion for the sake of others, surely the instinct of self-preservation ought to call on us to do so for our own sakes. The calamity is a common one, from which no class of society is exempted.

COMPARATIVE MORTALITY IN DIFFERENT DISTRICTS IN LIVERPOOL.—In order to the full understanding of the whole amount of evil with which we have to contend, it is necessary to examine the mortality of different parts of the town; and this we find to be connected with the greater or less neglect of sanitary measures in these districts. Rodney-street and Abercromby Wards, which are the best ventilated, drained, and cleansed in the town, are also the most healthy, while Vauxhall Ward is the most unhealthy. The following table gives the rates in the different wards. It is extracted from the valuable report of Dr. Duncan, who states that the years from which it was prepared were unusually healthy.

TABLE OF THE ANNUAL PROPORTION OF DEATHS TO THE WHOLE POPULATION, IN THE WARDS OF LIVERPOOL.

<i>Wards.</i>	<i>Deaths.</i>
Rodney-street and Abercromby	1 in 41.62
Scotland	1 in 31.74
St. Ann's and Lime-street	1 in 31.51
St. Peter's, Pitt-street, and Great George ...	1 in 31.36
St. Paul's, Exchange, and Castle-street.....	1 in 30.67
Vauxhall	1 in 23.50

This table exhibits the annual per centage of deaths, to the whole population of the Wards, and fully proves the influence of locality on sanitary condition. The average age at death, given in the following table, shews the same fact.

TABLE OF THE AVERAGE AGE AT DEATH IN THE WARDS.

<i>Wards.</i>	<i>Average Age at Death.</i>
Rodney-street and Abercromby	22.57
Great George.....	19.59
Castle-street and St. Peter's	19.23
Pitt-street	18.81
St. Ann's and Lime-street.....	18.62
St. Paul's and Exchange	18.38
Scotland	15.34
Vauxhall.....	14.93

We might expect that the mortality would vary considerably amongst the same classes of society in different wards; and this is found to be the case. Instead of multiplying tables, it may be sufficient to take an instance by way of illustration. The average age at death of the working classes is $13\frac{1}{2}$ years in St. Martin's district, (Scotland Ward,) while in Rodney-street and Abercromby Wards it rises to 19 years, affording an additional proof of the effect of locality.

Another important element in estimating the mortality of towns, is afforded by the comparative deaths from particular diseases. We shall select three of these, which are most directly connected with deficient drainage and ventilation: fever, consumption, and convulsions in children. Melancholy experience has fully proved this connexion, so that there is no disputing the fact; and it will be found, on applying this test, that Liverpool vindicates its bad pre-eminence.

PROPORTION OF DEATHS, FROM THREE DISEASES, TO THE
WHOLE POPULATION ANNUALLY.

<i>Diseases.</i>	<i>Birmingham.</i>	<i>Leeds.</i>	<i>Metropolis.</i>	<i>Manchester.</i>	<i>Liverpool</i> <i>Parish.</i>
	DEATHS.	DEATHS.	DEATHS.	DEATHS.	DEATHS.
Fever.....	1 in 917	1 in 849	1 in 690	1 in 498	1 in 407
Consumption....	1 in 207	1 in 209	1 in 246	1 in 172	1 in 166
Convulsions.....	1 in 645	1 in 301	1 in 453	1 in 205	1 in 188

We thus find that in proportion to the population, the deaths from fever are more than double in Liverpool what they are in Birmingham; that above half as many more die from consumption in Liverpool as in London; and that more than three times as many children perish annually from convulsions in Liverpool as in Birmingham.

The table speaks for itself, and completes the evidence as to the high mortality of Liverpool. It is no argument against the accuracy of our inductions, that the local bills of mortality are lighter during certain years. Such occurrences take place all over the country, but there is a return at last to a general average, and the relative averages are tolerably constant. The case, in fact, is proved.

DISEASE.—Lamentable as the evidence is which we have laid before our readers, there are other great evils, of which there is no record in the register of deaths: we allude to the large amount of sickness prevalent in certain districts of the town, a very considerable proportion of which depends on local causes capable of removal. Dr. PLAYFAIR states, that there is an excess of no fewer than 101,000 cases a year, arising from such causes, in Liverpool alone! The very phases of disease are peculiar to the localities, and are the result of the slow operation of poisonous exhalations undermining the constitution, and placing a great many cases beyond the hope of permanent relief. The powers of life become depressed, so as to produce lingering chronic affections, which entail long and tedious suffering on the patients; and even where this does not occur, we find the strength reduced far below the healthy natural standard, so that our lower orders are much less able for active exertion, than they ought to be. The strongest looking young men are generally chosen for recruits, but of those raised in Liverpool 47 per cent are rejected as unfit for service.

The records of the Dispensaries afford a tolerably accurate criterion of the state of health of the lower orders. But it must be recollected that no case of disease is admitted in which there is the barest possibility of the patient being able to pay for attendance. The better class of work-

men and their families are wholly excluded from the charities, and are provided for by clubs, or private medical advice. The very existence of so many munificent institutions argues the presence of a large amount of sickness. We find that in 1841 the North and South Dispensaries relieved no fewer than 54,400 cases, as their share of the work; and these, as we have already said, amongst the very poorest class; while, at the same time, we know that a large number of diseases, even amongst the same class, are prescribed for by druggists, or treated by other charities.

If therefore we add the probable amount of sickness which never comes under the Dispensaries, it is not at all unlikely that we should find the annual number of cases of illness, equal to that of the population, having a claim on the charities. In the same year, 1841, 5,779 cases of fever, and 8,492 of diseases of the respiratory organs, came under the two institutions.

It is easy to read of these things; but it is not so easy, without personal experience, to realize their full meaning. We are too apt to consider such statements as mere barren statistical results. They have in them, nevertheless, an awful depth of significancy. They are the indexes of a degree of human woe, compared with which many things that move our deepest sympathies are hardly worthy of mention; and of a needless waste of human life, which, whether we consider its continual existence, its extent, or its accompanying sufferings, throws into the shade the slaughter of battle fields. When we think of the dreadful localities in which sickness has to be endured; the absence of even the most needful comforts in illness; the loss of time and wages, which are their only property, on the part of heads of families, and the consequent privation to the families themselves;—the awful mortality, especially amongst the young, from whence it arises that in some instances 64 per cent. of all who die are children under five years of age, while the average age of death of the whole class is reduced to $13\frac{1}{2}$ years;—the heart-breaking sorrow that is itself so powerful an agent in the production of disease;—when these things are considered, and when we remember that the causes of all are to a great extent under our control, it will surely require no argument on our part to form the determination, in every well-constituted mind, never to rest till such evils have come to an end.

MEETING OF THE WORKING CLASSES.

One of the largest and most enthusiastic meetings at which we ever remember to have been present was held in the Music Hall, Bold-street, on Monday evening last,—the Mayor, JAMES LAWRENCE, Esq., in the chair. The following resolutions were ably moved and seconded, and unanimously adopted by the meeting:—

1st.—*Proposed by Mr. BLACKBURN, seconded by the Rev. Mr. HAMPTON.*

“That the reports published by the authority of Parliament prove beyond all doubt that there exists an alarming amount of mortality and disease in all the large

towns, arising from local causes capable of removal; and that by far the greater proportion of these evils fall on the working classes and their families."

2nd.—*Proposed by Mr. S. HOLME, seconded by the Rev. Mr. BEVAN.*

"That many of these causes, with their attendant evils, cannot be effectually removed without the zealous co-operation of the working classes themselves."

3rd.—*Proposed by the Rev. Mr. NOLAN, seconded by the Rev. Mr. PARKER.*

"That, in the opinion of this meeting, it is of essential importance that the working classes should make themselves acquainted with subjects connected with the public health: and that, for the attainment of this object, it is highly desirable that they form themselves into a local association, in order to give every assistance in their power in forwarding the sanitary improvement of the town."

Dr. SUTHERLAND gave a short detail of what had been done by the working classes in other towns, especially in London, and suggested that the example of London should be followed, and a requisition sent to JAMES SIMPSON, Esq., of Edinburgh, to come and address the working classes here before anything further were done. A working man present then moved a form of requisition, which was adopted and signed on the spot. The thanks of the meeting were given to his Worship the Mayor, on the motion of ADAM HODGSON, Esq., seconded by JOHN A. TINNE, Esq.

The requisition lies for signature at the Newspaper Offices; and we hope that every working man who can write will append his name to it. Our article on the Mortality of Liverpool affords the best reason we can give for zealous exertion on the part of the working classes.

THE MONTHLY MEETING OF COMMITTEE was held in the Town Hall on Wednesday, September 10th, Adam Hodgson, Esq. in the Chair. The proceedings of the Sub-Committees were read and confirmed. Letters were read from James Simpson, Esq., Edinburgh, and Joseph Toynbee, Esq., London, on the subject of Associations of the Working Classes. After some discussion, it was moved by Dr. Sutherland, seconded by Mr. S. Holme, and resolved, "That it is desirable to form an Association of the Working Classes in connexion with this Society, for the promotion of its objects, and that a Sub-Committee be now appointed to make necessary arrangements for the formation of such an institution."

WATER.—We shall have a great deal to say on this most important subject by-and-by; and in the mean time, to show that the Association has not overlooked it, we publish the following resolutions, unanimously adopted at the meeting in the Town Hall, on the 11th June ult.

Resolved unanimously,—That in the opinion of this Committee, no efficient system for improving the habits of cleanliness amongst the poor can be carried into effect without an ample supply of water.

That it is highly desirable that some method should be devised of supplying the inhabitants of this and every other town with water without any expense, except what is necessary for pro-

curing and distributing the needful supply.

That a copy of the preceding resolutions be transmitted to the Town Council, the Highway Board, the Select Vestry, and the two Water Companies, with a request that they will take the said resolutions into their serious and early consideration.

MODELS AND DIAGRAMS OF SANITARY APPARATUS AND IMPROVEMENTS will be open for public exhibition, in a few days, in the Rooms of the Association, Fenwick Chambers, Fenwick-street. The attention of builders, and others desirous of adopting the most recent improvements, is particularly requested.

ADDITIONAL DONATIONS AND SUBSCRIPTIONS.

DONATIONS.

James Long, Esq.	£5 0 0
John Priestley, Esq.	1 0 0

SUBSCRIPTIONS.

William H. Lyon, Esq.	0 10 6
Dr. Timmon	0 10 6
Ellis Jones, Esq.	0 10 6

Donations or Subscriptions will be received by Mr. James H. Macrae, Treasurer, or by Messrs. Harwood Banner, William Rathbone, W. J. Tomlinson, John Cropper, James Mullenoux, and Thomas Heyes, Members of the Finance Committee.

All communications for the LIVERPOOL HEALTH OF TOWNS' ASSOCIATION to be addressed to the Committee Rooms, Fenwick Chambers, Fenwick-street.

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No. 3.

SATURDAY, NOVEMBER 1, 1845.

PRICE 1D.

SANITARY CONDITION OF LIVERPOOL.

II.—PHYSICAL CAUSES OF MORTALITY AND DISEASE.

IN our last number, we laid before our readers an amount of evidence as to the extent of mortality and disease prevalent in Liverpool sufficient to arrest the attention of every one interested in the welfare of the town; and we now proceed to explain those causes from which such a state of things has arisen.

An apparent unwillingness to recognise the whole extent of the evil has led some persons to entertain opinions on this subject that will not bear a moment's investigation, and we have deemed it necessary simply to allude to these opinions, and to give the refutation of one of them, because we have very recently heard it urged by parties whose judgment and humanity are worthy of respect. It has been said that one very obvious reason of the high mortality of Liverpool is the great number of emigrants always passing through it. Many of them arrive in a state of comparative destitution, and are peculiarly liable to disease, and hence their deaths go to swell the account against the town. The grounds of this opinion have been most minutely investigated by Dr. Playfair in his report, and we shall simply quote one or two of his conclusions, which are sufficient to set the question at rest. They are as follow:—"The migratory population of Liverpool is a much more healthy class than the residents of that town. * * That the proportion of the population to deaths is elevated by migrants, and that Liverpool is thus rendered apparently more healthy than it really is." We must, therefore, look for causes of mortality elsewhere, and, unfortunately, we shall find abundance of them.

Like all living beings, man requires certain essential things, without which he is incapable of existing in a state of health. These are food, clothing, drink, pure air, heat, light;—his habitation must be dry, and its position such as not to expose him to unhealthy exhalations. In estimating the causes of mortality and disease in any place

every one of these circumstances must be taken into account, although some of them have a much greater effect than others; and all experience goes to prove that a very large part of the excess of disease and death which afflicts certain localities arises from,

First, Deficient ventilation, and consequent poisoning of the springs of life;

Second, Over crowding of the population;

Third, The presence of noxious vapours and gases arising from neglect of cleansing;

Fourth, Want of drainage.

We shall direct the attention of our readers to each of these in detail, as it is proved to exist in Liverpool.

1st. DEFICIENT VENTILATION.—It is absolutely essential to the ventilation of a town that its streets should be wide and straight; that they should be frequently intersected by others equally spacious; and that large open spaces should exist as numerous as possible. No town in which these requisites are wanting can ever be healthy: and for very obvious reasons. Wherever a number of human beings are congregated together, a certain quantity of deleterious gas is produced, which is greatly increased by want of proper cleansing and draining. Now it is necessary to dilute this gas as largely as possible with fresh air, so as to render it innocent; which can only be effected in towns by the means we have mentioned;—there is, in fact, no other way. Narrow streets are always filled with impure air, and, as the houses receive their supply from the streets, it is easy to perceive how the health of the inhabitants must suffer. Dr. Duncan describes the streets in Liverpool inhabited by the working classes as “on an average perhaps of about 8 yards in width; they seldom exceed 10, and sometimes are not more than 5 yards across. Each house is usually occupied by two or more families, exclusive of the cellar; and most of the densely peopled lodging-houses are situated in the streets. As a general rule, the houses have no thorough draught, from being frequently built up against the courts behind.” If fresh air be indeed an element necessary to health, we have, at all events, no provision made in these streets for ensuring a supply. But this is the least obstacle we have to deal with.

Effect of Courts.—Wherever courts exist, they are a most serious evil, because they ensure conditions directly the reverse of those

necessary to health. No modification of them is admissible unless they were built of proper dimensions and perfectly open; in fact, they ought to be *short streets*. But as they at present exist, closed up often at both ends, undrained, uncleaned, and containing filthy ash pits, sending out putrid exhalations, they are the most perfect contrivances for the production of disease that it is possible to conceive. Let us take Dr. Duncan's very correct description of them. "The population of the parish of Liverpool, by the census of 1841, amounted to 223,054, of whom about 160,000 may be estimated to belong to the working classes: and of these it is well known that a large proportion inhabit courts and cellars, and the remainder live in houses or rooms to the front of the street. * * The COURTS consist usually of two rows of houses placed opposite to each other, with an intervening space of from 9 to 15 feet, and having two to six or eight houses in each row. The court communicates with the street by a passage or archway about 3 feet wide,—in the older courts built up over head, and the further end being also in many instances closed by a high wall, or by the back or side of an adjoining building; the court forms in fact a *cul de sac*, with a narrow opening. Such an arrangement almost bids defiance to the entrance of air, and renders its free circulation through a court a matter of impossibility. * * * The houses themselves are three stories high, containing three rooms of about 10 or 11 feet square; and being built back to back with the houses of the adjoining courts, there is of course no thorough draught. An enumeration of the court and cellar population of the borough was made two years ago, under the authority of the Town Council, when it appeared that there were in the parish of Liverpool 1,982 courts, containing 10,692 houses, and 55,534 inhabitants. That is to say, more than one-fourth of the whole parochial population, or more than one-third of the working classes, were resident in courts. With regard to the character of these courts, it appears from the report of the Corporation Surveyors, that 629, or nearly one-third, were *closed at both ends*; 875, or less than one-half, were open at one end, and only 478, or less than one-fourth, open at both ends." Here, then, we have a state of things described, which both common sense and experience at once recognise as a most efficient cause of disease. Dr. Currie long ago called the building of such places "a pernicious practice," and states that in his day typhus was "constantly present" in them.

Mr. Grainger has instituted a comparison between the courts in Liverpool and those in Birmingham, with the view of shewing their effect on the sanitary condition of both towns. He states that in Birmingham there are 2,030 courts, the average size of which is 35 yards long by 20 yards wide, giving an area of 700 square yards to each, "so that these courts are so many small squares scattered over the town." In Liverpool, however, the average size of our courts is only 15 yards by 4, giving an area of only 60 square yards, so that the open breathing space considered necessary by the builders in Birmingham is nearly *twelve times* as great as that which has hitherto been allowed in the courts of Liverpool! Mr. Grainger says, "It is, I think, impossible to disconnect, as influential causes, in the one case the freer current and supply of air in Birmingham, with its sanitary state, which, for a great town has become proverbial among statistical enquirers, and in the other instance the narrow and cramped dimensions of the courts in Liverpool, with that high ratio of mortality by which it has unhappily gained so unenviable a state of notoriety."

Where there are several causes of disease and death acting together, it is not easy to apportion the precise share due to each; but a careful examination of the facts will afford a tolerably accurate idea of this. There is one disease, fever, which may be taken as a test, and the following table, extracted from one given by Dr. Duncan, will shew the connexion between the amount of population living in badly ventilated localities, and the amount of fever and mortality.

The column of fever cases only exhibits those who were attended at their own houses by the Dispensaries.

WARDS.	Proportion of whole Ward Population Living in Courts and Cellars.	Annual Proportion of Fever Cases in the whole Ward Population.	Annual Deaths in the Ward Population from all Causes.
Vauxhall	58.20 per cent.	1 in 27.44	1 in 23.50
St. Paul's, Exchange, & Castle-st.	36.07 "	1 in 37.66	1 in 30.67
St. Peter's, Pitt-st. & Gt. George..	27.10 "	1 in 56.51	1 in 31.36
St. Ann's and Lime-street.....	34.05 "	1 in 109.30	1 in 31.51
Scotland	40.60 "	1 in 77.02	1 in 31.74
Rodney-street and Abercromby...	22.36 "	1 in 237.18	1 in 41.62

There is one element which this table does not exhibit, namely, the *condition* of the courts and cellars, which varies considerably. Some are much better than others; and hence it is even possible to have a more healthy population living in a larger number of courts in one ward (provided the courts be more spacious and better drained) than in another, where the courts are less numerous, but in a worse

condition. Taking these circumstances into account, a simple inspection of the table will shew the connexion already alluded to; and the apparent exception of Scotland Ward is explained by the fact shewn in the following table, that a larger proportion of the courts in that ward are open and better ventilated. The table also exhibits the connexion between *different degrees* of ventilation and the number of fever cases:

WARDS.	Per Centage of Inhabited Courts. OPEN.	Per Centage of Inhabited Courts. CLOSED.	Proportion of Fever Cases to Inhabitants of Courts.
Vauxhall and St. Paul's.....	25.77 $\frac{1}{2}$ cent.	33.39 $\frac{1}{2}$ cent.	1 in 25.69
Exchange and Castle-street.....	2.15 "	63.66 "	1 in 21.42
St. Peter's, Pitt-st., & Gt. George.	17.29 "	28.94 "	1 in 28.08
St. Ann's and Lime-street.....	30.38 "	36.28 "	1 in 98.64
Scotland.....	15.24 "	15.24 "	1 in 57.92
Rodney-street and Abercromby.	23.88 "	3.88 "	1 in 108.64

The open courts are those in which the ventilation is better; the closed courts are of course the most unhealthy. This table, for reasons already stated, shews a discrepancy; but there is no mistaking the fact, that in Exchange Ward, with only 2 per cent. of open courts, and 63 per cent. closed, there is one case of fever to every 21 inhabitants of those courts; while in Rodney-street and Abercromby Wards, with 23 per cent. of open courts, and only 3 per cent. closed, there is only one case to every 108. The evidence as to cause is here as perfect as we could reasonably expect to find it. A similar result was obtained by Mr. Holland, at Chorlton. He examined the mortality in eighteen tolerably open streets, and in eighteen others exactly like them, except that they were built up at the end, or the ventilation obstructed in some other way, and found that the open streets, with a population of 2500, gave a mortality in five years of 424 deaths, or 3.4 per cent. per annum, while, in the same period, the deaths in the closed streets, out of a population of 1800, amounted to 387, or 4.3 per cent. annually. A considerable proportion of this striking difference is the result of difference of ventilation, and confirms what we have already advanced as to the unavoidable unhealthiness of courts, arising from want of fresh air.

Effect of Cellars.—Birmingham, as we have already seen, is one of the most healthy towns in the kingdom; and the committee of medical men appointed to enquire into its sanitary state could not discover that a single cellar was used as a dwelling. Here, then, are two facts, the intimate connexion of which is obvious. Let us take other two, by way of contrast. We have proved that *Liverpool is the*

most unhealthy town in the kingdom; and the Corporation survey has shewn that there are *no fewer than 6915 inhabited cellars in the parish*. Now if these two classes of facts be compared together, there cannot be a doubt of the influence of cellars on the amount of disease and mortality in the town.

Let us next quote Dr. Duncan's description of these horrible dwellings. "The cellars are 10 or 12 feet square, generally flagged, but frequently having only the bare earth for a floor, and sometimes less than six feet high. There is frequently no window, so that the light and air can gain access to the cellar only by the door, the top of which is often not higher than the level of the street. In such cellars ventilation is out of the question. They are of course dark; from the defective drainage, they are also very generally damp. There is sometimes a back cellar used as a sleeping apartment, having no direct communication with the external atmosphere, and deriving its scanty supply of light and air solely from the first apartment." "The enumeration already alluded to shewed that there were, in the twelve wards forming the parish of Liverpool, 6,294 inhabited cellars, containing 20,168* inhabitants, exclusive of the inhabited cellars in courts (of which there were 621, containing probably 2,000 inhabitants). * * * Of the entire number of cellars, 1,617 have the back apartment I have mentioned, while of 5,297, whose measurements are given, 1,771, or one-third, are five or six feet deep; 2,324 are from four to five feet, and 1,202 from three to four feet below the level of the street; 5,273, or more than five-sixths, have no windows to the front; and 2,429, or about 44 per cent., are reported as being either damp or wet."

Simple as this description is, we have met with few so full of meaning. It is in these dens of wretchedness that we see disease and death in their most repulsive aspects. If the whole history of one of them for the last forty-three years (the period when the parishioners decreed that they should not be interfered with,) were disclosed to view, what a rebuke would it be to ignorance, want of consideration, and distorted views of the rights of property! Where there is so much evidence, it is difficult to choose what is most striking. The following table, however, extracted from one drawn up by Dr. Playfair, will shew clearly the effect of cellar residence on children, whose delicate and excitable constitutions make them peculiarly liable to such influences.

* The cellar population of the Borough, as computed by Dr. Playfair, is 39,460.

TABLE, EXHIBITING THE COMPARATIVE EFFECTS OF HOUSE AND CELLAR RESIDENCES ON CHILDREN ATTENDING MOORFIELDS' AND ST. MATTHIAS' SCHOOLS, LIVERPOOL.

	MOORFIELDS' SCHOOLS.		ST. MATTHIAS' SCHOOLS.	
	<i>Per centage of Children living in HOUSES, always absent through sickness.</i>	<i>Per centage of Children living in CELLARS, always absent through sickness.</i>	<i>Per centage of Children living in HOUSES, always absent through sickness.</i>	<i>Per centage of Children living in CELLARS, always absent through sickness.</i>
Boys...	3 per cent.	19 per cent.	4.2 per cent.	10 per cent.
Girls...	2.2 "	16 "	5.9 "	15.3 "
Infants	6 "	70 "	2.3 "	24.5 "

The evidence obtained in Manchester was equally conclusive. It was found, on enquiry, that in one school the proportions of children living in different localities who were always absent through sickness were as follow:—*Streets*, 11 per cent.; *Courts*, 16 per cent.; *Cellars*, 69 per cent.; and in another school the proportions were—*Streets*, 19 per cent.; *Courts*, 72 per cent.; *Cellars*, 33 per cent., the cellars being in the last case apparently of a better description.

If we apply the test of fever to these localities, we find that, according to Dr. Duncan, the inhabitants of cellars yield 35 per cent. more of fever cases than the average of the other working population.

We have, as shortly as possible, given our evidence as to deficient ventilation being one cause of the high mortality of Liverpool, and the proof is sufficiently conclusive. We must, at the same time, say that it is difficult to write with calmness on such subjects. Our sole desire is that the facts now related may be carefully weighed by our readers, and that they may join us in a solemn protest against the continuance of such evils. We have a natural tendency to sympathise with distress at a distance; but it would be well to pause and enquire whether we have not closer, though, perhaps, less agreeable duties to perform at home. The labours of a Howard have rendered his name synonymous with all that is benevolent; but Mr. Chadwick has told us, that there are in the towns of England "great numbers of courts in which the condition of every inhabited room, and the physical condition of the inmates, is even more horrible than the worst of the dungeons that Howard ever visited." The wretched hut of the slave has been associated in our minds with every form of privation; and we have been told that the cabin of the Irish peasant is the most miserable habitation of man; but the Marquis of Normanby, who has had ample opportunities of becoming acquainted with both, has declared that "he would rather pass his life in any one of the first, or in most of the last, than he would

inhabit one of those dens or cellars too often used as dwellings by the industrious poor of this country—those upon whom the prosperity and quietness of this country so greatly depends." Man never was created to live under the ground, like the lower animals; and even if he could do so without loss of health and life, surely human nature ought to recoil against entailing such an indignity upon him. We ought to do the utmost in our power to put an end to such evils, by abolishing cellars for ever as places of residence. Courts ought to be opened up, so as to ensure ventilation; and wide streets run through our densely peopled neighbourhoods.

The first address from the Committee of the Metropolitan Working Classes' Association has just appeared. It states very clearly what working men may do in improving the sanitary condition of their dwellings, and we hope to see it extensively circulated.

MEETING OF COMMITTEE.—The last Meeting was held in the Town Hall, on Wednesday, October 8th; Adam Hodgson, Esq. in the Chair. After the confirmation of the Minutes of the Sub-Committees, two letters were read on the subject of the Smoke Nuisance; and after discussion, it was resolved, on the motion of Mr. W. Barry, seconded by Mr. R. V. Yates,—“That a Sub-Committee be appointed to take the whole subject into consideration, and to report to the General Committee.”

SALT WATER BATHS.—On this subject the following important resolution was proposed by Mr. Harwood Banner, seconded by Mr. Blackburn, and resolved,—“That formerly the health of the town and the comfort and enjoyment of the inhabitants were essentially promoted by the facility of bathing on the shores of the River Mersey, of which the people are now deprived by the extension of the docks; and that it is most important and desirable to restore the benefit of sea-bathing as much as practicable to the middle and lower classes, by providing salt water baths for their accommodation.”

The following Gentlemen were added to the Committee:—the Rev. D. D. Stewart, Mr. M. J. Whitty, and Mr. W. Gill.

MODELS AND DIAGRAMS OF SANITARY APPARATUS AND IMPROVEMENTS are open daily for public exhibition, between the hours of twelve and three P. M., in the Rooms of the Association, Fenwick Chambers, Fenwick-street. The

attention of builders, and others desirous of adopting the most recent improvements, is particularly requested. The Committee will be glad to receive any Plans or Models for Exhibition.

DONATIONS.

John Fletcher, Esq.....	£5 0 0
William Bennett, Esq.....	2 2 0
Thomas Bolton, Esq.	2 0 0
Roger Waterhouse, Esq.....	1 1 0
John Leyland, Esq.....	1 1 0
N. D. Bold, Esq.	1 0 0

SUBSCRIPTIONS.

George Crosfield and Co.	2 0 0
William Bennett, Esq.....	1 1 0
Samuel Blackburn and Co.	1 1 0
Sir Howard Douglas, Knt.	1 1 0
James Stitt, Esq.	1 1 0
Joseph King, Esq.	1 1 0
Joseph Boumphrey, Esq.	1 0 0
Alfred Higginson, Esq.	0 10 6
John Bigland, Esq.	0 10 6
C. G. Cowie, Esq.....	0 10 6

Donations or Subscriptions will be received by Mr. James H. Macrae, Treasurer, or by Messrs. Harwood Banner, William Rathbone, W. J. Tomlinson, John Cropper, James Mulleux, and Thomas Heyes, Members of the Finance Committee.

All communications for the LIVERPOOL HEALTH OF TOWNS' ASSOCIATION, to be addressed to the Committee Rooms, Fenwick Chambers, Fenwick-street.

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THE COMMITTEE OF THE LIVERPOOL HEALTH OF TOWNS' ASSOCIATION.

No. 4.

MONDAY, DECEMBER 1, 1845.

PRICE 1D.

SANITARY CONDITION OF LIVERPOOL.

II.—PHYSICAL CAUSES OF MORTALITY AND DISEASE.

2nd Cause.—OVERCROWDING OF THE POPULATION.—An overcrowded population is a fertile cause of disease and death. Human beings, by breathing often the same atmosphere, render it incapable of supporting life; and wherever they congregate together, those effluvia which always proceed from organized bodies become more and more concentrated, and consequently more active as agents in the production of disease. This is an effect altogether independent of locality. But if a crowded population be placed in those miserable courts and cellars we described in our last number, it is easy to perceive that the two causes, overcrowding and deficient ventilation, may become conjoined in their action, so as to produce great sickness and mortality.

A dense population may originate in two ways. It may arise from too great a number of houses being built on a given space, or from too many people being crowded into each house. The most ordinary case, however, depends upon both causes acting together. There is a strange, though not unnatural, faculty of accommodation to circumstances amongst the poorest and most neglected classes of society, by virtue of which they become contented with such habitations as a better state of feeling would make them shrink from with disgust. Moral degradation follows as a consequence, and hence it is the result of all experience, that *if dwellings be ever so bad, a class of people will still be found to live in them.* In addition to this, if a town be badly built, and crowded with miserable habitations, such as we see everywhere in Liverpool, the poor will not only inhabit them, but they will also overcrowd the houses, and thus increase the original evil. Nothing could shew more clearly the necessity of placing the whole internal structure and economy of towns under stringent laws, so as to protect the health, lives, and moral well-being of our working population. There is space enough upon the earth for the whole human race to live on; and a first duty of legislation ought to be *to prohibit absolutely* all attempts at crowding buildings together, while provision ought to be made for undoing the enormous evils which at present exist, at the very earliest possible period. This is one of the questions to which, for reasons given above, the principle of supply and

demand is wholly inapplicable; while the safety of society requires that sweeping changes should be made, as it is well known that the most dangerous characters thrive most abundantly in crowded localities.

The effluvia with which the air in dense neighbourhoods is always loaded are, beyond all doubt, poisonous in their action on the animal economy; and when in a very concentrated form, death ensues almost immediately to those within the sphere of their operation. In the year 1756, when Calcutta was surrendered to the natives, 146 British subjects were thrust into a chamber 18 feet by 14, having only two apertures through which air could be admitted. They were shut up at eight o'clock at night, and we are told that the bad effects were felt in a few minutes. Before eleven o'clock one third of the whole were dead, and at six o'clock next morning only 23 came out alive, most of whom were in a high state of putrid fever, and died subsequently. A similar instance happened in London, in 1742, when 20 persons were shut up for the night in a part of St. Martin's roundhouse, and several died. Formerly, in our jails, and on board ship, where the crowding, though great, was not to the same extent as in the cases given above, the resulting effluvia gave rise to putrid fevers, which used to be very fatal in their results. Precisely the same effects are now observed both in overcrowded towns and dwellings, the only difference being, that these effects are less intense, because the causes are less active. Disease and death increase with the density of the population, for the Registrar General states, as the result of his observations in London, that "it is proved beyond doubt, that if the population be the same in other respects, an increase of density implies an increase of mortality." And he has further shown, that these two occurrences have a constant relation to each other. Let us now take the case of Liverpool.

The average number of inhabitants to the square mile in England and Wales is 275: but in 21 of our principal towns there are as many as 5045 inhabitants to the square mile. Dr. Duncan has given the following table, exhibiting the greatest densities:—

TOWNS.	INHABITANTS TO THE SQUARE MILE.	
	Of the total area.	Of the built area.
Leeds	20,892	87,256
Metropolis.....	27,423	50,000 ?
Birmingham.....	33,669	40,000 ?
Manchester (township).	83,224	100,000 ?
Liverpool (parish)	100,899	138,224

If we take the whole area of London, built and unbuilt, and compare it with the same area of Liverpool, we shall find that the population is nearly four times as dense in Liverpool as it is in London. In the houses alone, area for area, Liverpool is above two-and-half times more densely populated. As all the evils that afflict the town are more severely felt in some localities than in others, we find that this holds good also in the present

instance. Dr. Duncan mentions a district in Exchange ward, containing about 12,000 inhabitants on a surface of 105,000 square yards, which is in the ratio of 460,000 to the square mile. That part of the district bounded by Addison-street and Great Crosshall-street contained, in 1841, 811 houses and 7938 inhabitants, on an area of about 49,000 square yards, which gives a density of 657,963 to the geographical square mile! It requires some effort to grasp such an idea, and we shall illustrate it by reference to London. In the same year London contained 1,900,000 inhabitants, and every square mile of building accommodated about 50,000 people. Now, by the last census, Great Britain and Ireland contained $26\frac{1}{2}$ millions; and if we could suppose 25 millions of these crowded into the present houses of London, we should have some conception of the condition of the people in that district of Liverpool. This, however, is not the worst. One instance is given by Dr. Duncan, out of a number of others, of a court in Crosbie-street, containing 118 inhabitants, on an area of 150 square yards. The usual average is nearly seven inmates to each house, while in this court it is fifteen to each; and there are entire streets where the average is nearly as high.

The crowding inside the lower class of houses, especially at night, is almost incredible. We have known twenty people occupying one cellar, so low in the roof, that a man of ordinary stature could hardly stand erect in it. The prison inspectors recommend that not less than 1000 cubic feet of space should be provided for each prisoner, "*as being essential to health and ventilation*;" and yet it frequently happens, that thirty human beings will voluntarily lay themselves down to sleep on the floor of a wretched apartment containing only 2100 cubic feet of air, being little more than *one-fifteenth part* of that allotted in our jails.

Let us now see the result of this fearful cause of disease. We shall again select fever, and, for the purpose of proving its connexion with density of population, we subjoin the following tables, from Dr. Duncan's "Report of the Sanitary State of the Residences of the Labouring Classes."

STREETS.	Sq yards to each inhabitant.	Proportion of Fever to inhabitants annually.	COURTS.	Sq yards to each inhabitant.	Proportion of Fever to inhabitants annually.
Lace-street	4	1 in 8	Coop-court	1	1 in $2\frac{1}{2}$
Oriel-street	6	1 in $9\frac{1}{2}$	Spencer-court	2	1 in $3\frac{1}{2}$
North-street	7	1 in $5\frac{3}{4}$	Newton-court	2	1 in 4
Crosbie-street	7	1 in 12	Barker-court	$4\frac{1}{2}$	1 in 10
Johnson-street	$7\frac{3}{4}$	1 in $11\frac{1}{4}$	Fleming-court	6	none.
Banastre-street	8	1 in $12\frac{1}{2}$	Rycroft-court	$1\frac{3}{4}$	1 in $5\frac{1}{2}$
Addison-street	$8\frac{1}{2}$	1 in $16\frac{1}{2}$	Cumming-court	$2\frac{1}{4}$	1 in $7\frac{1}{2}$
Primrose-hill	$14\frac{3}{4}$	1 in $26\frac{1}{2}$	Friends'-court	$4\frac{3}{4}$	1 in 8

There is here ample proof of the folly of attempting to evade the operation of a great vital law — *man must have a certain cubic amount of*

space to live in; and if he choose to transgress this law, he must pay the penalty. Compare Coop-court, with its one square yard to each inhabitant, and nearly half of its residents laid up with fever in the course of the year, and Barker-court, with its four square yards to each, and the fever cases reduced to one in ten. In the same way, compare Lace-street with Primrose-hill. The evidence is incontrovertible. It is found that other diseases besides fever follow a similar law of increase in proportion to the density of the population, and that mortality increases in a corresponding ratio. The following table, reduced by Dr. Forbes from the data of Dr. Duncan, shews this, with regard to Consumption and Fever.

TOWNS.	Ratio of density of population.	DEATHS IN THE WHOLE POPULATION ANNUALLY.	
		From Consumption.	From Fever.
Birmingham	40	1 in 207	1 in 917
Leeds (borough) . . .	87	1 in 209	1 in 849
Metropolis	50	1 in 246	1 in 690
Manchester	100	1 in 172	1 in 498
Liverpool (parish) . .	138	1 in 166	1 in 407

We thus learn, that the same space of ground which in Birmingham contains houses for 40 people is made to serve for house-room for no fewer than 138 in Liverpool! The poor people, however, *must suffer*: there is no escape from the consequences: and hence we find that the deaths from fever are more than double in Liverpool what they are in Birmingham; and that, although in the latter town there are particular trades carried on which predispose the workmen to consumption, a considerably larger proportion perish in Liverpool from that disease. The table fully bears out the statement of the Registrar General given above, and shews the dreadful results which follow from crowding the greatest number of houses together into the smallest possible space.

We have, in the present and preceding number, given only the bare outlines of evils which would require a volume for their full elucidation; but sufficient has been said to shew the vital importance of the subject to the prosperity and welfare of the country. Physical causes have a much closer connexion with moral degradation than is generally imagined, and our only surprise is, that so much patient endurance is to be found in the midst of so great an amount of neglected misery. The deadening of the thinking faculty itself can alone account for this occurrence. It would not be difficult to prove that such is the case, as the following most melancholy illustration, taken from the evidence of Dr. Southwood Smith, will shew. We have selected it, because it illustrates scenes of *every day occurrence* in Liverpool. Reader, such things are taking place *now*, in the immediate vicinity of our splendid Exchange, our docks, and our warehouses! "In the Poor-Law Comissioners' Report on the sanitary 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 whom 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 shews 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 question which naturally follows is, whether we are prepared to submit to the continuance of a state of things capable of producing such frightful results? Surely the Christian philanthropy of England is not so dead as to contemplate such a possibility. The truth must be spoken boldly on so momentous a subject; and well might Dr. Guy declare, at a recent meeting in Crosby Hall, London, while instancing the case of Liverpool and other towns, “I have heard it said that this is a civilized nation. * * I would not cavil about mere words, if the use of them led to no bad result: but words, if not representatives of things, are mere dust to throw in people’s eyes. It may seem very innocent and very harmless, to amuse an after-dinner audience, or an election mob, or, on rare occasions, the representatives of the people in parliament assembled, by boasting of our civilization; but it is positively mischievous, when the word, by the indefinite ideas it excites, puffs us up with national conceit when we should be overwhelmed with patriotic shame. It is gross flattery to talk of civilization with such scenes before our eyes.”

The overcrowding of houses is, perhaps, the most difficult part of the whole subject to deal with, because we cannot prevent people herding together if they choose to do so. Our duty, however, is to enlighten them on the consequences which must infallibly follow such proceedings; while we ought, at the same time, to be only the more zealous in pursuing those sanitary measures within our power. We *can* lend our influence to have the town weeded of its worst class of tenements, so as to spread the population over an adequate surface; while, by doing so, we should ensure a better ventilation, and thus diminish as far as possible the effects of this master evil.

THE SMOKE NUISANCE.

The Smoke Nuisance is, perhaps, one of the most gratuitous injuries inflicted on the public: for, in the first place, it is altogether unnecessary; and, secondly, it costs the perpetrators of it a good round sum every year to keep it going. Any one who has enjoyed the cloudless skies of continental cities is at once struck with this one pre-eminently disagreeable feature of our English atmosphere. And how can it be otherwise, when nearly one-third of all the coal thrown on our fires is evaporated into the air unconsumed? It matters not whether we are on land or sea, for the perpetual grievance is sure to follow us. Even the once pure breezes of the Mersey are at times more like the black sulphureous exhalations of a furnace than aught else. The Health of Towns' Association has had its attention called to the subject by various urgent communications, and we have much pleasure in making public the following report, which we trust will have its due influence with the offenders. It is now proved, beyond all question, that the nuisance can be abated, and a clear saving effected; and we would therefore urge upon the parties the necessity of proceeding at once to follow the course recommended. They have now an opportunity of doing so with a good grace, and if they let it slip, an act of Parliament will in all probability, before the end of next session, add the stimulus of compulsion.

The loss to the public, from *excess* of washing, &c., which a smoky atmosphere renders necessary, is more than at first sight might appear. Dr. Lyon Playfair has shewn, that in this one item Manchester has been expending £60,000 a year, and that, if the expense of additional painting and whitewashing be added, the actual money loss would be *double the amount of the poor rates* every year. The Rev. Mr. Clay states, that in Preston only two furnaces consume their smoke, and even that imperfectly; but were all the factories in town to do as much, the public would save £10,450 a year in extra washing.

In proof of the increase of heat gained by burning the smoke, we may cite the experiments of Mr. Henry Holdsworth, of Manchester, who has shewn, that in the front flue of a furnace, of common construction, the thermometer seldom rose above 1100 deg. Fahr., and often fell below 900 deg., the mean being 975 deg., while in the same furnace, when consuming its smoke, the mean temperature was 1160 deg. Fahr., ranging between 1400 deg. and 1000 deg. The quantity of water evaporated by a pound of coal was *one-half greater* than when the smoke was not consumed.

REPORT.

The Sub-Committee appointed by the resolution of the last General Committee to enquire into the subject of the Smoke Nuisance has to report,—That the production of smoke by various works scattered over the town, and also by the river steamers, is at present a cause of well-

grounded complaint on the part of the public. The large volumes of unconsumed carbonaceous vapours which are constantly being thrown into the air from these sources, in addition to the personal annoyance which they occasion, have a tendency to interfere seriously with the proper ventilation of the town, by polluting the atmosphere, while they increase the difficulties in the way of cleanliness of persons and houses, already sufficiently great from other causes, especially among the poorer classes of society. There can be but one opinion, therefore, not only as to the desirableness, but the absolute necessity, of putting an end to this cause of nuisance as soon as possible; and the members of the Sub-Committee have made individual enquiries, the result of which they now proceed to detail, as to the extent to which the object can be accomplished.

The perfect combustion of coal in a furnace fire requires that the gases generated during the process of burning should be brought in contact with an adequate supply of fresh air, so as to furnish oxygen for the conversion of the whole of the carbon into carbonic acid gas, which is invisible. If, from any cause, the supply of air be inadequate to effect this object, the carbon is deposited in the form of smoke, and every atom thrown in this state into the atmosphere is not only a source of nuisance to the public, but is also the cause of direct pecuniary loss to the proprietor of the furnace. Smoke is, in fact, just so much useful fuel evaporated into the atmosphere and lost. Before these facts were fully understood, many unsuccessful attempts were made to effect the consumption of smoke; but by the application of correct scientific principles, the difficulty has, in the opinion of the Sub-Committee, been effectually overcome; so that, with ordinary attention on the part of the fireman, the combustion may, with scarcely an exception, be accomplished in a manner sufficiently perfect for all practical purposes.

It is not the intention of the Sub-Committee to enter into any discussion as to the comparative value of particular modifications and varieties of apparatus which have been adopted in different works. All of these, however, may be described as resting on one general principle, namely, the admission of an adequate supply of air behind the fire-bridge of the furnace, just at the point where the supply afforded by the ordinary draught of the fire ceases to be effective. The carbonaceous vapours, being still heated to a high degree, become instantly ignited, on being brought in contact with the air, so that a sheet of flame may be seen to sweep along the bottom of the boiler, and no smoke is produced. If the extra supply be cut off, the flame immediately ceases, and its place is occupied by a dense volume of black smoke, which escapes by the chimney. The restoration of the current of air causes the smoke to cease and the flame to reappear. These facts have been ascertained by the examination of the following furnaces:—

- Two at the Railway Station, Edge-hill.
- One at the Water Works, near St. Patrick's Chapel.
- One at the Water Works, Lodge-lane.
- One at Messrs. Nichol, Gibb, & Co.'s Saw Mills, Stanhope-street.
- One at Messrs. Stringer & Mann's, Seel-street.
- One at Mr. Lawrence's Brewery, St. James'-street.
- Three on board of the Woodside Ferry-boats.
- One at the Grange-road Station of the Birkenhead and Chester Railway.
- One at the Works of Messrs. Samuel & James Holme.
- One at Mr. Graham's, Whitechapel.

In all of these instances, the members have satisfied themselves, by personal inspection, that the burning of smoke *can be and is* effectually accomplished, while they are of opinion that the adoption of similar

plans in other boiler furnaces would put an end to the nuisance at present existing. There are other smoke-consuming furnaces in the town, but the Sub Committee has thought the above-named examples sufficient to warrant the opinion now expressed.

The converting so large a quantity of waste fuel to a useful purpose must of necessity occasion a very considerable saving of expense, the exact amount of which, in particular cases, it is not easy to ascertain, on account of the varying circumstances as to work, firing, &c., to which all furnaces are subject. One engineer thought there was no saving. In another instance, a larger amount of work was done with the same fire than formerly. In other cases, however, a very decided saving has been ascertained. As much as twenty per cent. of the whole fuel employed has been saved; Messrs. Samuel and James Holme rate theirs as high as twenty-five per cent.; and there is authority for stating the saving in some cases even considerably higher than this estimate.

The two important points, namely, the perfect combustion of smoke, and the corresponding saving of fuel, may therefore be considered as *fully proved*; so that the parties giving rise to the grievous nuisance complained of may abate it if they choose to do so, while at the same time they may effect a pecuniary saving far more than adequate to cover any temporary outlay which the necessary alterations in their furnaces might require. The Sub-Committee has ascertained that in Manchester, under a local police act, which came into operation in January last, a penalty of £2 per week may be inflicted on the owners of steam and boiler furnaces, who do not use the best practical means of consuming their smoke. It is thus taken for granted that the nuisance *can* be abated by known methods: and under this act, which is gradually being extended over the town, it has already been very considerably diminished.

In presenting this report, the Sub-Committee would leave the whole subject in the hands of the General Committee, to be dealt with as may seem advisable; at the same time expressing a hope, that the public spirit of parties interested may lead them, on consideration, voluntarily to adopt improvements so conducive to public welfare as those which have been pointed out.

At the MONTHLY MEETING OF COMMITTEE, held in the Town Hall, on the 13th November, Thomas Blackburn, Esq. in the Chair; the Report of the Sub-Committee on the Smoke Nuisance was read and adopted. It was resolved to transmit a copy of the report to the Mayor, with a request that he would lay it before the Health Committee of the Town Council. A very valuable statistical statement of the condition of the operative tailors was presented, and referred to the sub-committee on the Working Classes' Association. After a discussion on Lord Lincoln's Bill, the following motion was unanimously adopted, on the proposal of Mr. W. Rathbone, seconded by Mr. S. Holme; "That the numerous evils and inconveniences arising from the existence of more than one authority for the management of the various matters bearing on the Health of Towns, have been so long experienced in Liverpool, that this Association feels itself called upon to record its conviction that the whole subject would be most efficiently carried out by committing it into the hands of one controlling and managing power."

Want of space obliges us to postpone a small list of subscriptions. The state of our funds calls for an increase of contributions; and donations and subscriptions will be received by Mr. James H. Macrae, Treasurer, or by Messrs. Harwood Banner, William Rathbone, W. J. Tomlinson, John Cropper, James Mulleneux, and Thomas Heyes, Members of the Finance Committee.

All communications for the LIVERPOOL HEALTH OF TOWNS' ASSOCIATION, to be addressed to the Committee Rooms, Fenwick Chambers, Fenwick-street.

THE LIVERPOOL HEALTH OF TOWNS' ADVOCATE.

PUBLISHED UNDER THE SANCTION OF

THE COMMITTEE OF THE LIVERPOOL HEALTH OF TOWNS' ASSOCIATION.

No. 5.

THURSDAY, JANUARY 1, 1846.

PRICE 1D.

SANITARY CONDITION OF LIVERPOOL.

II.—PHYSICAL CAUSES OF MORTALITY AND DISEASE.

3rd Cause.—NEGLECT OF CLEANSING.—The absence of a distinct and well contrived plan for building towns, is the chief cause of that train of abuses we are exposing. It has been a recognised principle, that all persons possessed of land have a perfect right to erect any number of houses upon it they may please, and to construct these houses in the way that may yield most profit, without regard to consequences. Hence it has arisen that Liverpool consists of an aggregation of narrow streets and lanes, and small, badly constructed, ill-ventilated courts, arranged in the worst possible manner, and exhibiting every form of sanitary evil. The recognition of proprietary right has not stopped even at this, but the surfaces of the courts and alleys themselves have been considered beyond the reach of municipal authority, and have been left without efficient cleansing; so that, while by *defective construction* the population is overcrowded, and a thorough ventilation rendered impossible, provision is made by *defective cleansing and draining* for loading the atmosphere with poisonous vapours and gases. It is in this manner that the various causes of sickness and mortality become connected, and mutually increase each other.

It has been a prevalent opinion in this country, that exhalations proceeding from putrid animal and vegetable refuse are not very injurious to health. This error has arisen to a considerable extent from the assertions of Parent Duchâtelet and other writers, who have been led to adopt their peculiar views from deficient observations and unwarrantable conclusions.

It has been considered a sufficient proof of the innocuousness of putrid emanations, that certain parties who have been exposed to their influence have not been immediately subject to disease. But the simple reply is, that such emanations do not usually act in this manner, although, as we shall presently see, they sometimes do so. Their operation is much more insidious, but no less fatal in the end. Dr. Riecke, of Stuttgart, and several writers in England, who have paid great attention to the subject, have refuted the statements of Duchâtelet; and the following conclusions of the German authority, which have been adopted by Mr. Chadwick, in the Appendix to his admirable Report, may be safely received as true; they include also the effects of emanations from Church-yards.

“The injurious effect of the exhalations from the decomposition in question,

upon the health and life of man, is proved by a sufficient number of trustworthy facts.

“That this injurious influence is by no means constant, and depends on varying and not yet sufficiently explained circumstances.

“That this injurious influence is manifest in proportion to the degree of concentration of putrid emanations, especially in confined spaces; and in such cases of concentration the injurious influence is manifest in the production of asphyxia, and the sudden and entire extinction of life.

“That in a state less concentrated, putrid emanations produce various effects on the nerves of less importance, as fainting, nausea, headache, languor.

“These emanations, however, if their effect is often repeated, or if the emanations be long applied, produce nervous and putrid fevers, or impart to fevers which have arisen from other causes a typhoid or putrid character. Apparently they furnish the principal cause of the most developed form of typhus — that is to say, the plague.”

It may, therefore, be safely assumed as a law of nature, that *wherever refuse animal and vegetable matters are accumulated together, vapours and gases of an injurious character are produced.* The evidence of our senses, and a little reflection, force the conclusion upon us, and science fully bears it out; but the fact is, that people do not think on such subjects, and they act just as if the law had no existence. In country districts, dunghills are generally placed as close to the doors of dwellings as is consistent with their being not absolutely offensive; and in towns, large quantities of putrid refuse are allowed to cover streets and courts, or are heaped up in ashpits: in either case poisoning the air night and day, and *wherever that air is breathed, health must suffer, sooner or later.* It is not even necessary to the production of these effects that there should be offensive odour. Some of the worst instances on record of the origin and spread of disease, from such causes, have been those in which a careful and cautious examination has been required to detect the source of the evil. Peculiar aerial poisons, the exact nature of which is not ascertained, are generated in abundance, and enter the blood through the lungs, so as to weaken or destroy the vital functions. One of the most deleterious to life of all the gases is sulphuretted hydrogen, which is also a product of putrefaction; and in some cases ammonia is produced in considerable quantities. A dog has been killed by breathing atmospheric air, containing only one 800th part of the former gas; and the injection of a small quantity of putrid water into the veins of another dog produced all the symptoms of putrid fever, of which the animal died in a few hours: and it is not a little remarkable that the appearances found on dissection were similar to those observed in the human body after the same disease. The exhalations from dunghills, ashpits, and uncleaned streets, are therefore of a poisonous nature, and increase mortality and disease.

As it is of great importance that this truth should be fully recognized, we give the following illustrations of the action of the poison in various degrees of intensity:—

1st. A few months ago, two men went into an ashpit in the lower part of Liverpool, for the purpose of cleaning it. Both became insensible. One died immediately; and twelve hours after death the whole body was in a far advanced state of putrefaction. The other man recovered; but the system was so deeply injured that mortification occurred in several parts of the body. These illustrations prove that the blood itself becomes changed, and unfit for supporting the vital functions. They are, in fact, cases of poisoning; and similar accidents have frequently occurred elsewhere.

2d. Some time ago, the contents of a cesspool at Clapham were scattered over a garden in the immediate vicinity of the play-ground attached to a boarding-school. Twenty-three children belonging to the school were immediately attacked with violent irritation of the stomach and bowels, convulsions, and great prostration of strength, and two died in about twenty-four hours.

3d. The following case happened in the practice of Mr. H. G. Harbord, in Toxteth-park:—"Early last year a fever of a very malignant form broke out in Wililoo, near the tanneries. * * The fever is known as malignant, or black typhus—in short, almost resembling plague. On investigating the cause, I found it to proceed from a privy, common to about thirty or forty houses. This privy was built *under the bedroom* of the first patient I was summoned to." [The description given of the place is horrible.] "In addition to this, the neighbouring ground was studded with pigstyes, and all their concomitant abominations. The plague was stayed with difficulty; but from that day to this, from what cause I know not, this horrid place still exists." Mr. Harbord further states—"I had, about a month or six weeks ago, three cases of malignant cholera in one house, within a few yards of this pest house. One case died a few hours after I was summoned."

4th. A family of seven persons lived in a new court at the south end of the town. The court had been built according to regulation; there were no cellars, and the houses were tolerably comfortable and clean. The surface was paved and channelled, and to all appearance the place was as healthy as such places generally are. The ashpit belonging to the court got filled up, and was not emptied in time, because the neighbours could not agree about the payment of the expense. At last it overflowed into the court, covering it with a layer of filth, the smell from which became intolerable. Fever now made its appearance in the family alluded to: First the mother was taken ill, and then the whole seven in succession were seized with fever. It was not malignant, and all recovered; but while the disease was progressing in this house, the landlord interfered, and cleared out the ashpit at his own expense, and not another case appeared in the court.

Evidence of a similar kind could be accumulated to almost any amount;

but the specimen we have given will be sufficient to convince any one, who will take the trouble to think on the subject.

We have already said that the senses do not always give warning of danger; and hence it becomes needful to resort to other kind of evidence. Thus it sometimes happens that disease will break out in prisons and hospitals, without the presence of any very notable effluvia, and yet the whole evil can be distinctly traced, perhaps, to the stirring up of some filthy ditch at a considerable distance from the building. Even the blowing of the wind over a distant nuisance will bring disease and death, although no warning has preceded its approach. The *effects* in this case lead us to look for and discern the *cause*. The suddenness and extent of the evil obtains for it an immediate remedy. But by far the most important results which follow from neglect of cleansing are so insidious, that sufficient attention is not attracted to the cause to ensure its removal. In the filthy streets and courts of the lower parts of Liverpool, in which this other evil is added to those of deficient ventilation and overcrowding of the population, we see those results which swell the registrars' list of deaths, and crowd our dispensaries and hospitals with disease. Just where the most perfect cleanliness was requisite to diminish, as far as possible, the effects of other causes of mortality, we find instead unspeakable horrors of every kind, which must be imagined, but not written, lest those whose influence we desire to win may turn away in disgust, as from a subject which cannot be approached without pollution. The following slight sketch, from Dr. Duncan's report, will give some idea of the *kind* of facts which could be brought forward:—

"The whole of the cellar population of the parish (upwards of 20,000) are absolutely without any place of deposit for their refuse matter. Of the front houses inhabited by the working classes, a large proportion are in a similar predicament." "In twenty-six streets * * * containing 1200 houses, not less than 804, or two-thirds, were without either yard, privy, or ashpit." Even where such conveniences exist, they are said to be "in an abominably filthy and ruinous condition." They are generally so full before they are emptied, that the filth "is deposited in the corners of the court, in the entries or back passages adjoining it, or in the street itself." Dr. Duncan further states, "I do not know of a single court in Liverpool which communicates with the street or sewer by a covered drain," the consequence of which is that the fluid contents of the overflowing ashpits "spread a layer of abomination over the entire surface of the court." In some instances, the same filthy fluid "oozes through into the neighbouring cellars, (inhabited, remember,) filling them with its pestilential vapours, and rendering it necessary to dig wells to receive it. One of these wells, four feet deep, filled with this stinking fluid, was found in one cellar, under the bed where the family slept."

To this general statement we shall add the following testimony of the Rev. Mr. Hampton as to a few individual examples. It is extracted from a speech delivered at the Music Hall, in September last, and exhibits a fair specimen of the condition of nearly the whole of that part of the town inhabited by the working classes:—

"He could enumerate many facts, but would go on to specify a few, which came under his observation during his pastoral visits on the previous Friday. He went into Bell-street, Toxteth-park, where he found the whole surface of the ground covered with filth and surface-water; he turned on his right to Atkinson-court, and was forced to take off his hat to walk upright; there he found eight houses, the inhabitants of which were supplied with only one privy; there was no under-ground drain, and all the water and filth was lying on the surface of the ground, and being washed away by the rain. A court, called Bell-court, in the same street, had in it sixteen houses and two privies, but no drain. In Gardener's-court, Perry-street, there were ten houses and one privy, the latter in a dreadful state, and five of the houses had not a drop of water: the other inhabitants had also to watch their opportunity, three days in the week, to obtain their scanty supply. In a court, called Ryan's-court, there were ten houses with two privies, and five of the houses had no water; in Rigby-court, nine houses and only one privy, and that in a very dilapidated state; one water-tap supplied the nine houses, and, when the water was on three times a week, the people had to wait their turn, and with difficulty obtained only a scanty supply, and sometimes the water was off before they could all get their turn. He wished, however, to notice the kind feeling which prevailed amongst the poor, as they saw that when the last person came, and was on some occasions unable to obtain any, they all gave a little drop.

In Aspinall-court, in the same street, he found five houses, and not one drop of water supplied to any of the people, who had to pay or beg for all they got: there was one privy for the use of the court: there were five privies at the back of the houses facing Harrington-street, not accessible to the inhabitants of the court, and those were within six feet each of every door; and, in consequence of the bad paving, the dirty water and filth flowed into some of the cottages; even when the nightmen came to clean the privies, they had no water to wash down the paving, and the stench remained for several days. In Nolan's-court, Mann-street, there were four houses with one privy; the gutters and paving in a disgraceful state, holding large quantities of stagnant water. A slaughter-house adjoins the above court at the back, which is a most abominable nuisance. The speaker then stated that he went into what might be inferred, from its title, a lovely spot, namely Peaceable-place, near the end of Gore-street. There were in it fifteen houses, and one privy for the use of the whole, which, however, was unapproachable, the seat being covered with filth to the depth of about 18 inches, and running out in all directions. He had also visited several of the cellars in Upper Harrington-street, which were fearfully damp, and the middens from the houses above and around oozing through the walls, producing a most offensive and noxious effluvia. In some instances they had the privies in the houses, but connected with a midden which was common to three or four others, and in such cases the effluvia was insupportable. In Mann-street there were some cellars which, generally speaking, were very damp and low, and in one or two a person could not stand upright, the ceiling or roof being exactly on a level with the street, the inhabitants literally burrowing under ground, like rabbits or rats. What he had stated would, he conceived, show the evils that weighed on the working classes and their families. The cess-pools and sink gutters, and surface drains in those narrow streets, were most offensive. The middens could not be cleansed from under 2s. 6d. to 5s., and with difficulty even at that price, especially in the summer, when the men who usually do that work get more profitable, and, he need scarcely add, more pleasant employment in the brickfields."

Such statements are enough to make us ashamed of the town, and at our own past apathy and indifference. It must not be supposed that because a deficiency of cess-pools is a nuisance, an adequate supply is the contrary. Such is not the case. *The whole system is wrong, and must be amended.* Cess-pools of all kinds are mischievous, and productive of disease. The very foundations of the town are saturated with their abominable contents; while they are, at the same time, constantly exhaling poisonous vapours into the atmosphere, and polluting the very air we breathe. Wherever a porous subsoil exists, be it of rock or gravel, or anything else, the impure fluids are sure to spread on all sides, and send noxious gases into the basement stories of even the best tenements. Every street in the town, and all the courts, have these contrivances in more or less abundance, so that the mischief is universal; and when we add to this the number of receptacles for refuse matter connected with stables, cowhouses, and slaughter-houses, and the filthy condition of the lower class of streets and courts, it is not too much to assert that *nearly the whole surface of the town is constantly exhaling vapours injurious to health.*

Our readers will now be able to form some judgment of the nature and extent of the operation of defective cleansing, as a cause of mortality and disease. To this, with its concomitant evil, deficient drainage, we are to look for an explanation of a large amount of the low cachectic forms of illness which are so peculiarly prevalent in Liverpool among all classes of society. After being exposed for years to the effects of an extremely diluted aerial poison, the functions begin to decay. The digestive organs are injured; general languor of the constitution follows, so that an epidemic state of the atmosphere at once lights up fever, and in other cases the seeds of fatal disease are engendered.

A thorough understanding of the principles of medical police would have prevented the occurrence of such abuses as we have detailed. Indeed there appears to have been no adequate recognition of the necessity of cleansing anywhere. Liverpool is not a singular instance of this circumstance, for it is almost universal. We learn from the report of the Sanitary Commission, that Edinburgh is at present the best cleansed town in the kingdom. There are 115 scavengers and 55 carts constantly employed. *The whole city* is swept once a day, and the closes and wynds are cleansed several times in the same period. The annual expenditure is £12,000; but by proper management £10,000 is recovered by the sale of the manure. In the same report we are told that Liverpool, which contains more than double the population, and with a far greater amount of traffic passing through its streets, is cleansed by 65 scavengers, generally paupers, and 24 carts. The streets are said to be swept *once a week only*; but Dr. Playfair has shewn that the men employed could not get through the work effectually oftener than *once in three weeks*. The cost amounts to £4820 a year, and £1150 is obtained by selling the manure. But the

worst of all is, that the courts and alleys, where so large a proportion of our poorer fellow-townsmen reside, are *not even professed to be cleansed*. It is in regard to these localities that Mr. Samuel Holme justly says, in his report, "I never hail any thing with greater delight than I do a violent tempest or a terrific thunder-storm, accompanied by a heavy rain, for these are the only scavengers that thousands have had to cleanse away the impurities and filth in which they live, or rather exist."

These things surely require only to be pointed out in order to be immediately remedied. The recent resolutions of the Cleansing Committee of the Town Council, though apparently *ultra vires*, will prove highly beneficial, if properly seconded by the public; and we hope to see the Commissioners or Surveyors of suburban districts adopt a similar course of procedure. But it must not be forgotten that effectual cleansing and draining can only be carried out by a very large supply of water, and by keeping continually in view the great sanitary principle, which we hope yet to see everywhere adopted—

THAT THE WHOLE REFUSE OF A TOWN SHOULD BE REMOVED OUT OF IT
AS SOON AS IT IS PRODUCED.

WATER ADMINISTRATION OF ANCIENT ROME.

At the present time, when so much interest is excited all over the country as to the manner of obtaining an efficient supply of water, it may not be out of place to recal the lessons of past civilization on this point; and we shall therefore devote a little space to giving an account of the water administration of ancient Rome.

In the early years of the city, the needful supplies appear to have been drawn from the Tiber, and from some fountains near the city walls.

It was, however, very soon discovered that the quality of the water of the Campania was not conducive to health, on account, probably, of the volcanic nature and sulphureous impregnations of the soil; and so early as the second century of Rome (B.C. 600), Ancus Martius formed the magnificent idea of traversing the wide Campania by a vast aqueduct, and bringing a supply from the very heart of the Apennines. For above 200 years, no further quantity appears to have been needed; but about the year of the city 442 (B.C. 312), Appius Claudius constructed the second aqueduct. Previous to the reign of the Emperor Nerva (A.D. 96), there were nine aqueducts: he added five more; and succeeding emperors augmented the whole number to twenty.

The most remarkable of these were the Aqua Appia, which, after a course of 11 miles, poured its waters into the Campus Martius. There were two aqueducts for conveying the waters of the Anio, the older of which was 43 miles in length. The Aqua Martia, first constructed by Ancus Marcius, took its origin at a spring 33 miles from Rome. It formed a circuit, and was carried in a covered tunnel, six-

teen feet in diameter, for a distance of 38 miles, on arches 70 feet high. The Aqua Virginia, which was constructed by Agrippa, in the time of Augustus, brought the waters of a copious spring a distance of 12 miles, partly through a tunnel. In one year, Agrippa constructed 70 pools, 105 fountains, and 130 reservoirs. Perhaps the finest of all was the Aqua Claudia, which still pours its waters into the streets of Rome under the name of Aqua Felice. It was constructed by Nero and Claudius, about A.D. 50. It was carried for $36\frac{1}{2}$ miles underground; for $10\frac{3}{4}$ miles on the surface; it was arched over for 3 miles, and carried on lofty arcades for 7, and supplied its waters to every part of the capital. In the construction of these conduits no expense was spared, and every resource of the engineer was called into requisition. Mountains were tunnelled, lakes were drained, and valleys filled up or crossed on arcades, so as to transport the pure streams of distant mountain regions into the heart of the metropolis of the world. They were the admiration of all men, and fully merited the eulogium of Pliny, that "there was nothing more wonderful in the whole world."

The water from the aqueducts was received within the walls into large covered reservoirs, from which it was conveyed by pipes to the public baths and fountains, and to private residences and palaces. The Roman engineers were well acquainted with the hydrostatic principle, that water in tubes will rise to the level of its source; and they generally employed this principle in its distribution. Three kinds of pipes were in use—of lead, wood, and earthenware. The first only were em-

ployed to bear pressure, and were made by folding a sheet of metal into the cylindrical form, and soldering the joint. The quantity of water delivered by the public cisterns was regulated by the diameter of the spout, of which there were 25 different sizes, the length of each being three-fourths of a Roman foot, or 8.7 inches.

The enormous expense of the construction and maintenance of these vast works was defrayed by a water rate, called *Vectigal ex aquæductibus*, and *Vectigal formæ*. It was levied on private houses and on public baths, the fountains apparently being free. It appears not improbable that the Emperor Nerva collected about £52,000 a year in this way, a sum amply sufficient to keep the works in repair; and for this purpose the Curator, who was a man of consular rank, had 750 men under his control. The estimated revenue, however, is only an approximation, as no very accurate data have come down to us. The whole administration of the public waters appears to have been conducted with the most jealous care; and imperial edicts were from time to time promulgated, to remedy abuses, and to protect the revenue.

The supply furnished by the aqueducts must of course have varied with their number and with the seasons. We learn from Frontinus that the nine older aqueducts existing in his time transmitted from their source 24,500 quinaria, or about 47 millions of cubic feet per diem. Of this quantity, however, a large part was distributed to villas and gardens outside the walls; another part was fraudulently taken, and only 14,018 quinaria, or 27,743,100 cubic feet, reached the city. It appears highly probable, however, as stated by competent authorities, that when all the aqueducts were in full play, as much as 50 millions of cubic feet were supplied every 24 hours, or 50 cubic feet (about 312 gallons) a day for each inhabitant, taking the usual estimate of the popula-

tion at one million. It was this immense supply that induced Strabo to say that whole rivers flowed through the streets of Rome.

Modern Rome is supplied by three aqueducts only, all the others having fallen into decay and ruin—the Aqua Felice, the Aqua Juliana, and the Aqua Paulina. They furnish a supply of 5,305,000 cubic feet a day, which, for a population of 130,000, gives about 40 cubic feet (250 gallons) a day for each inhabitant. This amount is very much greater than that enjoyed by any other European population. We have recently seen it stated that the present supply of London is 237 millions of hogsheads a year, or about 5,400,000 cubic feet a day; which, for a population of two millions, gives an allowance of not much more than *an eighteenth part* of that allotted to each inhabitant of ancient Rome: while, in the present day, London, with its vast population, has the same supply as Rome, with only 130,000 people. So completely have the lessons of ancient civilization been forgotten among us!

We have given sufficient details to show the importance in which water was held in ancient times; and we need only add, that wherever the sway of Rome extended, it was one of the first objects aimed at; and hence we find magnificent remains of aqueducts, and other similar works, over the whole empire. No obstacles were allowed to interfere in accomplishing so beneficent a purpose. And surely Christian England, with mechanical resources such as were unknown in ancient times, will not linger behind heathen Rome. When we hear engineers talking of insurmountable difficulties, it is hardly possible to suppress a smile, for now-a-days it is not easy to say what is insurmountable. Water is given to us as freely as the air, and there is no reason why we should not have an ample supply.

The last meeting of the Committee was held in the Town Hall, on December 10th, Adam Hodgson, Esq., in the chair. The meeting was occupied with discussions on various sanitary subjects, and a deputation was appointed to confer with the Commissioners of Toxteth-park, on cleansing within their district.

DONATIONS.

J. Cropper, Jun., Esq.	£10 0 0	R. Stubbs, Esq.	£1 0 0
E. Cropper, Esq.	10 0 0	Rev. J. S. Howson	1 1 0
H. Stubbs, Esq.	1 0 0	T. Rathbone, Esq.	1 0 0

SUBSCRIPTIONS.

W. Kay, Esq.	£2 2 0	G. Cooke, Esq.	£1 0 0
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The extract from the 5th Report of the Registrar General, given in our last number, ought to have been attributed to its author, Mr. FARR.

All communications for the LIVERPOOL HEALTH OF TOWNS' ASSOCIATION, to be addressed to the Committee Rooms, Fenwick Chambers, Fenwick-street.

THE LIVERPOOL HEALTH OF TOWNS' ADVOCATE.

PUBLISHED UNDER THE SANCTION OF

THE COMMITTEE OF THE LIVERPOOL HEALTH OF TOWNS' ASSOCIATION.

No. 6.

MONDAY, FEBRUARY 2, 1846.

PRICE 1D.

SANITARY CONDITION OF LIVERPOOL.

II.—PHYSICAL CAUSES OF MORTALITY AND DISEASE.

4th Cause.—DEFICIENT DRAINAGE.—The whole subject of drainage is of the highest importance in a sanitary point of view, both as it regards the face of a country and the streets and dwellings of towns. The rain which falls in a state of purity on the surface of the earth requires to be drained away as quickly as possible, either by natural or artificial channels; for if it be allowed to remain and stagnate in hollows, or in a too retentive soil, it soon passes from being an element necessary to the health of the vegetable and animal creation, into a cause of decay and death in both. The presence of an undue degree of moisture hastens the decomposition of vegetable matter, and the consequent production of malaria, which is the origin of fevers of various kinds, and of a number of other diseases.

These facts are well known in all parts of the country; and it has been satisfactorily proved that, other things being equal, just in proportion to the extent and efficiency of the drainage of any district, is the degree of health enjoyed by man and the lower animals in that district.

If pure rain water, when allowed to stagnate, can increase mortality to such an extent as it is known to do, we should naturally expect that the impure fluids of towns, impregnated as they are to saturation with decomposing animal and vegetable matter, would act with far more energy, and give rise to more important consequences. We have already proved the results which follow from neglect of cleansing, and we have shewn that these results are to be attributed to poisonous effluvia entering the lungs with the air which is breathed. Now, these very emanations arise to a great extent from the *fluids* with which the soil of towns is impregnated; for, as in the great majority of instances no efficient channels exist for their removal, they must either be dissolved by the air or sink into the ground. In the former case, the atmosphere becomes tainted, and every breath of air is to some extent injurious; and in the latter, the porous rock or subsoil is penetrated in all directions, and the lower stories of the houses of the rich, as well as the cellars of the poor, become filled with unwholesome damps. *It hence follows that there can be no efficient system of cleansing without a perfect system of drainage.*

We have already stated that it is not always easy to point out the exact amount of effect produced by any particular cause of mortality, on account of the number and simultaneous action of other causes. There is, nevertheless, abundant evidence that a very considerable effect is produced by each individually. We have selected the following examples from different towns, in illustration of the results of want of drainage, which will be sufficient to give a general idea of the subject:—

1st.—Mr. Holland has shown that while the mortality in the undrained streets of Chorlton amounts to 4 per cent., it is only 2 per cent. in the drained streets. Part of this difference must, without doubt, arise from other causes. But that the state of the drainage is a most important element, he has proved by the fact that some streets, containing 3500 people, yielded a mortality of 1 in 32 *before drainage*, and that in the same streets, *after drainage*, the deaths fell to 1 in 39. In other words, the simple expedient of sewerage of the streets *saved the lives of twenty persons every year*.

2d.—Mr. Ner Gardiner and Mr. Noble, of Manchester, have shewn that, in certain streets of St. George's district, in that town, the deaths in two years were 495. The streets were paved and sewerage, and in the next two years the deaths fell to 432, exhibiting a saving of no fewer than 63 lives in the period. A district in Ancoats had, in two years preceding the sewerage, 270 deaths, and in the two years following the improvement, there were only 230 deaths.

3d.—The town of Leicester affords valuable evidence, because some other causes of mortality, which are known to be very active in Liverpool, are nearly, if not entirely, absent in that town. The streets are wide, and generally well ventilated, and there is no overcrowding of population, such as we have here. There are some districts, however, much better drained than others; and if we compare the mortality of those districts, we shall find a remarkable difference. The average age at death is the test that has been chosen, and its relation to drainage is shewn as follows:—

	EAST DISTRICT. <i>Average age at death.</i>	WEST DISTRICT. <i>Average age at death.</i>
Culverted streets.....	24 $\frac{2}{3}$ years.	26 $\frac{1}{2}$ years.
Partly culverted streets	20 „	22 „
Not culverted „	16 $\frac{1}{3}$ „	17 $\frac{2}{3}$ „

The average loss in duration of life, arising from deficient drainage, would thus appear to be from 4 $\frac{1}{2}$ to 8 $\frac{1}{2}$ years in this instance; but other circumstances, without doubt, contribute to the result.

The testimony of experienced medical observers fully bears out the evidence given above. They may be said to be unanimous on this point. But we think it necessary to quote the opinion of only one very competent witness, which is sufficient for our purpose.

Dr. Southwood Smith, in his valuable evidence before the Sanitary Commission, states that—

“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.”

“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 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."

Previous to the year 1830, sewerage does not appear to have been regarded of sufficient importance in Liverpool. Except, perhaps, a few badly constructed conduits, which carried off a little surface drainage, there was no provision for removing the fluid refuse of the town. Some improvement has taken place since then, but most of the rain and well water, and all the drainage of water closets and cess pools, is still allowed to sink into the ground, or escape into the atmosphere.

At the outskirts of the town there are numbers of pits filled with putrid fluids, having no exit but by evaporation: several of the localities are notoriously unhealthy, and diseases of various kinds have been traced to them. In the course of last summer, a severe form of diarrhœa and dysentery, attended by unusual mortality, infested two streets opposite one of these accumulations, and fever is known to be unusually prevalent in the neighbourhood of others.

It is quite a common thing to see tracts of building land covered with water for a great part of the year. The land is nevertheless bought with this imperfection, and the builder digs his foundation. The water of course flows into the hole he has made, and cannot escape. Any one may see, even now, the foundation walls of houses, in some of our best streets, built in water, apparently with the expectation that as soon as the house is completed the fluid will, somehow or other, go away of its own accord. A hole is next dug for a cess-pool, and the drainage from the water-closet and sink is turned into it. There may be a main sewer within twenty yards of the house, but it cannot be used for its legitimate purpose; for there is a prohibitory law, which we believe to be altogether unique in its character; an example of legislation *not* sanitary, to say the least of it. The 18th clause of the Liverpool Amended Paving and Sewerage Act, passed so lately as May, 1842, has the following clause:—

"And be it enacted, that if the owner of any private sewer or drain, branching into or communicating with any sewer or drain vested in the Commissioners, or if the occupier of any house, building, land, or premises, to which such private sewer or drain shall belong, shall suffer the filth or soil from any privy or water-closet, or any other offensive matter, to flow down such private sewer or drain, into the sewer or drain vested in the Commissioners, every person so offending shall, for every such offence, forfeit and pay any sum not exceeding £10; and moreover it shall be lawful for the Commissioners to cause such communication between such private sewer or drain, and the sewer or drain so vested in them, to be stopped up, or cut off and discontinued."

And the clause prescribes that the expenses shall be borne by the offenders. In accordance with this remarkable clause, all parties petitioning to be allowed to make drains have to sign the following undertaking:

"And your petitioner declares that such private sewer or drain is required only

for the purpose of taking off the waste water, or overflow, from the premises, and is not intended to receive the filth, soil, or other offensive matter, from any water-closet or privy, in or upon the premises."

It seems to be gravely taken for granted that the unchangeable laws of nature can be set aside by our absurd legislation.

In this state houses are finished and tenanted. The builder completes his work, and is not unfrequently succeeded by the medical attendant. In the poorer districts, people who have to labour for their living are laid up in such houses with lingering diseases, which exhaust their means and injure their health for a long time; and it sometimes happens that after all the tenement has to be evacuated, and the proprietor suffers serious pecuniary loss. This pernicious and foolish system has gone on from year to year, until it has become a habit, or, we should rather say, a necessity; because the town has been allowed to outgrow its sewerage, instead of the latter being always in advance of the town, as it ought to be.

We need hardly say that damp kitchens are frequent enough. We have even known a heavy rain sink into the sandstone rock, and force the fluid contents of the cess-pool, with which it had been previously saturated, through the kitchen floor of a well built house, so as to cover it to the depth of three inches with putrid fluid; and sickness has followed as a consequence!

The whole of the town, including the enormous additions which have been recently made, has been built after this manner, and the consequences in the poorer districts are most deplorable. Every cellar in the borough must be to some extent damp; and a few years ago nearly 40,000 of our poorer fellow-townsmen lived in them. The Corporation survey has shewn that there were lately in Liverpool *parish* 2420 cellars, with probably 10,000 inhabitants, *absolutely wet or damp!* Water, and the fluid contents of cess-pools, drain into these wretched abodes, and if not received into wells, they cover the floor. Mr. Samuel Holme states in his report, that he had to *walk on bricks, across the flooded floor of a cellar, to the straw litter on which a poor woman was laid, who had been confined only a few days.* He says—"This is by no means an extraordinary case," for it would be easy "to find hordes of poor creatures living in cellars which are almost as bad and as offensive as charnel houses." Every medical man who has been in the habit of visiting the poor can verify this statement.

We remember, in one instance, the water from a horse-trough draining into a cellar, and running in a gutter made for it across the floor, into a hole dug at the doorway! There was a case of incurable rheumatism in the place, arising from the damp.

Dr. Duncan, in his report, has given an estimate of the extent and distribution of the sewerage in the *parish* of Liverpool, which we subjoin. There has been some advance since the time of its publication; but we

must at the same time remember that there has been a far greater increase of building in undrained localities, so that it may still be used to give a general idea of the subject. He says —

“The number of inhabited streets in the *parish* I estimate at 566, measuring 101,290 yards, or about 57½ miles, of which 235, measuring 25½ miles, are either wholly or partially sewered. But these 25½ miles are very unequally divided among the different classes of the inhabitants. For while of 243 streets, measuring about 20 miles, inhabited chiefly by the working classes, only 56, measuring about 4 miles, are sewered, the proportion of sewerage in the streets chiefly occupied by other classes of society, is 179 streets, measuring 21½ miles, out of 323, measuring 37½ miles.”

In other words, considerably more than one-half of the whole length of streets is without sewerage of any kind; of those inhabited by the working classes only 20 per cent. of the length is sewered; while of those inhabited by the better classes 57 per cent. of the length is sewered. The element of deficient drainage, like all other causes of mortality, is thus shewn to bear most heavily on the poorer classes of society.

In our last number we described the general bearing of deficient drainage on the rate of disease and mortality in the town, but we have no means of arriving at accurate statistical details. It would be perfectly correct to say that the undrained localities are by far the most unhealthy; but it happens that all the other causes of mortality exist in greatest intensity in those localities. Dr. Duncan has shewn, however, that even in the most unhealthy districts some portions are better drained than others, and that, allowance being made for other circumstances, the amount of fever and death is the greatest where the sewerage is most deficient.

SURFACE DRAINAGE AND PAVING. — There can be no proper surface drainage without good paving; and hence a badly paved town can never be healthy. Animal and vegetable refuse and impure fluids, in a state of decomposition, accumulate in every hollow of an ill-paved street or court, and give rise to deleterious exhalations. The entire drainage of a large proportion of the streets of the borough, and of all the courts, depends on the state of the paving; for, in these instances, there is no underground drain of any description. In many of the poorer streets of the town the paving is wretched, and even at the best it can never be sufficient for sanitary purposes, so long as round boulder stones are used. There are always spaces between such stones which retain mud and filth of all kinds.

Except where recent improvements have taken place, the condition of our courts is truly disgraceful. Many are altogether unpaved; and even where some attempts had been previously made at covering the surface with stones, the remedy was, to say the least of it, as bad as the disease. From want of proper levelling, there is sometimes no fall for the drainage, so that the surface is constantly flooded, and when the ashpits overflow the effluvia become dreadful. Mr. Samuel Holme gives the following description of one of these scenes in his report. He says —

"In Freeman's-row, I found, about two years ago, a court of houses, the floors of which were below the public street, and the area of the whole court was a floating mass of putrified animal and vegetable matter, so dreadfully offensive that I was obliged to make a precipitate retreat. Yet the whole of the houses were inhabited!"

Such things used to be far from uncommon, and even now they could be paralleled. There is still a great deal to be done; but we are glad to acknowledge that an advance has been made in the right direction.

We need not say that a considerable amount of disease must arise from bad paving; but we confess to have been hardly prepared for the disclosures made in the following experimental evidence. The facts are melancholy, because, if confirmed by other examples, they will shew what an awful extent of suffering has been inflicted on the poor by our neglect of so simple an improvement. But at the same time they afford most gratifying evidence of our power to alleviate the sanitary condition of the town. The data have been supplied by Mr. Carr, of the South Dispensary, from his register, and shew only the cases of disease visited at their own homes. Six of the worst courts, in one of the worst parts of Liverpool, were so notoriously unhealthy, that the medical attendant was hardly ever out of them; and when any epidemics visited the town, these courts exhibited their results in perfection. Their surface was in a most disgraceful state, being always covered to some depth with putrid mud, so that the inhabitants were compelled to place large stones at intervals, to enable them to reach their houses by stepping from one to another. In the course of last summer these courts were flagged, and the effect on their sanitary condition soon became apparent. To exhibit this, we have chosen five months, from August to December, inclusive, of 1844, before paving, and the same five months of 1845, the paving having been completed in the interim. We have selected these periods, because the general sanitary condition of the town was nearly the same in both:—

TABLE EXHIBITING THE SANITARY EFFECTS OF FLAGGING.

COURTS.	NUMBER OF HOUSES.	NUMBER OF CASES OF SICKNESS IN FIVE MONTHS.	
		Before Paving.	After Paving.
<i>Crosby-street.</i>			
Ash	8	8	3
Fir	8	18	4
Pine.....	8	7	None.
Oak	8	28	5
Beech	7	7	None.
<i>Brick-street.</i>			
Bridport-court	18	17	4
Total.....	57	85	16

The period of five months is too short to enable us to deduce accurate statistical results; and there may be other causes operating in producing this extraordinary difference, but still we trust the evidence is sufficiently conclusive to satisfy the public of the soundness of the principles we

advocate, while it ought to stimulate and encourage the authorities to prosecute vigorously the course of improvement on which they have entered. The arrangements for cleansing the surfaces of courts and passages, which have been adopted by the Town Council within the last three weeks, are highly to be commended; and the more frequent sweeping of streets by the machine will be of much sanitary benefit.

DEFECTIVE SEWERS.—If sewers be of a defective construction, it is quite possible to have a sufficient amount of drainage, without experiencing all the sanitary benefits which ought to be derived from it; nay, more—it may even happen that sewerage may increase the sickness and mortality of a town. It is, therefore, a matter of necessity, not only to have an adequate extent of drainage, but to take care that the drains themselves be properly made. The chief defects of sewers are, 1st.—*The deposition of putrid mud within them.* This ought never to occur in a well-constructed conduit. If the form be what it ought, and the levels rightly adjusted, a good supply of water constantly running through them, and especially used for flushing, will keep all sewers clean; and the present cess-pools, under the gratings, ought at once to be abolished. Where deposit exists, there is a continual evolution of deleterious vapours, which escape by every aperture. 2nd.—*Want of trapping in street drains.* At present all the gases generated in the drains of Liverpool, are allowed to escape into the streets—and every person must have been annoyed by the highly dangerous effluvia proceeding from the gully-holes, especially at certain times of the tide. This is a grievance which could be easily and simply remedied; and it is one that has long called for the interference of the authorities. If not removed, it will increase, as our sewerage becomes more extended—and no doubt the results described by Dr. Southwood Smith, in London, will, in the end, be verified in Liverpool. He says—

“I have been struck with the number of cases of fever opposite gully-holes. I have observed, that when fever once attacks any one member of a family in such a situation, it commonly attacks several individuals, and that the disease is generally severe.” * * * “Other medical men have made similar observations. I remember one of the medical witnesses * * * 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 untrapped, or which, being trapped, were situated opposite gully-holes. * * * Instances are recorded, in which servants, sleeping in the lower rooms of houses so situated, are invariably attacked with fever. * * * Instances are adduced, where it had been found necessary either to trap or to remove gully-holes in the vicinity of butchers’ shops, to avoid the injurious effects of the effluvia upon the meat.”

We put these remarks on record, as a warning which we trust will not be forgotten.

3d.—*The escape of vapours into houses through the want of trapping in house-drains.* It is established beyond all doubt, that this cause has given rise to a variety of dangerous and obstinate diseases, including fevers. Our space will not permit us entering into detail, but we shall

give an illustration which happened in Liverpool, only about three weeks ago. A poor woman and her three children, who inhabited a cellar in Cherry-lane, were simultaneously seized with illness. The children became insensible, but rallied on being removed into the open air: and on investigating the cause, the wretched cellar was found to be filled with the most horrible effluvia of sulphuretted hydrogen gas, proceeding from a drain which communicated, without being trapped, with another drain, conveying away the refuse of a soap manufactory in the neighbourhood! The accident very nearly proved fatal to the whole family.

We have now concluded our remarks on those physical causes of mortality and disease, which come more immediately under the province of the authorities of the town. There are other secondary causes that can only be removed by the people themselves; and it is our duty to deal with these also; but at the same time it appears almost a mockery to tell our poorer fellow townsmen to be cleanly in their houses and habits, until we give them an adequate supply of water—and until the streets and courts in which they live are properly paved and cleansed. To what benefit is it to enforce upon them the necessity of opening their windows to admit fresh air, when the atmosphere without is as bad, and in many cases worse, than that within? *The first effective movement must be made by those whose duty it is to watch over the municipal arrangements of the town.* We must remember that the eyes of all Europe are now upon us—and that Liverpool is held up as an example of the consequences of the neglect of public duty. It is time that this great community should recognize its responsibilities, and, leaving all minor questions for the present, should proceed with one heart and mind to put an end for ever to this state of things, and rescue the town from the stigma which so deservedly rests upon it.

The usual MONTHLY MEETING of COMMITTEE was held in the Town Hall, on Wednesday, 14th ult., ADAM HODGSON, Esq., in the Chair.

Two meetings of the working classes have been held, one on the 6th and the other on the 20th ult., in the South and North Church of England Schools. The Rev. Mr. CARPENTER took the Chair at the first meeting, and ADAM HODGSON, Esq. at the second. Lectures were delivered by Dr. INMAN and Mr. SAMUEL HOLME, followed up by addresses from several members of the Association. These meetings were numerous attended by working men, their wives and families, and great interest was displayed in the proceedings. Similar meetings will be held once a fortnight, and we anticipate much good from them.

DONATIONS.

Richard V. Yates, Esq.	£5 0 0	T. Littledale, Senr., Esq.	£1 0 0
Miss Yates	5 0 0	C. Grimshaw, Esq (additional).....	0 10 0
A Lady, & A. Higginson, Esq.....	1 0 0	C. G. C., the result of a bet.....	0 5 0

SUBSCRIPTIONS.

J. Coward, Esq.	£1 1 0	H. P. Horner, Esq..	£1 0 0	Rev. J. Green	£0 10 6
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All communications for the LIVERPOOL HEALTH OF TOWNS' ASSOCIATION, to be addressed to the Committee Rooms, Fenwick Chambers, Fenwick-street.

THE LIVERPOOL HEALTH OF TOWNS' ADVOCATE.

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THE COMMITTEE OF THE LIVERPOOL HEALTH OF TOWNS' ASSOCIATION.

No. 7.

MONDAY, MARCH 2, 1846.

PRICE 1D.

WATER AS A SANITARY AGENT.

The very first remedial measure for the sanitary condition of Liverpool, that measure, without which no other can be effectual, is a proper supply of water. There has, hitherto, been no thorough recognition of the vast importance of this agent in a sanitary point of view. It appears to have been taken for granted, that the small quantity devoted to domestic use was sufficient for every purpose. But all who have paid attention to the subject are aware, that large streams must be poured into our towns, instead of the miserable driblets that are doled out to the poor, for a few hours a week, at a shameful expense both of money and convenience. It is time that these things should be amended, and the present wretched system abolished, for some other more suited to the public wants.

These are our deliberate convictions, which we now proceed to justify, by requesting the attention of our readers to the following considerations:

I.—THE SANITARY USES OF WATER.

1st. Drink.— 2d. Cooking.— 3d. Washing.— 4th. Cleansing of Persons and Houses.— Such are the ordinary domestic purposes to which water is applied in the dwellings of the labouring classes. But any one who is in the habit of visiting the poor will not be long in discovering that some of these purposes are very imperfectly fulfilled. The washing of clothes is by no means so frequently done as it ought; and our experience convinces us that the quantity of water used is far from being adequate. It would not be easy to find a poor dwelling containing vessels capable of holding the supply required for *a washing*, as it is called, and the consequence is, that thorough cleanliness of apparel is a rare occurrence in the lower classes of society. Similar remarks are applicable to the washing of houses and furniture. The effluvia arising from the filthy water used in scouring are sometimes most offensive and unwholesome, for it not unfrequently happens that the same quantity has to be used for several purposes in succession. It may be said that bad habits have a good deal to do with these occurrences, and this we readily admit. But, at the same time, we can never expect to get rid of such habits *until we afford the poorer classes every facility in our power to amend them.* Our duty is plain. We must bring water into every house. It must be always there in readiness, and in any quantity that may be required, and then, but not till then, shall we be warranted in expecting a proper estimate of the value of domestic cleanliness among the poor.

There is the *desire* to amend, and the poor certainly shew every wish

to avail themselves of the scanty supplies at their command; for our excellent stipendiary magistrate, Mr. Rushton, has told us, that a large portion of the cases of assault brought before him arise from the anxiety of the people who crowd round water taps, and strive with each other for the best chance of getting their vessels filled. We have already published the evidence of the Rev. Mr. Hampton, as to the fact that the supply is sometimes cut off before all get their turn, while the more fortunate applicants exhibit a kindness of heart worthy of all praise, in dividing part of their own small quantity with those who have got none. We feel perfectly justified, then, in stating, that even for the ordinary domestic purposes of the poor the supply of Liverpool is miserably deficient, either in its quantity, its manner of distribution, or both; and, consequently, for other sanitary uses, there is not one drop to spare.

5th. Water for House Drainage. — Every cottage must have its separate drain, sink, and water-closet: cess-pools of every description must be abolished, and the improved appliances of a better civilization substituted for them. We shall return to this matter afterwards, and merely allude to it now as an important object for which water must be provided.

6th. Cleansing Streets and Courts by Washing, at least once a day. — This process requires head pressure and the use of the hose. It is applicable to all flagged surfaces and well-paved streets. It would hardly answer for macadamized roads, and is not very well adapted for rough paving; but even for this it would be a better method of cleansing than that now followed, which consists of little more than painting the whole street over with putrid mud, which had previously settled itself quietly in the gutters or hollows, in obedience to the law of gravitation. By the process of street washing, the whole would at once be swept into the sewers, and removed out of the town. We need hardly say that a very large quantity of water must be provided for this purpose.

7th. Washing of House Fronts by the Hose. — This very commendable custom exists in Philadelphia; and nearer home, at Oldham. The mill-owners wash their factories once a month; and the Town-hall is likewise cleansed within the same period: it is also used for private houses, but not universally. We agree with Dr. Playfair, that it "ought to be encouraged, for by accustoming the eye to cleanliness, and encouraging habits of neatness and taste, a decided step will be made in the improvement of the social and sanitary condition of our population."

8th. The Establishment of Public Fountains. — We consider this as one of the most important objects to which water could be applied. We have often asked ourselves the question, How it has happened, that, with all our civilization, we appear to have no perception of the *beauty* of water? And yet there are countries in Europe, on whose social condition we are accustomed to look with a kind of contempt, in which there is not a town, and hardly a village, that is not decorated with beautiful fountains. Man has provided, almost every where but in England, that the

community in which he dwells shall have gushing water in every street, and that the lower animals shall never suffer the pangs of thirst. It has been left for us, in the middle of the 19th century, to have towns without a solitary public well, either for man or beast. And when it is considered how dependent the animal creation is upon us, and that a poor dumb creature may walk for miles through the streets of Liverpool, and not find one drop of water to cool its tongue, it is enough to bring the blush of shame into every face. If we cross the Atlantic to New York, the Liverpool of America, we find a community alive to its duty, bringing a running stream for 40 miles, under ground, into the heart of their city, and welcoming its entrance "with roaring cannon, sonorous bells, waving flags, floral canopies, and a loud chorus of song." The New York fountains are amongst the most magnificent in the world. They throw their jets 60 feet high. The one in the Park, opposite Astor House, consists of a large central pipe, with 18 subordinate jets, playing in a basin 100 feet in diameter. The great jet at Harlaem throws its water above 100 feet into the air; and there is abundance for all. It is never too late to improve. Let us have plenty of water, if we have to bring it from the Lancashire or Yorkshire hills, and we shall soon combine the beautiful with the useful, and wipe off our present disgrace.

9th. Public Baths. — It is delightful to meet with something worthy of approval; and for the establishment of baths, the Town Council, and those individuals who originated the movement, deserve the thanks of the public. We hope to see our working classes so alive to the sanitary advantages of bathing, as to demand increasing accommodation, and consequently a larger quantity of water than is at present used.

10th. Water for Cleansing Sewers. — Some people would consider it very extravagant to let water run to waste; and yet this is one of the best uses to which it can be applied, provided it be allowed to pass into the sewers. Rain water, and the overflow from houses and fountains, when we get them, might be sufficient to keep up a constant current. But in order to secure the important object of having the sewers clean, provision ought to be made in the water supply.

Lastly. — It must never be forgotten that Liverpool is increasing with extraordinary rapidity, and that a quantity of water, which would be adequate for every purpose this year, would be most inadequate in ten years hence. So that our immediate supply must not only be very large, but capable of easy extension, to meet circumstances as they arise. We have said nothing of water for watering streets and extinguishing fires, because separate provision is now being made for these purposes. But still it appears a needless waste of money, to lay down two sets of pipes where one would be enough, and to have two establishments in a case where unity is so very desirable.

II.—AMOUNT OF SUPPLY.

After what has been said, no one can doubt for an instant that a very

large additional supply of water is requisite for Liverpool; but it is not so easy to calculate the precise quantity needed. The amount taken for domestic uses must, of course, vary according to the habits of the consumers. Those who are cleanly in their persons and houses will use more than others who are not so; but in any case, we do not consider that our working classes are sufficiently informed as to the great importance of water as a sanitary agent, to make use of the quantity which we yet hope to see consumed. The present supply, for domestic purposes, is probably much less than it ought to be in every town in the kingdom, for it is found to vary considerably in different places. Dr. Playfair states, that, "according to the evidence of well-informed witnesses, the cottage consumption of Liverpool, even in the case of a family of more than ordinary cleanliness, rarely amounts to 20 gallons daily." Taking the average population of our cottages at 7 persons, as given by Dr. Duncan, this would allow less than 3 gallons a day to each. Mr. Gravatt calculates the consumption for domestic purposes, in London, at 4 gallons a-head per diem. The experience of Nottingham and Preston is, that a labouring man's family requires between 40 and 45 gallons a day, which would give about 8 gallons for each; and at Greenock and Paisley, the amount actually taken for domestic use is about 12 gallons a day per head. How truly insignificant, at the most, do these supplies appear, when compared with what we lately mentioned of Modern Rome, with its 250 gallons a day dispensed to every inhabitant who chooses to use it, or the still greater quantity of 312 gallons, in the days of the empire! Only a small portion of this could ever be used for household purposes; but there is a great principle involved in it, which we wish to see fully recognized and adopted in practice, namely,—*an abundant and constant supply for all who choose to take it.* Nothing short of this will ever extend the use of water as it ought to be. We must have a water pipe to every cottage, and the water must always be on at pressure; and if there be those who are so poor as not to be able to pay the moderate rate required, they must be provided for by public fountains.

It is impossible to say what amount would be requisite for the other sanitary purposes we have enumerated. And the only method of providing for every contingency would be, to get all the water possible, from the most productive and cheapest source; for it fortunately happens that, if the supply be abundant, the additional expense of steam power (provided it be requisite) is only that of coal, tear and wear, and attendance. Mr. Hawksley says, in his evidence, "Assuming the possibility of varying our works without cost, the experience of Nottingham is to this effect, that we could give eight or ten times the present unlimited supply for about a double charge." This is a most important practical fact.

Almost of equal importance as water itself, is the *rate* required to be levied to pay the expense. This, of course, must depend on the capital laid out in the works, which must vary in almost every locality from a

great variety of circumstances. There are two considerations of immense importance, bearing upon this point. First, there ought to be the most perfect adaptation possible of scientific principles, so as to diminish the original cost of works to the lowest practicable level; and, secondly, discarding all idea of making the water supply of the town a matter of profit. In ancient times, charges appear to have been made simply for repairs; but, all over England, joint-stock companies have naturally been anxious about dividends. We do not blame them for this: such has been the custom; and they have only acted as others would have done, in serving themselves while they were serving the public. The fault is rather in the *system*, which has permitted a matter properly within the functions of municipal authorities to pass into private hands. The rates levied in different places seem to vary between 4 and 6 per cent. on the rental. But we repeat that, under a proper system, nothing ought to be charged but for cost of works and superintendence. *There ought to be no profit.* Several of the Scotch towns appear to be supplied in this way; but as the local facilities are unusually great, they cannot be taken in every respect as standards of comparison. It may be useful, however, to mention the case of Campbelltown, a town with 7000 inhabitants, which has been supplied by Mr. Thom, at a cost of only £2500, including the estimate for wear and tear, superintendence, &c. Interest at 5 per cent. is charged on the whole, which would amount to a water-rate of about 1s. 9d. a year on a family of five persons, provided all took the water: and for this small sum *each individual* would have a supply of 13 gallons a day. We cannot, of course, expect such a concurrence of circumstances in Liverpool; but still this example shews what may be done, and what ought to be aimed at. We shall afterwards have to prove that all the principal sanitary measures for the town will be carried out, at the least expense, as *a unity*. That is to say, the same parties who supply water must pave, sewer, and cleanse the town, and they must, in addition, find a profitable use for the manure, which will reduce the balance to be made up by general rate to the smallest possible amount.

III.—QUALITIES OF WATER.

In making surveys, to increase our supply, it is of essential importance to examine the geology of the country, and also to analyse all waters with great care. The absence of colour, taste, and smell, does not afford a test sufficiently accurate for all purposes, because some waters contain a large quantity of matter dissolved in them, which add greatly to their expense when used, while they do not influence their sensible qualities. A few examples will illustrate this point. The water of Aberdeen contains 1 grain of chalk per gallon, while that of Manchester contains 14 grains. Now, chalk makes water *hard*, which causes the consumption of so much larger a quantity of soap than soft water, that it has been calculated that the additional expense in Manchester amounts to £49,363 per annum, or nearly double the present water rental of the town! So that while the

nominal price of water may be low, its actual cost may be very great from its hardness. The London waters have from 13 to 16 grains per gallon: and the different companies distribute no less than 9000 tons of chalk a year with their supplies. Dr. Clarke, of Aberdeen, whose evidence ought to be used as a guide in this matter, has shewn, that water containing 16 grains per gallon, requires three times as much soap to form a lather for washing as another water with 4 grains per gallon. Hard water is also expensive from the great wear and tear of clothes, arising from the rubbing required in washing: so that the loss is twofold; and hence the direct tendency of the introduction of hard water into a town is to discourage habits of cleanliness among the poor. Of all qualities, therefore, that of *softness* is the most desirable.

IV. — MANNER OF SUPPLY.

The next question for discussion is the method best adapted for distributing water for towns. At present, Liverpool is supplied by what is called THE INTERMITTENT SYSTEM, which is described by Dr. Playfair as follows:—“In Liverpool, the water is laid on only on alternate days, or (as Sunday is excepted) three times in the week. The hours of service vary from 1 to 2½,* during which time all the water necessary for two days' consumption must be collected; and if, by any chance or necessity, the tenant be absent from home during these hours, and his previous supply be exhausted, he is deprived of water for four days.” * * The people “are obliged to collect the water in whatever vessels they can most conveniently procure. And even when this is effected, its retention in the sitting-room, where it becomes heated, and absorbs vitiated air, renders it unpleasant as a beverage, and induces the tenant to resort to other injurious modes of allaying thirst.” * * “The inconvenience of collecting water in vessels wanted for other purposes, affords so many inducements for its sparing use, that a proper degree of cleanliness in the houses of the poor is prevented.”

We have here a fair and temperate account of a few of the evils of the intermittent system; and if considered along with what has been already said on the sanitary uses of water, it can lead to no other conclusion than that the system is as mischievous to the poor as it is utterly incapable of fulfilling the great objects of a water supply. In an economical point of view, it is also most expensive. Dr. Playfair states, that when the rent of a cottage in Liverpool amounts to about £7, the water-rate paid to the company will be 7s.; but the actual additional rent paid by the tenant to the landlord is 13s. So that the poor, who are least able to pay, are taxed *by the system* to above 9¼ per cent. on their rental! Another item of expense, to be placed to the account of the intermittent supply, is the disastrous loss occasioned by fire, owing to the water mains not being constantly filled, and the greatly increased rates of insurance,

* It is sometimes not on for *one quarter* of this time.— *Vide* Report of the Highway Board.

rendered necessary to cover the increased risks. In short, the disadvantages are so great, that it is worth a great sacrifice to get rid of the system altogether. It has been proposed, as a remedy, to erect water cisterns and tanks, for supplying the poorer class of houses; but the remedy would be inadmissible on sanitary grounds, for water ought never to be exposed to the atmosphere of towns, especially such as ours. It ought, on the contrary, to be used as soon as possible after being drawn from the tap, otherwise it absorbs rapidly the deleterious vapours with which the air is loaded; and, practically, no cistern could be kept sufficiently close to exclude them. In addition to this, there would be the damp arising from water kept under the roofs of houses, the repairs needed, the amount of cleansing required in the cisterns, and the great original cost, which has been computed by Dr. Playfair at above £90,000, or probably nearer £100,000, for cisterns for Liverpool alone. This outlay would fall on the tenants, in the shape of rent, and make the supply still dearer.

In contrast with this barbarous method, let us see what is done by the NATURAL SYSTEM OF SUPPLY. The Croton river is brought to the city of New York by an aqueduct 40 miles in length. It is received into two reservoirs, one capable of containing 150 millions of imperial gallons, and the other 21 millions, at the height of 115 feet above tide. There are 150 miles of mains, four miles of which are three feet in diameter. The water is kept at high pressure in all the streets, at all times, so that it is always on, and the inhabitants have a constant supply night and day. When the New York report was printed, only a short time had elapsed since the opening of the works; but even then, 6000 houses and manufactories, out of 30,000, had taken the water, at an average rent of 14 dollars, which, of course, would decrease as the number of consumers augmented. All who cannot pay for water are supplied by public fountains and hydrants, of which there were 600; and the number has now greatly increased. "It is impossible to say how much water is supplied per annum, as the hydrants and fountains are in constant use," and "the water is used for all purposes." Fires are chiefly extinguished by a hose attached to fire plugs on the mains, the water being thrown up by the head pressure; and since the Croton water was introduced, the losses by fire have diminished one-half, and insurance premiums have fallen 25 per cent. Philadelphia is supplied on similar principles.

The natural system has also been already adopted in several places in this country with entire success. It is in operation at Preston, Ashton, Oldham, Bury, Rochdale, Nottingham, &c., and we hope soon to see it extended over the whole country. It requires a large supply of water to carry it out; and the present plan of pumping wells dry, and allowing the water time to collect, must of course be given up. The expense to the consumer is much less than that of the plan in operation in this town; for Dr. Playfair states that the charges in Liverpool, for a stinted and intermittent supply of water, are nearly double those charged for a constant and unlimited supply at Nottingham, Ashton, and some other towns.

Besides, *it is the only method suitable for sanitary purposes*; and on this account especially we would urge its adoption.

V.—SANITARY RESULTS OF INCREASED SUPPLY OF WATER.

Any one who will consider the subject must perceive that the additional cleanliness, and other circumstances arising from the proper sanitary use of water, must be attended not only with beneficial moral effects, but that there must at the same time be a diminution both in the amount of sickness and mortality. There have been hitherto comparatively few examples of increased water supply, but the results which have followed have been most satisfactory, as is shewn by the following extracts from the Reports of the Sanitary Commission:—

1st.—Mr. Ashton, of Hyde, who has supplied his tenants with plenty of pure water, is asked—

“Have you noticed any effect on their health? Yes, very great indeed: cleanliness has always a tendency to health, and they are much more cleanly.—You consider that their health has decidedly improved? Certainly: * * * they admit that themselves.

2d.—The following question is put to Mr. Hawksley, engineer of the Trent Water Works, Nottingham:—

“What has been the effect produced on their habits by the introduction of water into the houses of the labouring classes? At Nottingham, the increase of personal cleanliness was at first very marked indeed: it was obvious in the streets. The medical men reported that the increase of cleanliness was very great in the houses, and that there was less disease.”

3d.—Mr. Thom, of Greenock, in his evidence, says—

“When the cholera commenced at Greenock, the many dirty streets and lanes in that town were cleansed by a copious supply of water, sent down from the Shaws Water Aqueduct. Hence, in all probability, the few deaths which happened there, compared to those at Dundee, Dumfries, Musselburgh, and other places similarly low and dirty.”

4th.—Sanitary results have also appeared at New York and Philadelphia, particularly in the latter, in regard to which it is stated that—

“Since the present abundant supply of water has been introduced into the city, we see everywhere habits of cleanliness in and out of doors; and the health of the people has been increased beyond comparison with that of other towns not possessing similar advantages. Dr. Heylem says that the bills of mortality have lessened at least 2 per cent. since the introduction of the Schuylkill water.”

We deem any comment on these facts superfluous, further than that we consider them perfectly conclusive, and fully justifying our demand for a supply of water sufficient for every sanitary purpose.

The Monthly Meeting of Committee took place on the 11th ult., Adam Hodgson, Esq., in the chair.

A Meeting of the Working Classes was held in Moorfields School, on the 3d ult. William Brown, Esq., presided, and the address was delivered by the Rev. H. Hampton.—Another meeting was held on the 17th ult., in St. Patrick's School-room, Richard Sheil, Esq., in the chair; and the address was given by Sir A. Knight, M.D. The attendances were numerous.

*Subscriptions for the present year:—*Annual, Edwd. Humble, Esq. 21s., Richd. Sheil, Esq., 21s
*Donation—*Rev. John Robberds, 10s.

THE LIVERPOOL HEALTH OF TOWNS' ADVOCATE.

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PRICE 1D.

ECONOMY OF SANITARY IMPROVEMENTS.

BEFORE proceeding to the consideration of the various sanitary improvements for Liverpool, demanding a large outlay of public money to carry them into effect, it appears necessary, in order to meet objections on the ground of expense, to shew, at the very commencement, that, under proper management, these improvements, extensive as they must be, ought to produce a saving equal, to say the least of it, to any outlay that may be incurred.

I.—COST OF A BAD SANITARY CONDITION.

Let us begin with the loss entailed on the community by the evils which now exist. It is always an expensive matter to act, either in the neglect of natural laws or contrary to them; and as we have already proved that the low sanitary condition of the town proceeds from these very circumstances, we may infer that all the suffering and disease and death, which is taking place around us, cannot exist without occasioning a most serious pecuniary loss to the community. We have already shewn that, assuming Ulverstone district as a standard of comparison, there are no fewer than 3611 deaths a year, in Liverpool, more than there ought to be, if we could raise its sanitary state to that of Ulverstone. And we have also given Dr. Playfair's estimate of the annual excess of cases of sickness at 101,108. Our space will not permit us to trace the bearings of these two facts on the wellbeing of the public through all their ramifications; but we shall state a few of the more prominent results.

FIRST.—Out of these 3611 deaths, there are 2063 adults; and every individual born in the town loses, on an average, $21\frac{1}{4}$ years of life. There is a great mortality, as we have already seen, among children; and of those persons who arrive at adult age, every individual loses $12\frac{1}{2}$ years of the natural term of existence. The amount of pecuniary loss from these causes has been calculated by Dr. Playfair as follows:—1st. Taking the ordinary expense of funerals at £5 each, the annual extra cost under this head would be £18,055.—2nd. If the productive labour of each individual be assumed as worth 10s. a week, the total annual loss of labour would amount to £953,225.—3rd. Supposing each case of sickness to involve an expense of £1, we should have an annual loss of £101,108 from this cause. So that the first direct loss to the community is no less than £1,072,388 per annum, in addition to the great expense of medical charities, which,

in Liverpool, have a constant struggle for existence, on account of the heavy demands on them, from the bad sanitary state of the town.

SECONDLY.—The support of a large number of widows and orphans is continually entailed upon the public. In March, 1844, there were 1895 widows, and 1834 children under 14 years of age, dependent on them, in the receipt of out-door relief in the parish of Liverpool, in addition to widows and orphan children in the Workhouse; of the latter of which there were, at the same period, 344. Now, we do not mean to say that all of these were thrown upon the parish as a consequence of the low sanitary condition of the town, but that a very considerable proportion may have been reduced to widowhood and orphanage from this cause, we have already given sufficient evidence to shew. Another serious item of parish expenditure arises from fever, which, to a great extent, attacks persons in the vigour of life and usefulness. It has been proved, for instance, that the number of fever cases occurring between the ages of 20 and 30, is nearly equal to the number taking place at all other ages put together; and this scourge of unhealthy neighbourhoods does not choose the weak and sickly for its victims, but hardworking mechanics, in the very prime of their usefulness. Thus it was found that, during an epidemic, at Glasgow, out of 429 persons attacked with fever, only 10 were emaciated and unhealthy in appearance, and only 65 were of spare habit, all the others being vigorous. Now, if we would form an estimate of the expense of fever, a disease arising from preventible causes, let it be remembered that, during one epidemic in Liverpool, the North and South Dispensaries attended 5779 cases, and that we must add to these the number attended in the Fever Hospital and by other charities, as well as by private practitioners. The parish authorities of Liverpool and West Derby are the most competent parties to estimate the amount of poor-rate necessary to meet the expenses arising from fever, and other preventible diseases, in their boundaries. It was found that in two of the London parishes the cost of relief for fever cases alone, independent of every other disease, was £2467 16s. in one year.

It is a great mistake to suppose that where there is a high rate of mortality, the population must necessarily decrease. It is, on the contrary, a law of nature, that the more deaths there are, the more births there must be. We see similiar efforts at the preservation of species throughout the vegetable and animal kingdoms; so that, wherever there are a great number of infants born, we may be sure there is a high rate of mortality, while the survivors grow up into a sickly population. There is thus another cause of expense to the community, for in Liverpool we have an excess of no fewer than 504 births a year.

Enough has been said to prove that the low sanitary state of the town is anything but economical. We have been very unwilling to make use of such an argument, for it is to be hoped, for the honour of humanity,

that few, if any, of our readers require to be influenced by merely pecuniary considerations, in a matter so deeply involving the moral as well as the physical welfare of thousands in all time to come. It appeared needful, however, to the proper understanding of the subject, that such details should be given. On the moral part of the question, Dr. Playfair says, with justice, that —

“The pecuniary loss to the community is only a small part of the evils resulting from the premature removal of the parent, — there is a wide array of evils in the back ground, which in time come forward to oppress a community, whose neglect, in the first instance, was the cause of their production. The misery of surviving relatives — the dependence of those who should have been independent of public aid — the physical and mental deterioration of those who struggle with difficulty through the perils of childhood, without aid from the public funds — are far more important considerations than the pecuniary burdens entailed by their existence.”

“I believe there can be little doubt that the prevalent custom of exhibiting narcotics to children arose from the depressed state of their constitution, caused by the existing physical causes of irritation and disease. And all concurrent evidence combines to show that the same conclusion may be drawn with reference to the intemperate habits of adults. The low state of the system, produced by continued exposure to the physical causes of disease, creates an appetite for stimulants, which gradually lowers the moral as well as the physical condition of those who resort to their use. The absence of cleanliness in houses produces a state of discomfort, which gradually drives the most well-disposed person to the tavern, and causes much crime and immorality.”

The moral bearings of the subject would admit of much more extensive illustration, were it necessary; but the brief outline that has been given, if taken in connexion with the estimated pecuniary loss, ought to be sufficient to prove to every man, that such a state of things as we are at present surrounded by is dear at any cost, and that it must be put an end to.

Our argument, however, does not stop here; and we next proceed to show that, if it be an expensive matter to act in the neglect of natural laws, it is a very profitable thing to act in accordance with them.

II.—VALUE OF TOWN MANURE.

A great proportion of the sickness and mortality which afflicts the town arises, as has been already proved, from *want of drainage and want of cleansing*. We have permitted the constant accumulation of decomposing matters in our streets and courts, in our ashpits, and under the foundations of our dwellings; so that needless sickness and death are visited every year upon thousands of our fellow-creatures: and yet these very materials, when removed away, and applied to the purposes of agriculture, are ready to prove to us an inexhaustible mine of wealth. We might almost adopt, *verbatim*, and apply to Liverpool, the following graphic sketch, from the Report on the Sanitary Condition of the Labouring Population: —

“ Within the town we find the houses and streets filthy, the air foetid;—disease, typhus, and other epidemics rife amongst the population,—bringing in the train destitution, and 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, would 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 removeable, 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.”

It is a law of nature that the vegetable and animal kingdoms should be as it were supplementary the one to the other. Animals, by breathing air, load it with carbonic acid, and render it noxious to themselves; while vegetables absorb the acid gas, and give out oxygen in its stead, and thus supply the animal kingdom with vital air. Then again, whatever elements an animal takes from the soil as food, it returns again to the earth in a different form, noxious to itself, but nevertheless furnishing to the vegetable kingdom abundant and wholesome nourishment. It is thus that the organic elements complete their circuit in living beings. Nothing is lost, it is only reproduced in another form. These principles lie at the root of the whole science of agriculture, while they constitute the basis of all economical sanitary arrangements.

The principle has been long admitted, and to a certain extent acted upon, that the refuse of a town, when applied to agricultural purposes, has some money value; but there seems, with few exceptions, to have been no approximation even to an adequate estimate of that value. It is stated in Dr. Playfair's Report, made in 1844, that the amount obtained by the sale of the town manure of Manchester was £800 per annum; and in Liverpool it produced £1150; while at Rochdale it was only worth £18 10s. In some of the Scotch towns these things are managed better. The cost of cleansing Edinburgh is £12,000 a year, and the manure, which is public property—*as it ought to be in all towns*—sells for £10,000 per annum. At Perth and Aberdeen the manure pays the whole cost of cleansing, and returns, in addition, an annual revenue of £430 to the former town, and £600 to the latter. The whole of the rich and beautiful country extending from Gravelines to Ostend originally consisted of a

barren sandy waste, which has in the course of ages been converted into a garden, by the continued application of manure brought from a distance.

III.—SUPERIOR VALUE OF SEWER WATER AS A MANURE.

The instances given above shew in all probability the most that has been made of solid town manure. It is expensive to collect and remove, as well as to distribute over the land; and a good deal of the weight and bulk of it is unproductive, while in all towns where cesspools exist, the best part of the manure sinks into the subsoil or evaporates into the atmosphere, so as not only to be a loss to the public, but a serious cause of disease. Common sense, therefore, as well as economy, would point out the necessity of having a perfect system of sewers for every house, court, and street, so as to convey away all the manure in a liquid form, diluted with water. It should never be mixed with coal-ash and cinders, which ought to be removed separately. Now, this liquid manure, SEWER WATER, which is at present poured into our dock basins, as a nuisance to be got rid of, might be made a source of great wealth to the town. If by any means it could be brought in contact with the barren soils in the neighbourhood, it would cover them with the most luxuriant vegetation. Fortunately this is not a matter of mere speculation. It has been in operation for many years, and we are much mistaken if the practice does not become universal, so far at least as circumstances will permit. The sewer water of several of the towns in Devonshire is employed for the purposes of irrigation, particularly at Ashburton, where it has been so applied for above 40 years. The meadows are deep-drained, to prevent any stagnation, and the sewer water is thus allowed to pass off as soon as it has given its nutritious principles to the grass. Land which is not under this irrigation yields a coarse herbage, with rushes; but after the application of the liquid manure it grows the finer and more nutritious grasses in abundance, and there is a crop for ewes and lambs fully a month earlier than in other situations not similarly circumstanced. The value of *unimproved* land is from 30s. to 40s. an acre, but *after irrigation*, it is worth from £8 to £12 per acre. We have here, at all events, a very strong proof of the value of the manure.

The whole of the sewer water of Milan, a city containing 150,000 inhabitants, is distributed by channels over a large extent of meadow land, which it fertilizes to a prodigious degree. During the summer months the irrigation takes place for a few hours once a week, and during the winter it is nearly permanent. The meadows are mown in November, January, March, and April, for stable feeding; and in June, July, and August, they yield three crops of hay for winter; while in September they furnish abundant pasture for cattle till the beginning of the winter irrigation. These lands, after paying land-tax and all other expenses, yield a net annual rent of 8 guineas an acre.

The most remarkable example, however, of the value of this kind of

irrigation is afforded by certain meadows in the neighbourhood of Edinburgh. A portion of the sewer water of the Old Town is received into ponds, and allowed to deposit a considerable quantity of solid matter. From these ponds it is allowed to flow equally over plots of land, so as to cover them, and after passing through the soil it is carried off by thorough drainage. Three kinds of soil have been treated in this way: 1st, a strong loam on a clay sub-soil; 2nd, a lighter soil nearer the sea; and 3rd, *a pure sea sand, without any appreciable mixture of earthy matter*, going down to high-water mark. About 300 acres have been irrigated at various times, some for upwards of 30 years. The productiveness of these meadows is extraordinary. In the year 1835, some of the richest land was let for £38 an acre; and in 1826, which was a scarce year, as much as £57 per acre was obtained for the same meadows. Mr. Smith, of Deanston, who is the highest authority on such subjects, concludes his report of this most satisfactory experiment as follows:—

“The practical result of this application of sewer water is, that land, which let formerly at from 40s. to £6 per Scotch acre, is now let annually at from £30 to £40; and that poor sandy land on the sea-shore, which might be worth 2s. 6d. per acre, lets at an annual rent of from £15 to £20. * * * The average value of the land, irrespective of the sewer water application, may be taken at £3 per imperial acre, and the average rent of the irrigated land at £30, making a difference of £27; but £2 may be deducted as the cost of management, leaving £25 per acre of clear annual income due to the sewer water.”

But after the water has covered the whole of this land—even the sea sand down to high-water mark—with a rich and luxuriant vegetation, its productive powers are by no means exhausted; for Mr. Philips, the Government Chemist, found, that while a gallon of water taken immediately from the sewer contained 82·7 grains of solid matter in solution, after having caused all this fertility, a gallon taken as it flowed into the sea still held 72·9 grains in solution; so that the whole consumption of soluble matter was only 10 grains per gallon in its course. A short time ago it was proposed to compel the discontinuance of this irrigation on account of nuisance proceeding from the ponds, and the proprietors of only one portion estimated their claim for loss at £150,000; and it has been shewn, that even by the present very imperfect method of application, *the whole* of the sewer water of the city would bring a revenue of between £15,000 and £20,000 a year. These instances are amply sufficient to prove the existence of a great source of wealth in the sewer water of Liverpool.

There is nothing mysterious in all this, when we come to examine the subject. Let us take as an illustration the river Medlock, which receives the drainage of Ardwick, Chorlton-upon-Medlock, Hulme, and a large portion of Manchester. It is a source of disease in the town; and Mr. Holland describes it as giving out the “vilest compound of villainous smells that the most lively imagination can conceive.” Now, in the

as to the expense, from which it appears that the capital required for ponds, engines, mains, &c., would amount to £3 14s. 2d. an acre; and the whole expense, including the raising and distributing the water, wear and tear, interest on capital, rates, &c. of applying 17,920 gallons to an acre, would be 12s. 9d.; while the cost of an equivalent dressing with guano would be £1, and that of a dressing of stable dung £3. The larger the quantity of sewer water applied, the cheaper it would be in proportion. Thus, *twice* the quantity of each substance would cost—sewer water, 16s. 6d.; guano, £2; stable dung, £6. Assuming that the ground is dressed with the smaller of these quantities, the *average* saving from using sewer water would thus be £1 7s. 3d. per acre.

If we take the population of Liverpool at 300,000, their annual produce of sewer water would, according to Mr. Smith's data, be 7,140,485,676 gallons; and, *if use could be found for all of it*, at the yearly rate of 17,920 gallons per acre, it would fertilise 398,460 acres. So that, allowing about one-half of the saving to go to the farmer, there would still, on Mr. Smith's data, be a revenue of above £270,000 a year to the town. And be it remembered, that this estimate rests on the assumption of the *present sewer water* being used, without taking into account the improved drainage, by which the *whole soil* of the town (that to a very great extent is now otherwise disposed of,) will be suspended in the water of the sewers, and increase vastly its value as a fertilising agent.

By an experiment made lately in Lancashire, it was proved that eight tons of sewer water were superior in efficacy to fifteen of farm-yard manure, or three cwt. of guano.

We need hardly say that, if even a small part of this be true, the authorities of Liverpool may have at their command, whenever they choose, a fund amply sufficient to defray every necessary expense in improving the sanitary condition of the town. The Rev. Mr. Clay, in his report on Preston, has given a calculation, in which he shows, that to place that town in as perfect a sanitary condition as external means well could, a sum of money would be required, the *annual interest* of which, to be raised by a rate, would be £8959 9s. 8d. For this sum the whole town would be cleansed, every room in it ventilated, every house would have a water closet and drain; the needful main and secondary sewers would be laid down, and half of the town supplied with water. To meet this expenditure, he estimates the annual value of sewer manure at £25,000, and the whole annual saving from improved sanitary condition, a lower rate of insurance, &c., at £22,815 more. In other words, the whole *weekly* expenditure per head of the population, for every improvement, would be about *three farthings*, while the whole weekly saving per head would be 4½d. This may be thought somewhat extravagant, by those who have not paid attention to the subject; but let us see what the Towns' Improvement Company actually offers to do, and what it is about to do for

Leicester, and, not improbably, for Manchester also. The proposal for Manchester is — To lay on pipes to every cottage, with a constant available supply of water to the extent of 100 gallons per *diem* to each house, for a penny a week for houses under £5 rent. To provide every cottage of the same class with a sink, washhand-basin, and self-acting water-closet, for another penny a week; and, for an additional halfpenny a week, to keep the foot pavement and roadway clean by the sweeping machine and washing with the jet. And lastly, “to effect street sewerage and pavement on terms of contract, and to seek its profit from an undeveloped source of revenue — the application of the refuse of the town for the purposes of agriculture.” The company expects an income of 12 per cent. on the outlay from these sources; but offers to pay over one-half of all dividends above 8 per cent. to the Town Council, as an improvement fund. The Towns’ Improvement Company has, in connexion with it many individuals who are the most competent to form a judgment on the subject, and their proposals shew the commercial value attached to sewer water as a source of revenue. Captain Vetch, R.E., one of their engineers, says in his evidence—

“If the three objects of supplying water to the town, extinguishing fires, and of sewerage and draining, were skilfully combined into one system, and if each town secured the benefits of such a combination to the inhabitants at large, their comforts and conveniences might be met either very cheaply, or even *be entirely defrayed* by a proper application of the manure.”

The objection to the use of sewer water for agriculture on the ground of malaria, is very simply answered by the fact stated by competent parties,—that while a top-dressing of stable dung gives off gases for six days, a dressing with sewer water ceases to do so in *one day*.

We have deemed it our duty to lay the preceding statements before the authorities and the public at large. We have shown the enormous cost of the present bad sanitary condition of the town, and we have, at the same time, pointed out a source of revenue sufficiently great, provided it can be developed, to meet the expences necessary to make Liverpool, as it ought to be, one of the healthiest towns in the kingdom.

FIRST ANNUAL REPORT

OF THE

COMMITTEE

OF THE

LIVERPOOL HEALTH OF TOWNS’ ASSOCIATION.

THE Committee of the Health of Towns’ Association, in presenting a Report of their proceedings during the ten months which have elapsed

since the Association was formed, think it right to premise a few remarks as to the precise objects which were proposed in its formation, as there is reason to believe that much misconception has prevailed regarding them in the public mind.

It has been supposed by some that our object was to engage *directly* in the promotion of sanitary improvements, by the raising and application of funds for the purpose; while others have entertained the idea that the Association was founded in a spirit of hostility to the local authorities, whose functions it was intended to interfere with or to supersede. Nothing could be further from the truth. The largest amount of funds which the Association could possibly command would be perfectly inadequate to their object, if it were proposed to apply them to the improvement of ill-conditioned localities; and so far from its having been intended to interfere with the local authorities, it has, from the first, been the wish of the Committee to assist and to co-operate with them, in every possible way, in their praiseworthy endeavours to elevate the sanitary condition of the town. The object of the Association, as embodied in the resolution of the public meeting by which it was formed, is "the diffusion of knowledge, and the excitement of attention and inquiry, in reference to this important subject, as the most effectual means of removing the apathy, and obviating the prejudices and fears, by which the local and general authorities may be obstructed in their efforts for the public benefit." It is conceived that, by bringing to light facts bearing upon the present unhealthy and demoralizing condition of the residences of so many thousands of the working classes—by making these facts very extensively known among all circles of society—by communicating at the same time a knowledge of the remedies, and by urging the subject in every possible way upon public attention—all would be done which it would be in the power of a private association like this to effect, towards a mitigation of the monster evil which called it into existence. The steps which have been adopted by the Committee, with the view of carrying these intentions into effect, will now be detailed.

Two plans occurred to the Committee, by the union of which it appeared to them that they would most conveniently and effectually carry out the important object of "diffusing information, and exciting attention and inquiry." One of these was, the extensive gratuitous distribution of tracts or pamphlets, either original or selected, conveying information on the sanitary condition of towns generally, but especially with reference to Liverpool. It was obvious, however, that there was a large section of the population whose inability to read, and other circumstances, would render it impossible to reach them in this way; and in order to open a channel by which these classes might be approached, and at the same time as an additional means of influencing public opinion generally, the second plan was proposed, viz., the delivery of

lectures or addresses at frequent intervals, by which the information conveyed by the publications might be communicated in a more desultory, perhaps, but in a more familiar and attractive style. Two separate Sub-Committees were accordingly appointed—the *Publication* and the *Lecture* Sub-Committees—to carry these objects into effect.

The Publication Sub-Committee procured and distributed from time to time, copies of various short pamphlets or tracts, issued by the Metropolitan Health of Towns' Association, and they have recently ordered 1000 copies of the First Address of the "Metropolitan Working Classes' Association for improving the Public Health," to be distributed gratuitously among the working classes of this town. But the most important proceeding of this Sub-Committee was—their recommendation to publish a monthly Periodical, to be devoted to the subject of the Health of Towns, in the hope that it might prove a powerful means of informing and influencing the public mind. This recommendation, which originated with the respected Chairman of the General Committee, (Adam Hodgson, Esq.) having met with the cordial concurrence of that body, the first number of the Health of Towns' Advocate appeared on the 1st of September, and it has since been published regularly at monthly intervals, upwards of 1500 copies being distributed gratuitously. It is unnecessary to say more of the character of this little periodical, than that the numbers which have hitherto been published, contain an able analysis of the physical causes of the low sanitary condition of Liverpool, for which the Committee is indebted to Dr. Sutherland, whose zealous services, on this and on other occasions, entitle him to their warmest thanks. In commencing this publication, it was the wish of the Committee that it should address itself to all classes of the community,—to the working classes as well as to the more influential and educated inhabitants. But it was thought better—considering the small size of the publication, and for other reasons—that each number should be addressed wholly to the one or to the other of these classes, as its contents, if of a mixed character, would be in one portion or other comparatively unsuited to many of its readers. It will be observed that all the numbers which have as yet appeared, have been more particularly intended for a higher class of readers but it is in contemplation, very shortly, to issue either a number of the Health of Towns' Advocate, or a distinct tract, especially addressed to the working classes.

The General Committee, at their first meeting, received a communication from Mr. Grainger, an active member of the Committee of the metropolitan Health of Towns' Association, offering his gratuitous services for the delivery of a public lecture on the Insalubrity of Towns. Being aware of the interest which Mr. Grainger had long taken in the subject, the Committee eagerly embraced his liberal proposal, and the lecture was accordingly delivered (on the 21st of May,) under the sanction and at the cost of this Association, in the theatre of the Royal

Institution, which was kindly granted for the purpose. Invitations to this lecture were sent by the Committee to the Magistrates, the members of the Town Council, of the Highway Board, and of the Select Vestry, and to the Directors of the Water Companies,—and the interest which it excited may be judged of by the fact, that the lecture-room was wholly insufficient to accommodate the numbers who applied for admission. This lecture, intended for the more influential classes, was followed, in July, by one addressed to the labouring population of Toxteth-park, kindly volunteered by Mr. H. G. Harbord, a member of the Committee. The result of this first attempt was, on the whole, sufficiently encouraging to induce the Lecture Sub-Committee to make arrangements for holding similar meetings of the working classes, in the various districts of the town, during the winter months. Applications were accordingly made to the ministers of various denominations, for the use of the schools connected with their respective places of worship; and the Committee have much pleasure in stating that from the ministers thus applied to, with very few exceptions, replies were promptly received, in every instance placing their schools—where any existed—at the disposal of the Lecture Sub-Committee. The first of these meetings—at which, in addition to the lecturer, various members of the Committee took part in the proceedings—was held on the 6th of January, in the South Church of England School, Cornwallis-street; and others have since been held in the North Church of England School, Bond-street; in St. Nicholas' School, Moorfields; and in St. Patrick's School, South Chester-street; the meetings being continued on every alternate Tuesday evening.

It is gratifying to be able to state, that these meetings have been numerously attended by working people of both sexes, and that from the interest manifested in the proceedings, there is every reason to hope that they will be the means of drawing to the subject a degree of attention which it has never yet received from those classes of the people who are chiefly interested in it, and that they may be taught to feel, that without an intelligent and hearty co-operation on their part, the efforts of others on their behalf must in a great measure fail of their effect.

Deeply impressed with a sense of this truth, the Committee were anxious to avail themselves of every probable means of exciting in the minds of the working population a similar sense of its importance, and it was therefore with no small satisfaction that, in September last, they received a communication from Mr. James Simpson, of Edinburgh, offering to attend in Liverpool for the purpose of addressing the Working Classes, with the view of inducing them to form themselves into an association to co-operate with the Health of Towns' Association in carrying out its important objects. Mr. Simpson's spirit-stirring addresses in London, and in other towns in England, had been the means, in an extraordinary degree, of removing apathy, and of calling forth the sympathies

of the people on their own behalf. In London, his addresses to between two and three thousand operatives, in Exeter-hall, had been followed by the formation of the "Metropolitan Working Classes' Association for improving the Public Health." Immediately on the receipt of Mr. Simpson's communication, therefore, a Sub-Committee was appointed to promote the formation of an Association of the Working Classes, in connexion with this Society and for the promotion of its objects. This Sub-Committee having made known Mr. Simpson's willingness to attend in Liverpool if invited, a requisition to that gentleman was prepared, and received the signatures of nearly 2,000 operatives. All the necessary arrangements were made for the delivery of the addresses, the use of the large lecture-room of the Collegiate Institution was, by the kindness of the Directors, secured for the purpose, and the addresses themselves were duly announced, when, at the last hour, the Committee had the mortification to receive an intimation that Mr. Simpson's severe and sudden illness rendered it necessary to postpone his intended visit to Liverpool. The disappointment caused by this gentleman's long-continued indisposition is to be regretted, for, as a proof that even the comparatively slight agitation of the question, caused by the circulation of the requisition to Mr. Simpson, was not without its effect, may be mentioned the fact, that shortly afterwards a deputation from the Operative Tailors' Society waited on the Committee, and laid before them a document containing important information on the statistics of their trade in reference to the health of those employed in it,—a document which was the result of a personal visitation from house to house, which they were induced to undertake in consequence of finding that an influential association existed, whose special object was to promote the health and comfort of the operative classes.

In connexion with the proceedings of the Lecture Sub-Committee, it should be stated, that they have been in communication with Jas. Smith, Esq., of Deanston, one of Her Majesty's Sanitary Commissioners, and well known as a most scientific and successful agriculturist. This gentleman has kindly acceded to the request of the Sub-Committee that he would deliver a public lecture in Liverpool, at an early opportunity, on Sanitary subjects generally, but especially with reference to the subject of sewerage, and the application of the refuse of towns by irrigation to agricultural purposes. It is hoped that Mr. Smith's other engagements will enable him, at no distant period, to fulfil this promise.

The Diagrams and Apparatus Sub-Committee was appointed for the purpose of procuring models or diagrams of improved apparatus for ventilation, draining, &c., to be used in the illustration of lectures or for public exhibition. Mr. Grainger liberally placed at the disposal of the Sub-Committee, for the purpose of being copied, the diagrams and tables used in illustrating his lecture at the Royal Institution, and complete copies of which were accordingly obtained. At the same time, specimens of chimney

and window ventilators, and of Arnott's ventilating air pump, were procured from London. For the reception of these models and diagrams, and for the accommodation of the different Sub-Committees, whose meetings, as well as those of the General Committee, had hitherto, by the courtesy of the Mayor, been held in the Town-hall, it was thought desirable to rent a room in some central situation, and at which, besides answering the specific purposes already noticed, the general business of the Association might be transacted. An office was accordingly taken in Fenwick-chambers, Fenwick-street, and entered upon at the close of September, at the yearly rent of £25. It had previously been found necessary, from the increasing business of the Association, to engage a salaried assistant, who gives his attendance daily at the office between twelve and three o'clock, at which hours the diagrams and apparatus are open to inspection. It may be mentioned that the monthly meetings of the General Committee, for which the office in Fenwick-street furnishes no adequate accommodation, continue to be held in the Town-hall, an advantage for which the Committee are indebted to the kindness of the Mayor, to whom, as well as to the late Mayor, (James Lawrence, Esq.,) the best thanks of the Association are due, for their uniform courtesy in their communications with the Secretaries.

Among the matters affecting the health and comfort of the community, to which the attention of the Committee has been directed, is the atmospheric pollution caused by the large volumes of smoke, or, it should rather be said, of unconsumed fuel, emitted from boiler and other furnaces within the town. This evil, so long complained of, and so subversive of habits of cleanliness in a town where the supply of water to the working population is not over-abundant, induced the Committee to appoint, for the investigation of the subject, a Sub-Committee, whose members were at the pains to examine, personally, a number of furnaces in which smoke-consuming apparatus is employed. The Sub-Committee gave in a Report of some length, in which they state that they have satisfied themselves that "the parties giving rise to the grievous nuisance complained of, may abate it, if they choose to do so, while, by doing so, they may effect a pecuniary saving in fuel far more than adequate to cover any temporary outlay which the necessary alterations in their furnaces might require." By direction of the General Committee, a copy of this Report was forwarded to the Mayor, with a request that he would lay it before the Health Committee of the Town Council—a request with which his Worship was kind enough to comply. The Report was also printed in the 4th number of the Health of Towns' Advocate, a copy of which was sent to every proprietor of non-consuming furnaces in the town, in the hope that motives of self-interest, if no higher considerations, might induce them voluntarily to adopt improvements so conducive to the public comfort and welfare. The Committee are glad to observe

that the Town Council, in their Bill now before Parliament, seek for power to enable them to compel the owners of furnaces and river steamers to consume their smoke. Such a power has been vested in the authorities of Manchester since the commencement of the last year, and under its operation the nuisance there is being gradually abated. Every one who consults his own or his neighbour's comfort must heartily wish that the Town Council of Liverpool may succeed in clothing itself with a like authority.

Among the measures calculated to improve the sanitary condition of the town, one of the most obvious and important is an ample supply of Water at the lowest possible charge. It cannot be denied that the present supply of this first necessary of life is miserably incommensurate with the demands of a town like Liverpool, with its 330,000 inhabitants; and, accordingly, the General Committee, at one of its earliest meetings, adopted resolutions expressive of their opinion of the absolute necessity of a better supply, and the desirableness of devising some method by which water might be furnished to the inhabitants of this and every other town, "without any expense excepting what is necessary for procuring and distributing the needful supply." Copies of these resolutions were transmitted to the Town Council, the Highway Board, the Select Vestry, and the two Water Companies, with a request that they would take them into their serious and early consideration. It was hoped that by this course they would strengthen the hands of the authorities, and encourage them in their efforts to remove from Liverpool what has long been a reproach to the public spirit of its inhabitants. It is satisfactory to know that all parties are now alive to the necessity of adopting new arrangements with regard to the supply of water. It would be superfluous to refer to the untiring and praiseworthy exertions, in this respect, of Mr. S. Holme, one of the most valued members of the Committee; but they would call on all the inhabitants of the town to co-operate with the local authorities, who, it is to be hoped, will not relax in their exertions until their efforts are crowned with success. The Committee trust that they will be excused if they express an earnest hope that, in the new arrangements to be adopted, no system of intermittent supply will be sanctioned, unless it be distinctly proved, by the highest and most convincing scientific evidence, that a constant and more abundant supply is *impossible*. With the example of other towns before us, such as Edinburgh and Glasgow, in the latter of which it is proposed to bring into the town a quantity of pure water sufficient to furnish each inhabitant with thirty gallons daily, even were the population double of what it now is, it would ill become Liverpool to remain satisfied with less, on any other plea than that of impossibility, most distinctly proved; and, in particular, it is to be hoped that no consideration of expense will be allowed to stand in the way of so desirable an improvement.

Much inconvenience has been experienced in Liverpool, from the want of consolidation in the local boards exercising jurisdiction in sanitary matters, the various powers having reference to this subject being distributed among distinct, and sometimes opposing authorities. Where the paving and sewerage of the streets, the drainage and paving of courts, the cleansing of the streets, and the supply of water, are vested in distinct and independent bodies, it is impossible that there can be that harmony of design, and unity of management, which are essential to an efficient execution of their different powers. The Sanitary Commissioners, in their Report to Government, cite the case of Liverpool as a "grievous instance of ill-considered legislation and want of consolidation, which has led to much confusion and evil." The Committee, fully participating in these sentiments, thought it right, after discussing this matter, to record its conviction that the whole subject (of the various powers bearing on the health of the town) "would be most efficiently carried out by committing it into the hands of one controlling and managing power," an opinion which they are glad to find is now very generally entertained.

Many other matters of minor importance have occupied the attention of the Committee from time to time. In particular, they have received representations from different individuals regarding nuisances of various kinds, in which they have had no power of interfering, otherwise than by forwarding the complaint to the particular authority exercising jurisdiction in the matter, where any such authority existed.

In conclusion, the Committee think that they may congratulate the members on the improved aspect of matters, as regards the sanitary condition of the town. If we look back for a few years, we shall find that public opinion on this subject has undergone an entire and most salutary change. The apathy which formerly everywhere existed has given place to an earnest desire, in the minds of the great majority of influential men, to assist in the removal of those evils which have so long afflicted that numerous class of our fellow-countrymen—the cottage and cellar inhabitants of large towns. Much has already been done in Liverpool since the public mind became awakened to the importance of the subject; but much, very much, still remains to be done. It is to be lamented that no public authority in Liverpool is invested with the powers necessary to enforce a complete system of sanitary regulations. There is every reason to hope that the present Session of Parliament will not be allowed to pass away without the necessary powers being obtained; and that, when they next meet the members, the Committee may be able to announce a continued progress towards the accomplishment of the great objects which the Association has in view.

ANNUAL MEETING.

THE FIRST ANNUAL MEETING of the LIVERPOOL HEALTH OF TOWNS' ASSOCIATION was held in the CONCERT HALL, Lord Nelson-street, on the Evening of FRIDAY, February 27th, 1846 :

THE MAYOR, DAVID HODGSON, Esq., IN THE CHAIR.

The following Resolutions, after having been ably moved and seconded by the various speakers, were unanimously adopted by the Meeting:—

FIRST RESOLUTION.

Moved by ADAM HODGSON, Esq., and seconded by WILLIAM RATHBONE, Esq.:

That the Report now read be adopted, and that the accounts of the Treasurer be passed, and that the whole be printed and circulated under the direction of the Committee.

SECOND RESOLUTION.

Moved by the Rev. THOMAS NOLAN, and seconded by J. B. YATES, Esq.:

That, as there has heretofore been a general want of information with reference to the causes of disease and mortality, which have operated to an alarming extent, especially among the working classes, in Liverpool, the proceedings of this Association, during the past year, have fully demonstrated to this Meeting the importance and necessity of such an institution, for the purpose of awakening attention to the subject, and diffusing the knowledge of such principles as are essential to the right direction of any successful efforts for promoting an improvement in the sanitary condition of the town.

THIRD RESOLUTION.

Moved by the Rev. WM. BEVAN, and seconded by CHARLES ROBERTSON, Esq.:

That this Meeting records its gratitude to those gentlemen who, either by the press, or by lectures and addresses, have directed the public mind to the great objects contemplated in the establishment of this Association; and its satisfaction at the manifest approval with which their advocacy has been received in the large assemblies which have recently been convened in various parts of the borough; and rejoicing in the union of all parties in the effort to extend common benefits to every class of society, appeals with confidence to all the inhabitants, and especially to those who are engaged, in connexion with charitable and religious institutions, for more systematic and vigorous co-operation in further endeavours to communicate correct information with regard to the influences which have proved so prejudicial to health and life, and thereby to facilitate the application of such remedial measures as the peculiar circumstances of this vicinity demand.

FOURTH RESOLUTION.

Moved by the Rev. HENRY HAMPTON, and seconded by SIR ARNOLD J. KNIGHT, M.D.:

That this Meeting, aware of the extensive field of labour which is opened to this Association, and deeply solicitous that the Committee may render efficient service in the prosecution of the work assigned to them, commends their future operations to the liberal support of all classes of society, with the hope that the funds requisite to the success of their important undertaking will be provided, with a promptitude and munificence which shall evince the determination of the inhabitants of Liverpool to remove from their town the pre-eminence which it has acquired in the records of disease and death.

FIFTH RESOLUTION.

Moved by RICHARD SHEIL, Esq., and seconded by J. BRAMLEY-MOORE, Esq.:

That the following gentlemen be requested to act as the Officers and Committee of the Association during the ensuing year:—

PRESIDENTS.

THE MAYOR OF LIVERPOOL, THE SENIOR RECTOR, THE SENIOR CHURCHWARDEN,	}	FOR THE TIME BEING.
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GENERAL COMMITTEE.

ADAM HODGSON, Esq., CHAIRMAN.
 THOMAS BLACKBURN, Esq., VICE-CHAIRMAN.
 JAMES H. MACRAE, Esq., TREASURER.

SECRETARIES.

JOHN A. TINNE, Esq., and WILLIAM H. DUNCAN, M.D.

AUDITORS.

H. C. BELOE, Esq., and WILLIAM TARBET, Esq.

THE STIPENDIARY MAGISTRATE OF THE BOROUGH.

The PRESIDENTS and SENIOR PHYSICIANS and SURGEONS of the LIVERPOOL INFIRMARY, of the FEVER HOSPITAL, of the NORTHERN HOSPITAL, of the SOUTHERN and TOXTETH HOSPITAL, of the DISPENSARIES, and of the EASTERN DISPENSARY.

MR. SAMUEL HOLME.	MR. SWINTON BOULT.
MR. WILLIAM RATHBONE.	MR. JOSEPH BOUMPHREY.
SIR ARNOLD J. KNIGHT, M.D.	MR. J. C. DUNCAN.
MR. J. STEWART.	MR. THOMAS MOORE.
MR. WILLIAM BROWN.	MR. WILLIAM KAY.
MR. HUGH NEILL.	REV. H. CARPENTER.
MR. JOHN SMITH.	REV. THOMAS NOLAN.
MR. AMBROSE LACE.	REV. WILLIAM PARKER.
REV. H. HAMPTON.	MR. JOHN A. PICTON.
MR. WILLIAM ANDREWS.	MR. H. P. HORNER.
REV. WILLIAM BEVAN.	DR. TIMMON.
MR. JOHN CROPPER.	MR. ELLIS JONES.
MR. EDWARD CROPPER.	MR. R. V. YATES.
MR. JOHN EDEN.	REV. D. D. STEWART.
MR. W. J. TOMLINSON.	MR. RICHARD SHEIL.
DR. REYNOLDS.	REV. THOMAS RAFFLES, D.D.
DR. SUTHERLAND.	MR. I. B. COOKE.
MR. THOMAS BULLEY.	MR. CHARLES ROBERTSON.
MR. H. J. WEBSTER.	MR. HUGO REID.
MR. FRANCIS ARCHER.	MR. S. MARTIN.
MR. H. G. HARBORD.	MR. WILLIAM WALTHEW.
MR. JAMES MULLENEUX.	MR. M. ASHTON.
MR. WILLIAM BARRY.	MR. WILLIAM BENNETT.
MR. JOHN GRANTHAM.	MR. WILLIAM SKIRVING.
DR. DICKINSON.	MR. JAMES REAY.
MR. HARMOOD BANNER.	MR. GRIFFITHS.
MR. A. HIGGINSON.	

At the Meeting of the General Committee, held on the 11th ult., the following Sub-Committees were formed:—

FINANCE SUB-COMMITTEE.

MR. HARMOOD BANNER.	MR. JAMES MULLENEUX.
MR. WILLIAM RATHBONE.	MR. THOMAS HAYES.
MR. W. J. TOMLINSON.	MR. RICHARD SHEIL.
MR. JOHN CROPPER.	

PUBLICATION SUB-COMMITTEE.

SIR A. J. KNIGHT, M.D.	DR. DICKINSON.
DR. SUTHERLAND.	REV. THOMAS RAFFLES, D.D.
DR. REYNOLDS.	MR. THOMAS MOORE.
DR. CARSON.	

LECTURE SUB-COMMITTEE.

MR. SAMUEL HOLME.	REV. WILLIAM BEVAN.
MR. JOHN SMITH.	MR. CHARLES ROBERTSON.
MR. H. G. HARBORD.	MR. I. B. COOKE.
REV. HENRY HAMPTON.	

HEALTH OF TENEMENTS SUB-COMMITTEE.

MR. WILLIAM ANDREWS.	MR. WILLIAM BENNETT.
MR. H. C. BELOE.	MR. HUGO REID.
MR. SAMUEL HOLME.	MR. JOHN A. PICTON.
MR. JOSEPH BOUMPHREY.	

WATER AND SEWERAGE SUB-COMMITTEE.

MR. J. B. YATES.
MR. SAMUEL HOLME.
MR. THOMAS MOORE.
MR. RICHARD SHEIL.

MR. JAMES REAY.
DR. TIMMON.
MR. WILLIAM WALTHEW.

APPARATUS AND DIAGRAMS SUB-COMMITTEE.

MR. SAMUEL HOLME.
MR. JOHN GRANTHAM.
MR. WILLIAM BENNETT.
DR. INMAN.

MR. WILLIAM TARBET.
MR. THOMAS MOORE.
MR. A. HIGGINSON.

The MONTHLY MEETING of the GENERAL COMMITTEE was held in the Town Hall, on Wednesday, March 11th.

ADAM HODGSON, Esq., was called to the Chair.

The Committee proceeded to elect the office bearers and Sub Committees for the ensuing year, as given in the preceding list. It was deemed advisable to apportion the duties of the Buildings' Sub-Committee between two new sub-committees; one for Health of Tenements, and another for Water and Sewerage.

Dr. Timmon called the attention of the meeting to the condition of certain cellars, which have been recently evacuated; and stated it to be the opinion of the medical officers of the North Dispensary, that there was great danger of an outbreak of epidemic fever, unless steps were taken to amend their present state.

On the motion of Richard Sheil, Esq., seconded by I. B. Cooke, Esq., it was resolved:

"That Dr. Timmon and Mr. Macrae be requested to furnish a statement of the nuisance in Freemason's-row to the Chairman, in order that the attention of the proper municipal authorities be called thereto."

A letter of complaint as to the filthy state of Jenkinson-street was referred to the proper authorities.

Copies of the Report of the Manchester Health of Towns' Committee, on Lord Lincoln's Bill, were laid before the Committee, and the subject was referred to the Sub-Committee on the Bill, to examine and report.

A Public Meeting of the Working Classes was held in the North Corporation School, on Tuesday evening, March 3d; JOHN A. TINNE, Esq., in the Chair. The address was delivered by Dr. Sutherland. Another meeting took place on Tuesday, the 17th, in St. Barnabas' School Room, Greenland-street. The Rev. Mr. NOLAN occupied the Chair; and John A. Tinne, Esq., gave the address. The attendances on both occasions were very large, and much interest was excited. The meetings were also addressed by Adam Hodgson, Esq., Rev. Messrs. Dover, Hampton, Nolan, and Bevan, by William Rathbone, Esq., Dr. Inman, and H. G. Harbord, Esq.

Bill of the Liverpool and Harrington Water Company.

A SPECIAL MEETING of the COMMITTEE was held in the TOWN-HALL, on FRIDAY, the 27th ult., WILLIAM BROWN, Esq., in the chair, to take into consideration the Bill of the Liverpool and Harrington Water Company, now before Parliament. The meeting was very fully attended, there having been thirty-two Members present. A lengthened discussion took place on the provisions of the Bill, especially as to their operation on the sanitary condition of the town, and the following Resolutions were adopted:

1st. Moved by Mr. SAMUEL HOLME, seconded by Mr. BELOE, and resolved:

That the heads of the Water Company's Bill having been made known to this Association, it desires to record its opinion, that such a Bill is unjust in principle, detrimental to the public interest, and it is the opinion of this Association that every exertion should be used to prevent the measure from becoming the law of the land.

That a copy of this Resolution be forwarded to the Town Council, and also to the Highway and Sewerage Board, and that it be advertised once in each of the Liverpool papers.

2nd. Moved by Mr. SAMUEL HOLME, seconded by Mr. WALTHER, and resolved:

That a Requisition be presented to the Mayor, respectfully requesting him to call a Public Meeting of the Inhabitants, for the purpose of taking the opinion of the public with reference to the Bill of the Liverpool and Harrington Water Company now before Parliament, and that the inhabitants of the town be requested to sign such Requisition.

3rd. Moved by Mr. REAY, seconded by Mr. ANDREWS:

That a Sub-Committee, consisting of Mr. Blackburn, Mr. Charles Robertson, Dr. Sutherland, Mr. Reay, and the two Secretaries, be appointed to draw up the Requisition to the Mayor.

ACCOUNT PRESENTED AT THE ANNUAL MEETING.

HEALTH OF TOWNS' ASSOCIATION, *in Account with* JAMES H. MACRAE, *Treasurer.*

Dr.	£. s. d.	Cr.	£. s. d.
1845 to 1846.		1845 to 1846.	
To Cash.—Printing and Advertising, &c.....	54 3 6	By Cash.—Donations.....	194 4 0
Health of Towns' Advocate...	32 0 0	Subscriptions.....	61 1 6
Agent's Salary.....	18 0 0	Discount on Bills....	0 2 0
Cash remitted to London for Pamphlets.....	5 11 0	Bank Interest.....	2 0 2
Expenses incurred at Public Meetings, Lectures, &c....	12 4 6		
Rent of Offices, Fenwick-st....	5 15 1		
Cash for Apparatus.....	6 7 0		
Sundry expenses.....	7 10 2		
Cash, Balance.....	115 16 5		
	£257 7 8		£257 7 8
		1846.	
		Feb. 25.—By Balance.....	£115 16 5

LIVERPOOL, FEBRUARY 26TH, 1846.

Audited and found correct,
HENRY CHRISTIE BELOE.

Errors excepted.
JAMES H. MACRAE, Treasurer.

All communications for the LIVERPOOL HEALTH OF TOWNS' ASSOCIATION to be addressed to the Committee Rooms, Fenwick Chambers, Fenwick-street.

THE LIVERPOOL HEALTH OF TOWNS' ADVOCATE.

PUBLISHED UNDER THE SANCTION OF

THE COMMITTEE OF THE LIVERPOOL HEALTH OF TOWNS' ASSOCIATION.

No. 9.

FRIDAY, MAY 1, 1846.

PRICE 1D.

PRINCIPLES OF SEWERAGE.

THERE is perhaps no matter connected with the sanitary condition of towns the importance of which is so little understood as that of sewerage. In various parts of the country, ignorance and a short-sighted economy have left entire communities to suffer from the effects of damp and unwholesome dwellings, while the poorer classes have had to bear nearly the whole weight of this, as of every other public neglect.

We have already referred to the great advance made by ancient nations in sanitary police, and of this truth perhaps no better illustration could be adduced than that supplied by our present subject. Dionysius, of Halicarnassus, expressly mentions the magnificent Cloacæ of Rome, as one of the three marks whereby the true greatness of the Empire might be known. Every house in Rome had a constant supply of water, and a drain communicating with a main sewer; and there is reason to believe that some of our newest improvements in house drainage, namely, tubular sewers, were extensively used. The whole of this sanitary department was placed under the control of proper officers, and "laws were established which prevented individuals from doing anything which would interfere with the public health or enjoyment." Our own practice has hitherto been the very reverse of this; but we trust that the legislative interference about to take place, if met in a proper spirit by the public, will go far to remedy existing abuses.

The first great structural improvement for Liverpool is the execution of a perfect system of sewers and house drains. Every house, cottage, court, and street must be properly provided with these indispensable agents in the sanitary amendment of the town. It is not within our province to enter into practical details. Our object is rather to direct public attention to the great leading principles of the subject, which we now proceed to do, as fully as our limits will permit.

I.—SURVEYS.

It is impossible to proceed a step in any general arrangement of sewers without accurate levels, and one of the chief complaints made by builders is the want of such data. The very first thing therefore is to have the whole town *contoured*, as it is called. The use of contour lines originated from observing the traces left by a great inundation; and the best idea that could be given of them would be to imagine the whole town immersed

in water to the top of Edge-hill. If the water were to subside four inches in perpendicular height, it is plain that a line drawn on the ground all along the water level would be horizontal, and every point of that line would be exactly on the same level as every other point.

If the water were to subside other four inches, another similar line might be drawn, and if we could suppose this process repeated, and these lines drawn at every four inches of perpendicular height, we should have the whole town *contoured*. Similar lines can be discovered by ordinary levelling, and if all were accurately transferred to a Plan of Liverpool, any one could tell at a glance the precise relative level of any two points in the town. This is what is meant by **CONTOUR LINES**, and we need hardly point out their great importance in all operations of draining, water supply, &c. A good contoured map of Liverpool on a large scale, and showing every four inches of difference of level, is therefore requisite. A system of permanent records of the levels marked "by the insertion of bolt or bench marks, having reference to some common datum in the chief public buildings and other convenient places in the town," is also considered by the Sanitary Commissioners of essential importance; and in accordance with this opinion, they recommend, "that before the adoption of any general measure for drainage, a plan and survey upon a proper scale, including all necessary details, be obtained, and submitted for approval to a competent authority." It has been calculated that from the want of such a survey in the Finsbury and Holborn districts, no less than £250,000 would be required to adjust the sewerage levels. A plan of all existing sewers is also requisite.

II.—DRAINAGE DISTRICTS.

One of the greatest evils of the present system is the want of proper legislation in regard to drainage districts. The results of this are visible in almost every town in England, and in none more so than in Liverpool, on account of its rapid extension. No provision whatever has been made for sewerage land before it is built on, and hence the large increments that are now being made to the town, are entirely in damp localities, beyond the jurisdiction of the town drainage, while the whole outskirts are studded with water-pits, which are a source of disease amongst all classes in their vicinity. In addition to these evils, we are told in the words of the Commissioners that—

"The interior of the proper area of drainage comprising the town itself is split into two districts, and these districts are placed under divided and imperfect authorities, so clashing with each other, as to render systematic drainage impracticable."

To remedy this state of things, it is obvious *that the whole drainage area of the borough of Liverpool, including the drainage of houses, must be put under one authority*. This is perfectly indispensable to proper management; and there must be power vested somewhere, (the Commissioners say in the Crown,) to extend the drainage district to meet the

expansion of the town; and to effect the drainage of land *before, and not after, it is built on*. Another most important recommendation of the Commissioners is the appointment of officers fully conversant with the whole detail of public sanitary works; to superintend the laying out of sewerage districts, and the construction of the sewers and drains; a measure which will be of great benefit to the community.

III.—MAIN AND SECONDARY SEWERS.

The laying down of sewers has been considered so much a matter of mere practical detail as not to admit of the application of scientific laws. Sewerage is nevertheless as much a branch of hydraulics as water-supply, and had the scientific bearings of the subject been more attended to, there would have been greater perfection in the practical execution, as well as a great saving of public money. It has happened, for instance, that from the want of a little ordinary calculation, or from some mistaken principle of economy, sewers have been laid down of a size altogether incommensurate with the water they had to convey, and consequently it has been necessary to remove them and build new ones. In other instances they have been made greatly too large. Then, again, sewers with flat bottoms and vertical sides used to be thought sufficient for every purpose, although a very small amount of scientific knowledge would have shown, that such conduits could never be anything else but long cesspools, retaining the greater part of the solid matter held in suspension in the sewer water, and pouring out deleterious vapours at every aperture. Such deposits also arise from sewers being joined at right angles, whereas, their junction ought always to be made with a curve, so that the two streams may flow in the same direction before they unite.

Form.—The very worst form of sewer that could be constructed is the square shape already alluded to. Sewers with semicircular beds and vertical sides are better: they are nevertheless objectionable, because the sides are liable to be pushed inwards by the weight of the soil, so as to cause extensive ruin in the structure, in addition to the stopping up of the water-course. Circular sewers, built with radiated brick, have a decided advantage over either of the others. They resist pressure, and allow the flow of water to take place with less obstruction; but they are in some degree liable to deposits during dry weather. This arises from the quantity of water flowing through them being spread over a considerable surface, which diminishes its velocity, and consequently its cleansing force. Of all forms, the one resembling the section of an egg with the small end downwards is the best. It possesses the requisite strength to endure external pressure. Its surface admits of the free passage of fluids; and in dry weather, when the supply of water is low, the force of the quantity flowing through the sewer is concentrated into a small space by the peculiar form, and sweeps the deposit onwards.

The proper construction of sewers exhibits another instance of the

pecuniary saving consequent on the adoption of sound principles. Mr. Roe, C.E., states that the various improvements in the Holborn and Finsbury division effected a saving of £7,900 in one year.

Size.— It is a matter of great importance to form an accurate estimate of the size of a sewer requisite to drain any district. If it be too large, there is a tendency to form deposits, while there is, at the same time, a greater outlay of money than needful entailed on the public. Too large a sewer is therefore both expensive and bad. If the size be too small, the evil is still greater, for a heavy fall of rain will flood some portion or other of the district. Many illustrations of such things have occurred, and they can only be avoided in future by acting on correct scientific principles.

The main sewer of a district should be large enough to carry away the whole water supply, in addition to the *maximum* fall of rain in that district. It should do both easily, and any further augmentation in size is unnecessary. It should always be borne in mind, however, especially in towns such as Liverpool, that the great prospective increase of the population requires main sewers of a greater size than might appear absolutely needful for present use.

On this important point we must refer professional readers to the paper given by Mr. Hawksley, at the end of the second volume of the second Report of the Sanitary Commissioners, and shall merely illustrate the principle by a few facts. The fall of rain on an acre of ground during a thunder storm is about 120 cubic feet per minute. In town districts, 100 cubic feet of this quantity will pass into the sewers every minute, so that the sewers in towns must be provided of sufficient capacity to carry away a number of cubic feet of water per minute, equal to 100, multiplied by the number of acres in the natural drainage area supplied by these sewers. Thus, if we assume the drainage area of Liverpool to be, in round numbers, five square miles, or 3,200 acres, then the sewers should have a capacity to remove $3,200 \times 100$, or 320,000 cubic feet per minute of rain water, in addition to the quantity of the water supply of the town that may be supposed to pass into the sewers at the same time.

The capacity of a sewer to remove water depends also on the fall, and admits of correct calculation. Mr. Hawksley has given a table for various sizes and inclinations, from which it appears, that a circular sewer six feet in diameter, with a fall of one foot in ten, will discharge 63,460 cubic feet of water per minute, and drain 634 acres of town district of its maximum fall of rain. A sewer of the same size, with a fall of one foot in a hundred, will discharge 20,040 cubic feet per minute, and drain 200 acres: but if the fall be one foot in eight hundred, a similar sewer will only remove 7,097 cubic feet per minute, and drain 71 acres. We have given these illustrations to show that sewerage is really a matter of scientific investigation, and that the old hap-hazard method of construction must be abandoned.

IV.—CLEANSING OF SEWERS.

Most sewers have hitherto been constructed with express provisions for enabling men to go into them, and shovel out the putrid black deposit; while others have to be broken into for the purpose. Of all uses to which a man can be put, surely one of the worst is to send him into a sewer. The power of scientific invention ought to be taxed to the utmost to put a stop to such a custom. It is dangerous, and productive both of physical suffering and moral degradation in the agents employed. Mr. Roe, C. E., says in his evidence—

“Another nuisance, which was considered a great one, was its affecting the health of the men concerned in removing the stuff. I have known a man in opening a small sewer, in White Horse-court, Cow-cross, the moment he had opened it, and arrived at the deposit, taken ill immediately, and obliged to go home, and he was ill for a month with fever. The men, in many cases, have been afflicted with dysentery.”

We might predict with certainty, that this method of cleansing was not economical. In fact, there is nothing more remarkable than the circumstance we have again and again pointed out, that in sanitary matters, *the way that is in itself the worst, is always the dearest*. Mr. Roe states, that in the finsbury district, the expense of breaking up the pavement, in addition to the cost of labour, became at last so great, that it was determined to try what *flushing* would do; and it was found that, with an imperfect apparatus, a quantity of mud which it would have cost £2,387 to shovel out, was flushed away at the expense of £644 12s. 7d.; while, at the same time, all the public nuisance arising from the more dangerous process was saved.

Flushing.—It is a scientific truth, that the power of running water to carry heavy bodies along with it, is in proportion to the velocity of the current; and *flushing* is neither more nor less than the application of this law to the removal of deposits of mud, gravel, &c., from sewers, instead of taking them out by hand labour.

Professor Robison, in his Treatise on Rivers, gives the following experimental results of the force of running water:

Velocity of Current in inches per second.		Substances carried along by the Current.
3 inches	....	Fine clay.
6 "	....	Fine sand.
8 "	....	Coarse sand.
12 "	....	Fine gravel.
24 "	....	Gravel 1 inch diameter.
36 "	....	Angular stone the size of an egg.

Now in order to flush a sewer so as to clear it of deposit, all we have to do is to supply plenty of water, and to adopt some method of sending a current through it of the requisite velocity. The most perfect method of doing this would be, to have a reservoir so placed, that a large quantity of water could be suddenly poured into the main sewers, so as to sweep

their whole length with a considerable velocity, and the cleansing would infallibly take place. Another method that has been adopted in the Holborn and Finsbury districts, is to have iron flood gates in the sewers, at convenient distances, so as to dam up the ordinary flow of water: the gates are then opened and the flood allowed to sweep through the drain. In this way it is found that the usual water supply can be made efficient, and one man can flush 15 miles of sewers. The process is usually performed once a quarter, but sometimes oftener; and we should say the more frequently the better. Including every expense of iron gates, &c., the average outlay for cleansing the sewers is one-third what it used to be under the old system. The following summary of the advantages of the new process is given by Mr. Roe, in his evidence:

“The great principle intended to be carried out is, that instead of occasional cleansing as formerly, the sewers should, when once cleansed, be kept free from deposit. The pecuniary saving is, I consider, the least advantage of this mode of cleansing: the great points attained are the avoidance of all accumulations of filth in the sewers, and the stirring up in removal, and the consequent disagreeable effluvia, is also avoided. The streets and pavements are undisturbed; the men engaged in cleansing sewers have a more healthy employment than heretofore; private individuals are saved from the annoyance of their drains being choked; and as this plan of flushing affects the health and cleanliness of the inhabitants, the accomplishment of it, on a general and systematic principle, should be deemed of the utmost importance.”

It is impossible, however, for Liverpool to enjoy any one of these advantages, so long as the inhabitants submit to the present wretched system of water supply; and while engaged in discussing one of its most important uses, we would again press upon the authorities and the public, the absolute necessity of immediately taking steps to provide the town with this most indispensable sanitary agent.

V.—TRAPPING AND VENTILATION OF SEWERS.

Sewers must be trapped and ventilated, to prevent the escape of deleterious gases into streets and houses, and to provide for their conveyance into the atmosphere, so as to be carried away safely.

Several plans are in use for trapping. The one commonly employed is the water-trap, which effectually prevents any escape of vapour. It has, however, been objected to, on the ground that the water itself becomes saturated with poisonous gases, and is apt to send malaria through the gully holes. *Flaps*, of various kinds and materials, have been placed at the point where two sewers join. They are made of iron, slate, or earthenware, either of the latter being preferable, on the ground of durability. They act by allowing a free course for the water downwards, while they prevent reflux and the escape of vapours.

There are proposals in the Sanitary Reports to effect *ventilation*, by erecting chimneys or shafts communicating with the most elevated parts of the sewers. Another method is, to carry terra cotta tubes from the drain up the side walls of houses to the height of the chimneys; or to

effect the same object by carrying the pipe which discharges the rain water from the roof to the crown of the sewer, so as to make it serve two purposes.

It is a sound principle to diminish the number of gulley holes as much as possible, and to place them in such situations as shall prevent their being a cause of nuisance or disease to the population, while every one ought to be properly protected by traps or valves.

VI.—HOUSE DRAINAGE.

There is, properly speaking, no house drainage in Liverpool; but we have a law instead, which, as we formerly showed, inflicts a penalty of £10 on any one who shall be guilty of allowing any house soil to pass into a main sewer. This law must of course be repealed, and we trust that the day is not far distant when every cottage in the town shall have its separate drain. The very first principle in house drainage is to avoid the use of the square box drain. It is one of the worst contrived and most mischievous forms that could be adopted. All competent authorities denounce such conduits as being little better than cesspools, and where they are carried under the kitchen floor, they may at any moment introduce fever or bowel affections into the house. They are generally made vastly too large, and, from the open nature of the work, there is a continual escape of gases at every aperture, while there is also danger arising from the leakage of their contents into the subsoil, or into wells. This latter accident is far from uncommon, and is a cause of dysentery and other diseases. Under peculiar circumstances, it may give rise to most fatal results, of which a melancholy example occurred near Liverpool, (West Derby,) a few months ago, when a family of five persons died from poisoning by arsenic, which had escaped from a drain into the well.

There is no house drain to be compared for safety to a small iron or earthenware tube, glazed inside, and perfectly tight between the open ends. It is remarkable how small a diameter will answer every purpose. Mr. Roe says in his evidence—

“I know one instance of an iron pipe, three inches in diameter, put into a sewer fifty feet distance from the house, about eleven years ago, and having a fall of about an inch in ten feet, which has never been obstructed.”

James Simpson, Esq., advocate of Edinburgh, has published a Report of a similar experiment made in his own house, where an iron pipe, *only two inches and a half in diameter*, has received and carried away the whole drainage of the house, including back yard, kitchen, baths, water closets, &c., without having been once obstructed for five months, the period which had elapsed since the tube was laid down. In order to test the comparative merits of this tubular drainage, with those of the large old box drain previously in use, the iron tube was allowed to terminate by its open orifice in the square drain outside the house. When this drain was examined, after one month's use, it was found that a deposit two inches deep had taken place in it, while the iron tube was perfectly clean.

The report, which is attested by the architect, the surveyor, and the plumber, concludes as follows :

"It is thus demonstrated that a two-and-a-half inch tube or pipe is competent for the drainage of your house, even with the flushing afforded by the ordinary and moderate discharges of the common water closets and sinks; while a striking example of the superiority of this system of sewerage over the old, was seen in the accumulations of matter having occurred in the old drain only, while the new continues perfectly free from any thing like obstruction or deposit."

Now when we remember that it is usual for such square drains to pass under the lower stories of houses, we shall be at no loss to account for the sickness that not unfrequently breaks out when they become foul; while the perfect action of the tubular sewer proves it to be of great sanitary importance.

Mr. W. Dyce Guthrie, in his valuable evidence on house drainage, has given a table of the expense of clay tubes, in which he shows, that with a diameter of three inches, they would cost only 6d. a yard. The same length with a diameter of six inches would cost 9d., and with a diameter of a foot, 1s. 3d. The rapidity with which these tubes can be laid down would also occasion a great saving in expense. He suggests a diameter of between three and six inches for ordinary tenements. But here again we must have an ample supply of water, otherwise such improvements cannot be carried out. The great principle of house drainage is to use a small tube and to trust to keeping it clean by flushing. It is impossible in this way that any deposit should take place, for it is carried at once into the main sewer by hydrostatic pressure; and a flap at the orifice would effectually prevent the passage of foul air from the main sewer into the house. Large tubes are altogether unnecessary, except for secondary sewerage, to which it is proposed to apply them.

In conclusion, we hope the drainage of the town will be made as perfect as possible; for we have the high authority of Mr. Rennie for the fact, that "*No town in the British dominions is better situated than Liverpool for a complete system of sewers.*"

The Monthly Meeting of the Committee took place in the Town Hall on the 8th ultimo; THOMAS BLACKBURN, Esq. in the Chair. The usual routine business was transacted.

On the 31st of March the Working Classes were addressed by the Rev. Mr. HIGGINS, in the Free School, Hunter-street; T. LITLEDALE, jun. Esq. in the Chair. Another Meeting was held in the South Corporation School, on the 14th ultimo; the Rev. H. HAMPTON took the Chair, and Dr. DUNCAN delivered the Address. The last Lecture of the present season was delivered by the Rev. W. BEVAN, at the Circus-street School, on the evening of Tuesday last; the Rev. J. KELLY in the Chair. These Meetings were also addressed by Sir A. J. KNIGHT, Messrs. A. HODGSON, SAMUEL HOLME, BLACKBURN, Dr. SUTHERLAND, Dr. INMAN, Mr. HARBORD, and Mr. PARKER.

DONATIONS.—Miss Blake, per R. V. Yates, Esq. £1. T. Littledale, Jun., Esq. £1 1s.

All communications for the LIVERPOOL HEALTH OF TOWNS' ASSOCIATION, to be addressed to the Committee Rooms, Fenwick Chambers, Fenwick-street.

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PRICE 1D.

TOWN IMPROVEMENTS.

IN the third and fourth numbers of the Advocate, we showed the fearful consequences resulting from two great causes of sickness and mortality in our population, namely, DEFICIENT VENTILATION and OVERCROWDING, and we now proceed to state our opinions as to the necessary remedies.

I.—QUESTION OF PROPERTY.

After an abuse has existed time out of mind, it is very difficult for the public to recognise it as an abuse. People at length consider it as a natural occurrence, and they treat it as such, without regard to consequences, while they oppose every effort at its removal, especially if such removal appear to affect their interests. This is exactly the state of matters with which we have to contend. We have in fact to solve anew, in the middle of the 19th century of the Christian era, a question which was solved in the days of Paganism, and one of the greatest moment to every civilized community. The question is this. How are we to recognise the right of private property, while we provide that such right shall in no wise be prejudicial to the common weal?

There are but two ways of considering the right of property. It must either be an *absolute*, or a *limited* right. A man must either be able to do what he will with his own in every sense, even although he should occasion the death of thousands of his fellow creatures every year, as we have shown to be the case in Liverpool, or he must be restricted in the use of his property in such a way, that while he is left in the enjoyment of it, he shall be prevented from so enjoying it as in any degree to injure the community in which he dwells. Now it is obvious, that whenever men form themselves into a society, the right of property must necessarily pass from being an absolute, to a limited right. The very existence of the social tie requires this. We find the distinction recognised in all civilized states from the very earliest period. Under the republics, as well as under the monarchies of antiquity, laws were enacted which told the subjects of the state, that in congregating together into cities they must necessarily consent to have their proprietary rights so limited that the good of the commonwealth must in no wise be injured. The rearing of a robust population was then a measure of absolute necessity, and the whole municipal administration was directed to this object. It is known that

all over the East, as far as India, in Egypt, in the Grecian states and colonies, and over the whole Roman empire, there were officers appointed with power to execute laws, one main object of which was to ensure a proper sanitary condition in towns and cities: and so extensive were their powers that they were compared to parents of families, whose duty was to take care of the comfort, health, and lives of all committed to their charge. They watched over the quantity and quality of food—the supply of water—rivers, that their banks might not become unhealthy—fields—the sewerage and cleansing of towns—the paving of streets, and the construction of roads and other public works—the laying out and building of towns—the preserving of ventilation in cities; and one of their duties was to take special care that no building was erected which might deform the symmetry of the town; a duty which would render their office no sinecure in the present day. They had the care of the dead as well as of the living, and were bound to see them properly entombed. Powers of this extent are sufficient to show the vast importance with which great public interests were regarded in ancient times, and to prove that private rights were made to yield to them.

Borrowing from the wise legislation of antiquity, our early kings enacted many excellent sanitary laws, which from various causes have passed into abeyance and desuetude. The contest between private right and public good has been going on for ages; the latter giving way more and more to the former, until the idea of the supreme nature of the right of property has become paramount. The ancient and beautiful motto of our common law, "So use thine own as not to injure others," has been trampled on, and the experience of early ages set aside. The dictates of reason and humanity, even under the superstitions of Paganism, continued to whisper that there was something more sacred in man than the proprietary right over a few square yards of the earth's surface, or the bare brick walls that human hands might raise upon it: and when Christianity came with its pure and ennobling influences to sanction those dictates, we should naturally have expected a great advance in the physical condition of our race. But what has been the fact? The right of property was met Christianity, and we are ashamed to say, without being influenced by its benign principles,—let us hope only because of the gross ignorance which has hitherto prevailed on the subject,—and the result has been, that our cities and towns have become little better than charnel houses. Liverpool, with its unexampled commercial wealth, has taken the lead in opposing private right to public good. Our corporate bodies, as well as private individuals, have been accessory to the cutting up of the ground by square inches, in order to make money by packing human beings together as if they were cotton bales. The highest possible price has been screwed out of building land, so that our poorer streets are mere narrow lanes, without proper light or ventilation; and we cannot

afford to have open spaces where they are most needed. We have crowded our population together into courts so small, that it would take no fewer than *twelve* of them to make such a court as the labouring classes occupy in Birmingham. But even this is not the worst; for in some parts of the town the poor people have been packed so close, for fear of *sacrificing* land, as it is called, that if London were equally crowded, it would hold *twenty-five millions* of people. And, apart from this altogether, the miserable courts, and cellars, and houses, which constitute the great bulk of the town, are destitute of light, and air, and water, and, indeed, of almost everything that constitutes a proper abode for a human being; and as a consequence of all this, we have an amount of disease, and death, and human woe unparalleled in any town in England. Surely no further experiment is needed, to convince men that the prevalent idea of the supreme right of property is, at all events in towns, an evil of the most enormous magnitude; and that it may boast itself of a greater number of victims every year than ever fell beneath the car of Juggernaut.

Now we feel bound to declare that this must come to an end. Every man who chooses to hold property in a town must learn that there are certain duties connected with that property, by the very nature of it, which must be fulfilled. He cannot use it as he would. He must, on the contrary, submit to those wise legislative measures which in all ages have been found necessary to protect the common weal. The attempt to obtain exorbitant profits, either from the sale of land or the rent of houses, must be curbed by a proper public spirit, and by the legislature declaring what kind of streets and houses it will allow to be built, and how many upon a given space. We must revert to the ancient laws, and permit nothing to be done, come what may, which shall injure the health or comfort of the inhabitants. But those who possess property must not imagine that in doing this we shall interfere with their real interests; for in the moral arrangements of the universe there are certain checks which infallibly prevent our doing as we would in these matters. We may build double the number of houses, and quadruple the population on any given space, but sickness and death, and moral as well as physical degradation, will step in and prevent our reaping the fruits we anticipate. We have very little doubt that the history of most of the bad property in Liverpool has been one of annoyance, and disappointment, and loss to the proprietor, as well as of disease and death to the tenants.

II.—REMEDIAL MEASURES.

The remedial measures for these evils are, we fear, more easy to point out than to carry into effect. Had the parishioners not unfortunately opposed and defeated the Corporation Bill of 1802, on the very ground of its interference with the rights of property, Liverpool would have been in a higher position than it now occupies. But since then a vast

amount of property has grown up within the borough, a very great proportion of which would require sweeping alterations to remove the existing causes of mortality and disease.

In order to understand the changes required, we would again refer to the following ratios of density of the population in several towns:—

Birmingham.....	40	Metropolis	50
Leeds (Borough)	87	Manchester	100

Liverpool (Parish)..... 138

These figures represent the number of inhabitants dwelling *on equal spaces of ground* in the different localities. Now it is obvious that if we wish to remove the sickness and death arising from overcrowding and bad ventilation, we must spread the inhabitants over a larger area. But few are perhaps aware, that to reduce the density of Liverpool to that of London, it would be requisite to spread the present houses of the parish over a space above two and a half times as large as they at present occupy: that is to say, if we assume the surface of the parish at three square miles, we should have to lift the existing houses, and spread them over a space of above $7\frac{1}{2}$ square miles, the additional $4\frac{1}{2}$ square miles being the breathing space which the parish of Liverpool would require to make the houses as airy as those in London.

London is nevertheless overcrowded. And if we were to make Liverpool as airy as Birmingham, which has the smallest density on our list, we should require to spread the three square miles of houses in the parish over a space of no less than *ten square miles, so as to add seven square miles to the present breathing surface of the town.*

Perhaps nothing can give a clearer idea of the monstrous evils which at present oppress the working classes of this great community, or of the necessity which exists for legislative interference, to remove these evils as soon as possible, and to prevent their occurrence in those parts which have yet to be built.

To give Liverpool as good a ventilation as Birmingham, it would be requisite to alter two things—our courts and our streets.

The average size of a court in Birmingham is 35 yards by 20, or 700 square yards; and the average size of a court in Liverpool is only 15 yards by 4, or 60 square yards. Query,—What number of cottages would have to be taken down, and how many courts thrown together, to make a Liverpool court, equal in size to a court in Birmingham? If we assume the cottages, including the walls, at 12 feet square, a Birmingham court, of the dimensions given above, would hold inside of it three double rows of back to back cottages, five in a row, and four courts, each very nearly the average size of our Liverpool courts!

In order, therefore, to alter our courts to the size of those in Birmingham, three double rows of cottages, or thirty cottages, would require to be pulled down, and the space left thrown into an open court! It

would be very desirable to consider whether, in our circumstances, it would not be better to abolish courts altogether, and to take down as many houses as might be needful to convert them into short streets opening at both ends into wider streets. There are besides moral objections to courts, which we do not think have been sufficiently considered. A small court is a separate community, and its inmates must have a certain influence either for good or evil upon each other. The bad example of one family must necessarily influence others; and respectable people are obliged to consort with those whom they cannot esteem, but whom they cannot avoid. And when we consider how large a proportion of the female sex, industrious mothers of families, are condemned to spend their whole lives immured between the blackened walls of those narrow and pestilential localities, never, perhaps, seeing the sun shine into their houses, and knowing nothing in the wide universe but its miseries, it is enough to make the heart sick. And what must the reality be! Let our readers, especially our female readers, try to realise this. Let them consider at the same time that these poor women are not only cut off from every intercourse with objects of natural beauty, but that they very generally spend their short lives in ill health, with their children sickly and dying around them; and all this because building land is valuable, and cannot be *sacrificed*. It certainly is valuable, for human sickness, and sorrow, and death, are counted light in comparison, while all the moral evil produced in the living is equally disregarded. How many a respectable woman, by reason of familiarity with such scenes, has passed through all the downward phases of filth, bad habits, and drunkenness, to confirmed vice! The fact is notorious; and indeed it could not be otherwise, constituted as human nature is. We would for these reasons abolish courts, unless they were very differently constructed from any we have in this town.

In regard to **STREETS**, it may be said that, with very few exceptions, they are all too narrow. Measures are therefore requisite for widening them, and opening up others, so as to thin the population, and ensure more fresh air. All of these improvements ought to be made on a **WELL DIGESTED PLAN**, including both the present town and those outskirts which may yet be built upon. There could be no more legitimate outlay of public money than to offer prizes for such a plan, and there is perhaps no architectural subject which would afford greater scope for the exercise of genius. In the sanitary reports, there is a plan for rebuilding London after the great fire, constructed by Sir Christopher Wren, which exhibits marks of the pre-eminent talent of that extraordinary man. The streets are all wide and straight, and cross each other at right angles, and the square blocks of houses are cut across by diagonal streets, so as to shorten distance, and to ensure ventilation, and the action of the sun's rays as extensively as possible. The whole is beautifully designed. There are

large open spaces with streets leading directly from the river to them, so as to keep up a constant supply of fresh air; and with these advantages, the sewerage, levels, and other important matters, were duly attended to. The great architect lived, however, before his time, and his plan was rejected. Mr. Butler Williams cites this fact as—

“An example of the disastrous effects of allowing the predominance of ignorance, combined with local and mistaken views of present interest, to countervail the best knowledge, and science, and skill of one competent mind, who had mastered the subject.”

Disease and death followed the plan which was adopted, and

“The race of citizens has, by this self-inflicted, increased mortality, been swept away, and continues to be carried off,—the population of the city being only sustained by immigration.”

The chief points in a SANITARY IMPROVEMENT PLAN OF LIVERPOOL are—

First. The thinning of the population, as already mentioned.

Second. The opening up of wide spaces as numerous as possible. This is a matter of great importance. All writers on sanitary subjects are agreed that wide streets are not sufficient: spaces are required to act as reservoirs of air; and any one who would see their utility, has only to walk up any of our smoky streets, towards one of those spaces or squares, and he will observe the atmosphere become clearer as he approaches the open space—the smoke affording an index to the ventilation.

Third. Wide and straight streets, running in such a direction as to obtain supplies of air from the river, and converging towards central spaces, as in Wren's plan, so as to cut the town into polygons, and admit the sunshine to the houses. Until the town be properly ventilated, it is impossible to ventilate the houses as they ought to be: and we shall show by and by why we must have sunshine admitted. Suffice it to say at present that it is indispensable to health.

Fourth. The alteration of courts, or their conversion into short streets, as already mentioned.

Fifth. Uniform architectural elevations for streets of all classes. There is no reason whatever why this should not be aimed at, and the existing deformity of our towns and cities removed. It appears to have been quite forgotten that there is a beneficial moral influence connected with objects of beauty.

Sixth. Combining these changes with the sewerage plans and levels.

These recommendations are not chimerical; for we have illustrations of such plans for the gradual improvement and building of towns in actual operation, so that we are stating no novelty. The additions made to Edinburgh, on the north side, are according to a fixed plan. Nobody can do what is right in his own eyes. Again, most of the towns in British and Spanish America are built on regular plans, to ensure ventilation. As an illustration of the use of open spaces, we may quote the statement of Captain Vetch, R.N., in Mr. Chadwick's report, in regard to the city of Seville, which, he says, was “essentially benefited” in this way.

"The streets are there numerous, narrow, and dirty, but the city abounding in large convents, the removal of some of them, and the conversion of their ample sites into piazzas or squares, afforded the air and space so much required for the public health."

The city of Paris affords a striking example of progressive improvement, under circumstances of far greater difficulty than exist in Liverpool. Mr. Butler Williams has given the following detail of the method adopted :—

"A comprehensive plan of the city, accessible to the public, and approved and sanctioned by the municipal authorities, indicates the improved and widened lines of streets to which houses, when rebuilt, must conform; and in their tortuous and narrow thoroughfares are to be seen, from distance to distance, new houses built, or being built, from five, to ten, or fifteen feet back from the old frontage, and in such directions as (when all the houses shall have been re-built) ultimately to present regular, instead of the existing tortuous lines, which, by irregular projection and retreating of the houses, interrupt the traffic and impede the free sweep of the winds. * * * In every district of their crowded city, promises of the ultimate widening of their streets are to be observed. The compensation for the ground thus ceded for the widening of the public ways is fixed by juries of 'Experts,' and there seem to be but few complaints against the mode of assessing the rate of compensation."

Here we have a plain common sense method of proceeding, which is calculated to answer every purpose. Why should not Liverpool be rebuilt on such a plan. Leases are constantly falling in, or might be purchased, and the re-building with all the necessary improvements effected. A long time would be required, but for this there is no remedy. The work *must* be undertaken, and the sooner it is begun the better; *and the worst parts of the town should be the first improved.* It is nothing but a mockery of the poor to devote public money to improvements, which are not immediately wanted, however good they may be in themselves, while there is life to be saved, and human suffering to be alleviated. We know no reason, however, why Liverpool should not ultimately be as remarkable for its architectural beauty as it is at present for its deformity. Every alteration, if properly made, though necessarily accompanied with present expense, would eventually enhance the value of property, and more than pay itself. The finest cities of the middle ages were the commercial cities; and it would be a noble object for our municipal council to take the lead in a work which would be the means of rescuing thousands from the deepest physical and moral degradation, while it would at the same time place the town in that position which its high commercial rank entitles it to occupy.

The extension of the town should be effected on the same general principles, and *upon a fixed plan*; while great care should be taken to avoid the recurrence of evils which at present exist. *We beg again to enter our protest against the use of cellars as dwellings.* It is only a bad habit and in no case a necessity. The best authorities on medical police not only condemn the existence of cellars, but advocate the raising of all floors of

dwellings above the level of the ground; which we believe to be a sound sanitary principle. With the experience of Birmingham to contrast with our own, it would be nothing but a criminal waste of human life to perpetuate the existing practice. We shall afterwards prove that it is quite possible to provide the working classes with healthy dwellings, at a fair rent; so that the wretched hovels which constitute the bulk of our towns are by no means a necessary existence; for, in the words of Mr. Martin's excellent report,—

“The interests of the builders and of the tenants, if only rightly understood, are identical. * * * Under an improved condition of the dwellings of the lower orders, the tenant's ambition, hopes of advancement in life, and desire for increased comfort, would rise along with a laudable emulation: there would be less of immorality and disease, less drunkenness, more time and ability for labour, and more providence in the use of earnings: in short, * * * there would arise all that the speculators in building desire—an increased power on the part of the tenants to pay an increased rent.”

The practical considerations we would press upon the attention of our readers are—

First. THAT THE SOCIAL ADVANCEMENT OF OUR WORKING CLASSES CANNOT TAKE PLACE UNTIL THEY ARE PROVIDED WITH HEALTHY, COMFORTABLE DWELLINGS.

Secondly. THAT IT IS THE DUTY OF MUNICIPAL BODIES TO PROVIDE FOR, AND OF EVERY MEMBER OF THE COMMUNITY TO SUBMIT TO, THE LEGISLATIVE REGULATION OF THE RIGHTS OF PROPERTY, SO AS TO INSURE THE CONSTRUCTION OF SUCH DWELLINGS.

Thirdly. THAT THE INTERESTS OF PROPRIETORS WOULD IN REALITY BE ADVANCED BY SANITARY LEGISLATION AND IMPROVEMENTS.

Fourthly. THAT ALL TOWN IMPROVEMENTS SHOULD BE CARRIED OUT ON ONE GENERAL PLAN.

The last Meeting of the Committee was held in the Town Hall, on Wednesday, May 13th—Adam Hodgson, Esq. in the Chair. A discussion took place on the subject of Ventilation; after which, it was resolved, on the motion of the Rev. W. BEVAN, “That the whole subject of the Ventilation of Houses and Public Buildings be referred to the Lecture Committee, with the view of delivering Lectures on the subject to Builders and others.” The condition of the recently-emptied cellars was again brought before the Committee; and it was moved by Mr. S. HOLME, seconded by Mr. I. B. COOKE, “That a very strong representation be made to the Highway and Sewerage Board, on the subject of the wet Cellars in Freemasons' Row, with a request that a sewer may be laid down, so as to drain the locality.” The following resolution was moved by Mr. BLACKBURN, seconded by Mr. WILLIAM BROWN, and adopted, “That the attention of the Common Council be urgently called to the necessity of obtaining power, in the Sanitary Bill now before Parliament, to lay open courts which are closed, and to widen them when necessary.” A note, complaining of a nuisance in Priscilla-place, Grosvenor-street, was referred to the authorities.

NEW SUBSCRIPTIONS.

Messrs. Jeffery, Morrish, & Co.....	1	1	0	Charles Edward Rawlins, Esq.....	0	10	6
Rev. H. H. Higgins.....	0	10	6	Hugo Reid, Esq.	0	10	6

All communications for the LIVERPOOL HEALTH OF TOWNS' ASSOCIATION, to be addressed to the Committee Rooms, Fenwick Chambers, Fenwick-street.

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No. 11.

WEDNESDAY, JULY 1, 1846.

PRICE 1D.

CLEANSING AND PAVING.

We have already shown, that the preservation of perfect cleanliness in towns is of such immense importance to the public health, as to constitute it an indispensable part of sanitary police; and we trust that, as soon as the necessary legal powers are obtained, a thorough and entire reform will be effected in the present disgraceful condition of Liverpool, and that the town will ere long be relieved from the stigma which at present rests upon it in this respect.

The only safe sanitary principle, in regard to cleanliness, is the one we formerly laid down, namely, "*that the whole refuse of a town should be removed out of it as soon as it is produced.*" Refuse matters, either of animal or vegetable substances, are constantly undergoing change, and giving out vapours and gases which, even in exceedingly small quantities, are injurious to health, especially if they be constantly inhaled. We need not repeat the proofs already advanced of this fact. They are, in our judgment, perfectly conclusive. All accumulations, therefore, of decomposing matters, whether in large or small quantities, should be forbidden, and such principles adopted as shall ensure their immediate removal.

I.—ALL TOWN MANURE SHOULD BE PUBLIC PROPERTY.

We have formerly given sufficient evidence to show that town manure is exceedingly valuable as a source of revenue, when it is collected and disposed of on a well arranged system. On this ground alone, therefore, even were there no other, it would become the duty of municipal bodies to make it public property. But it is of far more importance on sanitary grounds that such should be the case. According to the present practice, the removal of accumulations of refuse is conducted on no fixed plan. The community is left entirely at the mercy of a few private individuals, who cleanse out ash-pits only when there is a demand for their contents, or when they are paid such a price as they may choose to ask for their labour. The present cost of the process is ten shillings for the better class of houses, so that, just at the hottest period of the year, when manure is not in request for farming operations, it is allowed to accumulate all over the town, in our narrow, pent-up courts, so as to poison the air night and day, because the poor cannot afford to pay the cost of cleansing. Such a system cannot but operate injuriously on the public health, and it is satisfactory, therefore, to know that it is to be abolished, and the whole cleansing of the town, both its expenses and its profits,

transferred to the Town Council, whose duty it will be hereafter to look to the public interest as well as the public health in this matter.

II.—REMOVAL OF HOUSE SOIL.

No town in which cesspools exist can ever be healthy. This is a point we wish to press upon the public mind. The existing practice in the Lancashire towns is worthy only of being reprobated. It would be scandalous in any community at all advanced in civilization, and nothing but a miserable deficiency of water and drainage could justify its continuance even for a time. We have already shown that ashpits, cesspools, and all similar contrivances, are not only most prejudicial to health, but that they occasion the loss of a great deal of valuable manure, which sinks into the ground, and spreads in all directions under the houses. The following facts, stated in evidence, by Henry Austin, Esq., Architect, may be taken as descriptive of the condition of the whole foundations of the lower parts of Liverpool:—

Q. "In what condition did you find the subsoil on foundations in the line of the district where the Blackwall Railway was constructed? A. It was the state of that soil which first drew my attention to the necessity of abolishing cesspools in towns. I found that the fecal matter, or the soakage from the cesspools, had in many cases actually joined from house to house. Q. Then the population were living on a vast dungheap, were they not? A. The soil in the immediate connexion 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 dungheaps. It was exceedingly offensive to remove, and it was constantly matter of remark, how 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 entirely to be prohibited."

In these opinions we most cordially agree. House soil ought never to be removed in any way except by the sewers, and for this purpose every cottage should have a water closet. Water should be considered the great cleansing agent. Water pipes are the true arteries of towns, conducting through all their ramifications the pure vital fluid from the open country; and, after it has become impregnated with noxious impurities, it should be collected at every house, by the sewers (which, in reality, perform the office of veins), and returned by the main trunks to the country, there to become purified by evaporation, and by yielding the rich manure it holds in solution to the soil. These are the true principles on which the cleansing of houses should be conducted. They are the only ones whereby the two great objects of health and profit can be conjoined. In the older parts of Edinburgh and some other towns, where there are no water closets, a practice prevails, which, although apparently good, we strongly suspect to be a cause of epidemic fever and other diseases. The house soil and other refuse is removed by carts once a day; but it is kept in the bedrooms or sitting rooms of the poorer houses during the intervening space of time, so that, in reality, there are always some noxious matters in the

houses; and wherever such is the case, there must be disease. The use of water closets is the only means of avoiding this, and the fact affords another proof of the necessity of aiming at their universal introduction. We may again mention, that expense can be no bar; for the Towns' Improvement Company actually offers to introduce them at Manchester for a penny a week, for houses under £5 rent.

III.—REMOVAL OF ASHES & SOLID REFUSE FROM HOUSES.

Accumulations of dust or ashes are not unhealthy, as they do not give out gases or vapours; but, in addition to these substances, there are always remains of vegetable and animal matters used as food, which ought never to be heaped up in ashpits or middens. Even supposing the whole soil of houses were removed by the sewers, there would still be danger of disease, from house refuse in a state of decomposition. Under a wise system of sanitary police, the whole of these refuse matters ought to be withdrawn from the town as frequently as possible. House dust is an article of some value in London, where the contractors pay as much as 3s. 2d. a chaldron for it to the parish, while they undertake all the expenses of removal. The parish of Mary-le-bone has received as much as £1850 a year for dust. In Liverpool, however, it is entirely lost, from the custom of throwing it into ashpits, to be mingled with other refuse.

Taking all things into consideration, it would perhaps be better, in a sanitary point of view, to discourage accumulations of ashes and refuse altogether, and to have all the dust and other matters removed from the houses in baskets, and thrown at once into carts sent round every day for the purpose. It would tend to give the poor habits of cleanliness, while it would effectually obviate the causes of disease proceeding from such substances.

IV.—CLEANSING OF COURTS AND STREETS.

The cleansing of the surface of the town is as inadequately performed as every other sanitary duty. The whole system must be changed, and people must be made to know, that, wherever they see a dirty street or court, the elements of pestilence are at work in the neighbourhood. The most perfect cleanliness is requisite, especially in crowded localities, in order to protect the public health; and nothing ought to be permitted to interfere with this. It must never be forgotten, that we have to do with nothing less than the lives of our fellow-townsmen. It is not a mere question of convenience, or personal annoyance, but one of health. No person must, therefore, be permitted, on any plea of interest, to tamper with this matter; and every nuisance that occasions filth in streets or courts, or that accumulates it on any other surfaces,—especially such nuisances as arise from pigsties, cowhouses, stables, slaughterhouses, dunghills, &c.,—must be put down by the arm of the law. We shall deal with specific cases afterwards, but at present we are desirous to explain the broad sanitary principles involved in the subject.

It has hitherto been the custom, in the Lancashire towns, to cleanse the streets at distant intervals, and the courts not at all. In Liverpool the operation was done, until lately, only once a week; but Dr. Playfair has shown that the men employed could not have got through the work oftener than once in three weeks. Considerable improvement has recently taken place; but any one who will take the trouble to go into the worst parts of the town may see sufficient evidence of defective performance of the duty, even at the present time. The only safe practice, in a sanitary point of view, is, to cleanse the whole town once a day, and the worst parts of it, those districts which are the most densely peopled, several times a day. In fact, no corner of the town should EVER be dirty.

Objections may be raised by uninformed persons on the ground of expense; but we have an illustration in this, as in other sanitary matters, that the best way is, in itself, always the cheapest way; for it has been shewn that frequent cleansing is actually more economical than leaving the streets dirty for a length of time.

1st. Mr. Whitworth, of Manchester, has shewn that frequent cleansing actually diminishes the amount of refuse to be removed from streets; and the reason of this is obvious when we come to inquire into the subject. When mud is allowed to remain for a length of time on certain kinds of surfaces, it increases in quantity by the waste of the road; and where there is much traffic, the water acts on the surface just as it does on a lapidary's wheel, and aids the wheels of carts and carriages to grind away the stone, and thus to injure the paving. The loss in this case being two-fold. In Manchester, when the streets were seldom cleansed, a load of sweepings used to be taken from 343 square yards of surface. Under a more active and frequent system of sweeping, a load was taken from 859 square yards; while in those parts kept constantly clean by the machine, only one load was taken from 4338 square yards.

2nd. In regard to the superior durability of streets under a good system of cleansing, Mr. Whitworth states, that

“The tendency of cleanliness to promote the durability of streets, and consequently to diminish the expense of repairs, is so great, that even under the present system, it would be decidedly more economical to clean them oftener. When dirt is allowed to collect on the surface, the water, as before observed, is prevented from running off, and sinks down to the foundation, which, becoming soft, yields to the first pressure.” * * “In the end, the structure of the street, which otherwise might have lasted unimpaired, is completely broken down.”

3rd. A third source of economy arises from the draught of vehicles being always less in proportion to the cleanness of the street or road over which they pass.

4th. When street manure is frequently removed, its value to the farmer is greater than when it is allowed to accumulate and become mixed with grit and mud, from the destruction of the road, or its strength to be washed away by rain.

It is thus proved, that cleanliness in streets is far more economical, as well as far more healthy, than dirtiness.

As long as *courts* exist, they ought to be preserved in a state of as great purity as possible. They should be well flagged and channelled, in addition to the underground sewerage, and washed frequently with water.

V.—METHODS OF CLEANSING.

HAND LABOUR.—We look upon this method as defective, both on account of expense and machinery. There is a great deal of unnecessary labour, and it requires constant attention to see that the work is thoroughly done. It not unfrequently happens, that upon the whole, the street is in a worse sanitary state after the scavenger has left it, than it was before he began his work. Persons who have been in the habit of observing the condition of our worst streets must frequently have seen this; and the reason is, that the gutters and hollows are filled with most offensive and unwholesome matters, which, in the effort at removal by sweeping, are spread over the entire surface, so as to increase the mischief. In all towns, however, there are some situations which can only be cleansed by hand labour.

CLEANSING BY THE MACHINE.—We hope the introduction of the Sweeping Machine may prove a most important sanitary improvement. It is both cheap and effectual, and admits of such modifications of arrangement as to make it suitable for almost every locality. Mr. Whitworth, the inventor, has given a report of its advantages, which is printed in the Sanitary Reports, in which he says, that he and his partners had entered into an agreement “to sweep the streets” of Manchester “twice oftener than under the old system, at an actual saving to the town of £500 per annum.” * * * “The average number of yards swept daily by a machine, drawn by one horse, is from 16,000 to 24,000.” * * * “When the machine is in operation, the horse going only $2\frac{1}{2}$ miles an hour, it sweeps during that time 4000 yards; thus performing in a quarter of an hour nearly the day’s work of a man.” * * * “When going at the rate of only 2 miles an hour, with brooms three feet wide, the patent machine will clean nearly 60 superficial square yards per minute. This is about the average work done by 36 men.” “The process of street cleaning consists of three parts, viz., sweeping, loading, and carrying. Under the present system, these are entirely distinct operations; each of them constitutes a protracted and expensive process.” * * * “By the aid of the Sweeping Machine, all the three processes are not only carried on simultaneously, but, as it were, blended into one operation.”

On the question of comparative expense, Mr. Whitworth states, that “Generally the cost of sweeping and removing the refuse to places of deposit by the machine, will be from one-half to one-third the price of scavenging on the old system.”*

* We understand that a further trial of the comparative results of the Machine, as contrasted with hand labour, is about to be made in Liverpool.

CLEANSING BY WATER.—This process, although not universally applicable, should be introduced wherever it is possible, because, of all methods of cleansing, it is the most effectual. With a good surface and plenty of water, every particle of filth could be removed and swept into the sewers; and where this could not be accomplished entirely, cleansing by water might be employed to complete the work of the machine.

An immense increase of the water supply of the town, at high pressure, would be required; and the water ought to be used by the hose. For flagged courts and passages, and footways, and all impervious street pavements, it would be by far the best and most convenient method of cleansing. We should anticipate no danger from the sewers becoming obstructed, because a good supply of water sent through them by flushing, would effectually clear out all the mud, and prevent accumulation. It is the custom, in some parts of London, to sweep the street mud directly into the gully holes, and no obstruction is found to take place in the sewers.

Dr. Playfair has given the details of an experiment in water-cleansing, made at Preston. He says, that “on a very inconvenient boulder stone pavement, and with all the disadvantages of a first experiment, the cost of scavenging very effectually 1000 square yards amounted to 4s.” But it has been calculated that the general introduction of the method, and practical facility in its application, would reduce the expense to one-half.

The following are the details of the experiment:—

“1st. *Fishergate*.—Water used 36 gallons per minute, with a small rose on the hose; time expended 13 minutes; street cleaned 26 yards \times 8 yards = 208 square yards: $13 \times 36 = 468$ gallons consumed, value 4d.

“2nd. *Lune-street*.—Water used 90 gallons per minute, with large rose on hose; street cleaned 25 yards \times 10 yards = 250 square yards; time 11 minutes: $11 \times 90 = 990$ gallons consumed, value 9d. The expense of 1000 yards would be—

Water	3s.
Labour.....	1s.
Wear and Tear	?
	—
	Total 4s.”

The streets of Philadelphia are daily cleaned by washing with water by the hose; and this fact may to some extent account for the great increase in the salubrity of this city since the introduction of a *constant* water supply. The operation of watering is performed in the same way. The perfect action of a heavy fall of rain in cleansing the whole town, and sweeping the sewers clean, is a strong argument in favour of the practice. The Towns' Improvement Company proposes to combine the use of Sweeping Machines with the water jet, and to use the latter for “cleansing the foot pavements, and occasionally the roadways, so far as the road pavement will admit of it.”

STREET WATERING.—A well organized system of watering pavements by the hose is not only important for cleanliness, but is also necessary on account of health. Dr. Arnott, who is a high authority on such

subjects, states, that it is scarcely conceivable that street dust should not be injurious to health; and he cites a case of a gentleman, who, after riding twenty miles on a dusty road, had to cough and expectorate for ten days to clear his chest again. Dust, when inhaled, has a constant tendency to irritate the lungs.

We cannot conclude this part of our subject without impressing upon all municipal bodies the absolute necessity of attending with unremitting care to the cleanliness of towns. We could adduce a multitude of facts, in proof of the deplorable consequences which have arisen from the existing neglect of this important part of their duty. The sanitary regulations in the army, which have been the result of observation and experience, all go to prove that there can be no health without cleanliness—and they are enforced with the utmost rigour. But, in the words of Mr. Chadwick's well merited censure,—

“The towns whose population never change their encampment have no such care; and whilst the houses, streets, courts, lanes, and streams are polluted and rendered pestilential, the civic officers have generally contented themselves with the most barbarous expedients, or sit still amidst the pollution, with the resignation of Turkish fatalists, under the supposed destiny of the prevalent ignorance, sloth, and filth; whilst such neglects are visited by the scourge of a regularly recurring pestilence and ravages of death, more severe than a war.”

PAVING.

We have already given sufficient evidence to shew the vast importance of good paving as a sanitary improvement, and shall confine our present remarks to the best kind of surfaces to ensure efficient cleansing and surface drainage.

1st. Pavements should be made as impervious to fluids as possible, otherwise the subsoil remains moist, and becomes impregnated with matters deleterious to the purity of the atmosphere. All stone pavements should therefore be closely joined; and consequently those made of round boulders are inadmissible for sanitary purposes. The street pavements in some of the Italian cities are better than ours for drainage. They consist of polygonal blocks of limestone, the joints of which are accurately fitted together by cement, so that the rain water flows off as easily as from the roof of a house, and there are neither ruts nor hollows. The old Roman pavements were similarly constructed.

2nd. Great care should be taken to prevent the formation of pits and hollows, which are always injurious to health, by permitting the retention of solid and fluid substances in a state of decomposition, and presenting great obstacles to cleansing.

3rd. All courts and passages should be *flagged*; the common paving is inadequate for sanitary purposes in such localities.

4th. A complete reform should be effected in the manner of constructing street gutters. If any one will take the trouble to go through the town on a wet day, he will be astonished to find how many of these con-

duits have the property of retaining the water, instead of facilitating its passage into the sewer. It should never be forgotten, that a badly made gutter is literally worse than none; for it only draws the foul water from the street nearer the doors of dwellings, while the spaces between the stones allow of its free passage into the subsoil, so as to render the houses more damp than they would otherwise be. Perfect smoothness, and proper adaptation of the stones, which should be much larger than any now in use, along with a proper *continuous* declivity, (not by steps like a stair,) are indispensable requisites in a well made gutter. We are glad to know that the authorities are now engaged in making improvements in this matter also.

We need hardly point out the absolute necessity for the whole of the sanitary improvements we have been discussing being under one control, for it is now generally admitted. Every one of them is but a part of a single system, and cannot be separated without injury to the other parts. The supply of water, cleansing, paving, sewerage, and the proper application of the manure of the town, are inseparably connected together; and it is to the use of sewer water that we have to look, as a source of revenue, to enable us to meet a great part of the expense of the necessary improvements. We would again urge upon the authorities the propriety of directing their attention to this subject. It is one of great importance in a pecuniary point of view; and indeed we do not see from what other available resources the necessary funds can be obtained.

A Meeting of the GENERAL COMMITTEE was held in the Town Hall on Wednesday, June 10th, 1846; WILLIAM BROWN, Esq., in the Chair. The following resolution was proposed by J. B. YATES, Esq., seconded by H. G. HARBORD, Esq., and unanimously adopted.

"The attention of this Association having been called to a Bill now pending in Parliament, whereby the Herculaneum Estate, with powers to construct Docks, &c., is proposed to be transferred to the Birkenhead Company, and it having been represented that in the said Bill the clauses of the former Act are altogether omitted, whereby it was rendered compulsory upon all parties constructing docks to establish along the whole extent of the land a marine parade, with landing slips, and one or more streets, not less than 10 yards in width:— It was resolved, 'That with reference to the health and comfort of the inhabitants of the southern parts of the town, it is highly important that the said parade, with its appendages, should be constructed, and that measures be *immediately* adopted by all influential parties, for the purpose of suspending the further progress of the Bill until the former clauses shall have been restored. And that copies of this resolution be sent to the Earl of Shaftesbury, the Liverpool Town Council, the Toxteth Park Commissioners, and the Birkenhead Dock Commissioners.'"

It was moved by R. V. YATES, Esq., seconded by Dr. SUTHERLAND, and resolved, "That a Memorial be presented to the Town Council, begging that they may have introduced into the bill now before Parliament, a clause to the following effect,—'That in order to prevent the sickness occasioned by courts being closed at one end, in future, no courts shall be built unless they be thoroughly ventilated at both ends.' And that if it be too late for the bill now before Parliament, such a clause be introduced at the very earliest opportunity."

A communication from JOHN BULLAR, Esq., on the subject of a petition in favour of a general measure for Baths and Wash-houses, was referred to the Committee on Lord Lincoln's Bill.—A letter from Mr. FORREST, on his Window Ventilator, was referred to the Health of Tenements' Sub-Committee.—A letter from a "Rate Payer" was referred to the authorities.

At the Meeting in May, the names of Mr. PRIESTLEY and Dr. MACROBIE were added to the Committee.

All communications for the LIVERPOOL HEALTH OF TOWNS' ASSOCIATION, to be addressed to the Committee Rooms, Fenwick Chambers, Fenwick-street.

THE LIVERPOOL HEALTH OF TOWNS' ADVOCATE.

PUBLISHED UNDER THE SANCTION OF
THE COMMITTEE OF THE LIVERPOOL HEALTH OF TOWNS' ASSOCIATION.

No. 12.

SATURDAY, AUGUST 1, 1846.

PRICE 1D.

DEFECTIVE VENTILATION,

IN DWELLING-HOUSES, WORKSHOPS, SCHOOL-ROOMS, AND PUBLIC BUILDINGS,
AS A CAUSE OF DISEASE.

There is an expression of Hippocrates of great depth and meaning, and which, like many other short sentences, contains more than meets the eye. He says, "the whole body inspires and expires." This is an important truth; for it not only describes a condition without which life cannot exist, but it also lies at the root of the whole subject of ventilation. The vast extent and universal diffusion of the atmosphere around the earth, and the numberless contrivances whereby nature is continually aiming at preserving it in a state of purity, all go to prove, that any confinement or stagnation must be injurious to health. It is from the atmosphere that man "inspires" the vital element without which he cannot exist, and it is into the atmosphere that he again "expires" those various gaseous matters which, if retained within his frame, would prove equally fatal with the deprivation of air itself. The chief agency whereby those gases and vapours are rendered innocuous is, *dilution* in the vast mass of the atmosphere, and the purifying action of rains, winds, and the leaves of plants. It is by these means that the atmospheric ocean is preserved in a state of purity, and fitness for the support of living beings.

Whenever men depart from the conditions on which health is granted to them, they must infallibly suffer. If they shut themselves up in narrow, confined streets and courts, which preclude the possibility of a free circulation of air, their health must be sacrificed. And still more will this be the case, if they increase the impurity of the atmosphere, by having the localities in which they dwell uncleaned and without adequate drainage. But when to these causes, which we have already fully discussed, we add the peculiarly impure air which is allowed to accumulate, generally without the possibility of renewal, in dwelling houses and other buildings, the evils resulting from the neglect of obvious natural laws may be said to have reached their climax; and it is to this latter circumstance that we now beg to call the especial attention of our readers.

I.—INFLUENCES WHICH AFFECT THE PURITY OF THE ATMOSPHERE IN DWELLING-HOUSES, WORKSHOPS, &c.

1st. PRODUCTION OF CARBONIC ACID BY RESPIRATION AND COMBUSTION.—A wholesome atmosphere contains, in every 100 parts, 79 parts of nitrogen and 21 of oxygen gas; so that, in casting our eyes round a

room, we may consider that one-fifth part only of its cubic contents consists of vital air, or oxygen gas, while the remaining four-fifths consist of nitrogen, which, by itself, would be instantly destructive to human life, if breathed. These facts can be easily illustrated by the following simple experiment:—Take a common glass bottle, with a wide neck, and put into it a fragment of burning paper, or a small piece of lighted candle or taper, and cover the mouth closely. The oxygen will be very soon consumed, and the light will be extinguished. If the bottle be now opened, and a lighted candle plunged into it, the candle will immediately cease to burn; and on making a chemical examination of the air in the bottle, it will be found to consist of nitrogen gas, and carbonic acid, which has been produced by the union of the charcoal in the inflammable body with the oxygen of the air. Another gas has thus been formed, which is highly destructive to living beings. The experiment has been varied, by placing a live animal in a confined quantity of air, and the results have been entirely similar. In a short time the animal evinced signs of great suffering, and finally died; and on putting another live animal into the bottle, it too died, just as in the experiment with the lighted candle. When a chemical examination of the air was made, it was found to consist in this case also of nitrogen and carbonic acid. The process of burning, and the process of respiration, are thus proved to be of the same general nature; and it follows, from these facts, that if an inhabited room were made perfectly air tight, every person in the room would die, from the oxygen gas being withdrawn by breathing.

An adult consumes about 40,000 cubic inches of pure oxygen gas in 24 hours, and produces an equivalent quantity of carbonic acid. But it is not necessary that the whole of the oxygen should be withdrawn, in order to make air injurious to health. A very small amount of deterioration will cause disease; so that, if a number of people be living together in a badly ventilated house, there can be no question of the evil results which must follow; and these would be much more striking than they are, were it not for the operation of a very beautiful physical law, "the law of diffusion," as it is called, by virtue of which all gases have a continual tendency to diffuse themselves, and dilute each other, if we only leave them a sufficient number of openings to do so. The carbonic acid tends to spread itself by every available aperture, from an ill ventilated house, into the external atmosphere, while fresh air enters to supply its place: *but there must be apertures to admit of this interchange*, otherwise the law is inoperative.

Another source of carbonic acid is, the burning of gaslights, lamps, and candles, all of which deteriorate the air in confined rooms. A single candle consumes nearly as much oxygen as a human being. In regard to gas, the better it is, the more air it deteriorates. Two common jets require more fresh air than suffices for the respiration of three men. Two union jets (the common gas light used in houses and shops), consume nearly the oxygen required for the breathing of eight adults, and two

14-hole argand burners, that necessary for eleven. These facts will shew the extent to which air in buildings is deteriorated by combustion.

2nd. ESCAPE OF WATERY VAPOUR FROM THE LUNGS.—This is easily proved, by breathing upon a looking-glass. The quantity of water produced by an adult in this way is very nearly an ounce every hour, and it is all diffused through the atmosphere. We may hence infer, that, if a number of people be congregated together in a confined space, the exhalations from the lungs, along with the carbonic acid produced, will render the air very damp and unwholesome. Air of this kind lowers the vital powers, while it prevents the skin and lungs giving off that quantity of moisture necessary for health, and tends to interfere seriously with the important function of respiration.

3rd. ESCAPE OF WATERY VAPOUR FROM THE SKIN.—The discharge of vapour from the skin is equivalent, in an adult, to about an ounce of water every hour; so that the whole quantity of moisture thrown out by a grown up person is no less than two ounces an hour, from the skin and lungs together; and, keeping this fact in view, we shall be at no loss to account for the languor, headache, and other symptoms, which are experienced by people who crowd themselves together into ill ventilated rooms. A large supply of air is needful, to carry away this moisture, and to keep the skin and lungs in proper activity.

4th. THE PRODUCTION OF CARBONIC ACID FROM THE SKIN is another source of atmospheric impurity, which has to be taken into account as influencing health.

5th. THE EFFECT OF VARIOUS EXCRETIONS UPON THE ATMOSPHERE.—In addition to carbonic acid and water, there are various organic substances, which are constantly escaping from all the surfaces of the body. An infinite number of vessels and glands are continually in action, to throw off matters which would otherwise be deleterious to the system; and of these peculiar animal substances a considerable amount is dissolved by the watery vapours which escape along with them, and perhaps constitutes as great a cause of atmospheric pollution as any of the others already mentioned. Chemistry has, as yet, given little account of these aerial poisons; but their effects leave no doubt of their existence, and we have the high authority of Dr. Priestley for the fact, that they remain permanently in an atmosphere which has been breathed. Indeed, they cannot be removed by any known means except ventilation. They can even be recognised by the sense of smell, in the peculiar, close odour of bedrooms and crowded apartments. Now, it is a natural law, that every organic substance which is expelled from the body is hurtful to life; and hence we may infer, that, if these vapours be breathed, they are certain to prove noxious to the system, and to cause disease.

Lastly. In all dwelling-houses and workshops there are processes continually going forward, which deteriorate the atmosphere quite independently of the presence of human beings. The burning of lights,

already mentioned — the escape of gases from fireplaces and stoves — cooking — washing — the injurious vapours given off in certain manufactures — the high heat of the atmosphere, especially in workshops, and the exhalations which continually rise out of the foundations of houses — these, and a variety of other causes, are always in operation in lowering the health; and they can only be removed by keeping up a constant supply of fresh air, so as to imitate, as far as possible, inside our dwellings, those great natural processes whereby the whole body of the atmosphere is preserved in a state of purity. *There is, in fact, no other remedy.*

II.—DISEASES CONNECTED WITH DEFECTIVE VENTILATION.

As it is of great importance to impress on the public mind the absolute necessity of attending to the subject of ventilation, we shall proceed to detail a few facts, in proof of the injurious effects resulting from the present apathy and neglect. In doing so, however, we must be distinctly understood as admitting, that the diseases we are about to mention may, and do, arise from other causes besides want of fresh air. The proof only goes to shew that deficient ventilation is *a cause*, and a most important one; so that, if all other causes were removed, and a bad state of the atmosphere in dwelling-houses, workshops, &c., were allowed to continue, the diseases would still occur. The first illustrations we shall choose are taken from the valuable evidence of Dr. Arnott and Mr. Toynbee, in the Sanitary Reports, as exemplifying the effects of a bad ventilation on the lower animals. Dr. Arnott relates the following facts:—

“In the Zoological garden, in the Regent’s-park, a new house was built to receive the monkeys, and no expense was spared, which, in the opinion of those entrusted with the management, could ensure to those natives of a warmer climate all attainable comfort and safety. Unhappily, however, it was believed that the objects would be best secured by making the new room nearly what an English gentleman’s drawing-room is. For warming it, two ordinary drawing-room grates were put in, as close to the floor as possible, and with low chimney openings, that the heated air in the room should not escape by the chimneys, while the windows and other openings in the walls above were made as close as possible. Some additional warm air was admitted through openings in the floor, from around hot water pipes placed beneath it. * * * When all this was done, about sixty healthy monkeys, many of which had already borne several winters in England, were put into the room. A month afterwards more than fifty of these were dead, and the few remaining ones were dying. This room, open only below, was as truly an extinguisher to the living monkeys as an inverted coffee cup held over and around the flame of a candle is an extinguisher to the candle. * * * It was necessary only to open, in the winter, part of the ventilating apertures near the ceiling which had been prepared for the summer, and the room became at once salubrious.”

Mr. Toynbee gives evidence to the same effect, he says—

“The general climate, the cold, the damp, and the soil, were at first accused of the excessive mortality amongst the animals in the Zoological Gardens, but it is

now clearly ascertained that it principally arose from defective ventilation. * * * I found that scrofula was by far the greatest cause of their mortality. * * * Since the dens have been properly ventilated, the previous complaints have much diminished."

Precisely similar results are observed to follow in human beings when subject to the same influences.

1st. SCROFULA.—This disease appears to be peculiarly connected with bad ventilation, and is considered one of its effects by every writer of eminence who has treated of the subject.

M. Baudelocque, in his work on scrofula, says —

"The development of scrofula is constantly preceded by the sojourn more or less prolonged in air which is not sufficiently freshened. This is the only cause which is always met with, isolated, or united to circumstances whose action is very secondary. * * * Invariably it will be found on examination that a truly *scrofulous* disease is caused by vitiated air; and it is not always necessary that there should have been a prolonged stay in such an atmosphere. Often a few hours each day is sufficient, and it is thus that they may, in the most healthy country, pass the greater part of the day in the open air and yet become scrofulous, because of sleeping in a confined place, where the air has not been renewed."

Sir James Clark, Bart., states that

"There can be no doubt 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 origin of scrofula in schools is perfectly well known to proceed from the same cause. A famous case occurred at Norwood in 1832. There were 600 pupils in the school; and scrofula broke out extensively, and was accompanied with great mortality. It was proved by Dr. Arnott to be entirely due to defective ventilation, which was corrected, and the scrofula not only disappeared, but 1,100 children now live in health where 600 could not do so before. We could adduce a number of similar facts were it necessary, but what has been said is sufficient to illustrate the subject.

2nd. CONSUMPTION AND OTHER PULMONARY DISEASES.—No one can doubt that the tendency to consumption, and other diseases of the chest, is developed by a vitiated atmosphere. Indeed it could hardly be otherwise. We have seen that the whole body is constantly throwing off vapours injurious to health, and if these vapours be breathed again and again, instead of being diffused through the atmosphere and so rendered innocuous, the functions of the lungs must be interfered with, so as to prevent the due purification of the blood. The lining membrane of the lungs, with which the vitiated air is brought in contact during respiration, amounts to no less than 440 square feet; so that, acting over this large extent of surface, a much more powerful impression is produced on the

frame than at first sight might be expected. The vital powers are lowered, and the part which receives the first impression of the injury is the first to suffer. In his admirable work on climate, Sir James Clark enumerates amongst the exciting causes of consumption, "long confinement in close, ill-ventilated rooms, whether nurseries, school-rooms, or manufactories." And in another work he states, that "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 often suffice to induce tuberculous cachexia," (the beginning of consumption.) This point may be illustrated still further by a few facts.

It is found that consumption and other pulmonary diseases are awfully fatal in particular trades. We shall select three of the worst, as examples; tailors, printers, and dressmakers. The places of work of these trades are notoriously deficient in the means of obtaining a proper ventilation. Indeed it seems never to be thought of. The fearful responsibility of the consequences lies entirely with the masters and mistresses. Many of them are, doubtless, benevolent, well-meaning persons, but it is an undeniable fact, that they appear to care for nothing but packing the greatest possible number of work people into the smallest possible space, and making the most money out of them they can, regardless of the sickness and death which result. A mere trifle of expense would do all that is required, but because it is no part of the bond, it is not incurred. Take the following description of a tailor's workshop, given in Mr. Chadwick's Report—

"The place in which we used to work at Messrs. Allen's was a room where 80 men worked together. It was a room about 16 or 18 yards long, and 7 or 8 yards wide, lighted with skylights. * * In summer time, the heat of the irons made the room 20 or 30 degrees higher than the heat outside. * * I have known young men, tailors from the country, faint away in the shop from the excessive heat and closeness; persons coming into the shop used to complain of the heat and smell as intolerable. The men sat as loosely as they possibly could, and the perspiration ran from them from the heat and closeness."

The witness goes on to describe the results to the workmen, and states that intemperance and bad habits followed as consequences, and that "the closer the ventilation of the places of work, the worse are the habits of the men working in them." "Great numbers of them die of consumption. 'A decline' is the general disease of which they die."

Mr. Chadwick says, that "in the registered causes of death of 233 persons, entered during the year 1839, in the eastern and western unions of the metropolis, under the general head 'tailor,' no less than 123 are registered as having died of disease of the respiratory organs, of whom 92 died of consumption."

Dr. Guy has given some valuable information on the sanitary state of letter-press printers, who appear to be exposed to nearly similar influences as tailors. He says that in a close upper room he found 17 men at work,

and that "three had spitting of blood, two were subject to affections of the lungs, and five to constant and severe colds;" so that 10 out of 17 in this instance suffered from bad ventilation.

Of all the evils which result from improper ventilation, those that fall on poor sempstresses are the most dreadful. We cannot find language sufficiently strong to condemn the heartless negligence which consigns so many human beings to a premature grave, from want of attention to the most ordinary precautions. Crowded work-rooms, a foul atmosphere, sometimes at a temperature of 90°, no adequate provision for fresh air or exercise, long hours and emaciating toil, are the agencies of which the ravages of consumption are only the legitimate results.

Mr. Chadwick states, that of 52 deaths of milliners and dressmakers, reported in the metropolitan unions in 1839, *no fewer than 33 were from diseases of the lungs, and of these 28 were from consumption!*

Our readers will be at no loss to perceive that the results of these *experiments on the effects of bad air on the human constitution* are exactly the same as in Dr. Arnott's case of the monkeys, for they too died of consumption.

3rd. FEVER.—This disease is well known to be intimately connected with deficient ventilation. One remarkable fact we have already mentioned, namely, that most of the 23 persons who came out alive from the Black Hole in Calcutta were in a high state of putrid fever, of which many died. Another equally striking example occurred in Glasgow, in a large ill-ventilated building, occupied by 500 people. There were sometimes as many as seven cases of fever a-day in that building; but after proper ventilation was established, fever was hardly known to occur in it.

The only other fact we think it needful to state, is from the Medical Report of the London Fever Hospital, for 1846, in which it is given as "an illustration of the mode in which this malady commonly arises and spreads." The Report states, that

"Considerably more than one-fifth part of the whole admissions this year—no less than 130 patients, were received from one house alone, namely, Marlborough House, Peckham," in which "commonly 50, and sometimes it is stated from 90 to 100 men are crowded into a room 33 feet 9 inches long, 20 feet wide, and 7 feet pitch in the centre, the roof sloping from the middle to the side, at which part the ceiling is described as being no more than 2 feet high." * * "The room is closed at night. There are only two small apertures for windows, about 18 inches square; so that the whole of this dormitory does not afford a larger bulk of air for respiration than is appropriated in the wards of an hospital to 3 patients."

No better illustration of cause and effect could be given. We are ashamed to add that the room is a night asylum for the houseless poor!

4th. CONVULSIONS IN CHILDREN are so dreadfully fatal in Liverpool, that one in 188 *of the whole population of the parish* dies every year from this disease, which, to a great extent, arises from the cause we are discussing. The strongest *experimental* evidence of the origin of convulsions from foul air is afforded by the fact, that in the Dublin Lying-in

Hospital, in 1781, on account of defective ventilation, "every sixth child died within nine days after birth of convulsive disease; and that after means of thorough ventilation had been adopted, the mortality of infants in the five succeeding years was reduced to nearly one in twenty."

5th. DEPRESSION OF THE GENERAL HEALTH.—A depressed state of the digestive functions, and of all the other powers of the constitution, is one of the most frequent consequences of badly ventilated towns and dwellings. We have seen many illustrations of this, particularly in children, who are more susceptible than adults to the effects of a deteriorated atmosphere. The following judicious remarks of Sir James Clark, in the work already quoted, are worthy of serious consideration.

"Let a mother, who has been made anxious by the sickly looks of her children, go from *pure air* into their bed-room in the morning, before a door or window has been opened, and remark the state of the atmosphere—the close, oppressive, and often fœtid odour of the room—and she may cease to wonder at the pale, sickly aspect of her children. Let her pay a similar visit sometime after means have been taken, by the chimney ventilator or otherwise, to secure a full supply and continual renewal of the air in the bed-room during the night, and she will be able to account for the more healthy appearance of her children, which is sure to be the consequence of supplying them with pure air to breathe."

Did our space permit, we might adduce evidence to show that skin diseases, sore eyes, rickets, nervous and many other complaints, as well as the spread of contagious diseases, such as measles, scarlet fever, &c., may be traced to neglect of ventilation. In short, wherever the air is breathed in a state of habitual impurity, various diseases of the respiratory function may *directly* supervene: and the office of the skin may be so impaired as to induce direct disease of its functions; while extensive secondary diseases of the constitution may also take place.

The whole of the sanitary police of towns, in fact, resolves itself into the adoption of measures for preserving the external atmosphere from becoming tainted with noxious exhalations; and one of the most indispensable sanitary duties in regard to all inhabited buildings, is the adoption of means for renewing the air within them as frequently as necessary. In our next number we shall consider the principles of ventilation.

The MONTHLY MEETING of the GENERAL COMMITTEE was held in the TOWN HALL, on Wednesday, July 8th, Adam Hodgson, Esq., in the Chair. The usual routine business was transacted, after which, a communication was read from W. A. Mackinnon, Esq., M P., enclosing a copy of his Bill on the subject of Interment in Towns. The Bill was referred to a Special Sub-Committee, consisting of the Rev. Dr. Raffles, Dr. Sutherland, Rev. H. Hampton, Rev. W. Bevan, Mr. J. Eden, Mr. H. G. Harbord, and Mr. Higginson, to examine and report to the next Meeting.

The practice of conveying the bodies of children to places of interment in cars was brought forward by Mr. Harbord, and the subject was also referred to the Special Sub-Committee.

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THE LIVERPOOL HEALTH OF TOWNS' ADVOCATE.

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No. 13.

TUESDAY, SEPTEMBER 1, 1846.

PRICE 3D.

PRINCIPLES OF VENTILATION.

Ventilation may be defined to be "the art of replacing impure air within buildings, by fresh air drawn from without." We use the term *art* advisedly: because, however obvious those laws may be, by which a perfect renewal of the air in any locality may be effected, there are, nevertheless, many difficulties in their practical application which can only be overcome by experience.

The very first condition, and it is one altogether indispensable, is, that an adequate supply of pure air be attainable. This is a matter of far greater difficulty than people generally imagine; for in all towns there are causes in operation that load the atmosphere with impurities. Undrained and uncleansed streets; the existence of those foci of pestilence, open cess-pools and middens, untrapped gulley-holes, the smoke of chimneys, and other similar causes, act in this manner: so that, in the present wretched sanitary condition of our towns, it is obviously impossible to ventilate a single dwelling-house in an efficient manner. It has been proposed to obviate this difficulty by drawing supplies of air from a considerable height above the ground, by means of shafts erected for the purpose; but there is no attainable region of the atmosphere that is not poisoned by the smoke of furnaces and manufactories. We had occasion recently to observe this point in regard to Liverpool. On a clear still day, when the atmosphere was unusually transparent, the whole town was covered by a dense opaque cloud, and by referring its height to a known altitude, it was found to be about 300 feet in thickness. It is from this impure atmosphere that the whole ventilation of Liverpool is at present supplied.

The very manner in which our towns have been constructed would at first sight appear to have been chosen for the express purpose of rendering ventilation as difficult as possible. It would be no easy matter to contrive more efficient means to keep the pure air of heaven from reaching our dwellings than those which have been adopted in Liverpool. We have streets built without any reference to the direction of the winds, while they are so narrow and irregular, and change their direction so frequently, as to oppose great obstacles to the passage of air through them. Our courts are generally mere cul-de-sacs, through which no currents can ever sweep, and in which the air stagnates and becomes charged with putrid effluvia from the cess-pools, one of the chief causes of the ravages of cholera. In

many of these localities it would be impossible to ventilate the houses, for the inhabitants are frequently compelled to close every door and window to keep out the horribly offensive odours which pollute the external atmosphere. Then again the houses themselves are built so low, that the smoke is not conducted to a sufficient height above the ground to be carried away; and it very generally rolls over the roofs and descends into the streets and courts, so as to mingle with the air from which the houses must be supplied. This is a fact any one may observe. It is hence quite obvious that the sanitary improvement of towns must precede the sanitary improvement of dwellings; and that laws for facilitating needful structural alterations in streets and courts, and for compelling the consumption of smoke, and proper cleansing and draining, must be obtained and administered with rigour, before the *full* effect of a perfect system of ventilation can be brought to bear upon the public health. We have not made these remarks for the purpose of discouraging effort; for although the atmosphere of towns be at present impure, it is very much more healthy than the air of dwellings, so that it would be a great boon to the poor to have their houses ventilated even under existing disadvantages. Our sole object has been to make our readers acquainted with the difficulties of the subject, and to show that all sanitary improvements constitute *a unity*, and that it is absolutely necessary to prosecute every one of them with equal vigour.

I. — CONDITION OF THE AIR IN UNVENTILATED APARTMENTS.

In our last number we showed the various agencies at work in deteriorating the atmosphere within inhabited buildings, and the first question that requires solution, in order to our removing the impure air, is to determine its position, and this can be easily done by the application of known physical laws. The same processes which deteriorate the atmosphere of rooms also heat it. Thus the impure air proceeding from the burning of gaslights, candles, &c., is of a temperature considerably above that of the surrounding atmosphere; and the exhalations from the lungs and skin are also heated by the body. Now warm air is lighter than cold air, and is pressed upwards by it, for the same reason that a piece of cork rises to the surface of water; and hence the position of the unwholesome air of inhabited apartments is towards the ceiling. This is a very important fact to keep in mind, because it is a common error to suppose that such is not the case, and that even in quarters where a more correct judgment might have been expected. Thus Dr. Arnott states, in his evidence on the destructive effects of foul air on the monkeys in the Zoological Gardens, related in our last number, that "for ventilation in cold weather, openings were made in the skirting of the room close to the floor, with the erroneous idea that the carbonic acid produced in the respiration of the animals, because heavier than the other air in the room, would separate from this, and escape below."

FIG. 1.



The fact is just the reverse, for heated impure air ascends, as may be illustrated by a simple experiment. Take a common cylindrical lamp glass, Fig. 1., such as is used for argand burners; hold it perpendicularly, and place upon the upper end of it a piece of flat glass or wood, so as to close it above and leave it open below. The lamp glass now resembles our ordinary sitting rooms, which are all closed above, though they are by no means so open below as the glass is. Now in order to show the position occupied by impure air within the apparatus, place the open end over a lighted taper, so that the flame may enter an inch or an inch and a half within the glass, and notwithstanding the large lower opening, the taper will very soon be extinguished. The explanation of this fact is simple enough. The vitiated air produced by the flame, being highly heated, is carried to the top of the lamp glass, and fills the whole space from above downwards, till it envelops the flame and so extinguishes it. The experiment is an instructive one, for it illustrates what occurs, though in a less degree, with the warm foul air in ordinary apartments, and we may learn from it—

1st. That the upper part of a room is more unhealthy than the lower.

2nd. That seats in galleries, in ill ventilated churches and other buildings, are more unhealthy than those on the floors.

3rd. It explains why persons seated at elevated desks, in shops and offices, are not unfrequently subject to illness from the bad air they breathe.

4th. It shews why the upper flats of unventilated cottages and houses are always the most unhealthy, the impure air passing upwards by the staircases, and accumulating in the bed-rooms, so as to fill them at times with the most sickening effluvia. It is for the same reason that the upper flats of workshops and manufactories are more unwholesome than the lower ones; for all the heated effluvia from the bodies of the workmen, and the hot air from the gas-lights, stoves, &c., with other hurtful vapours, pass upwards to the higher floors, and materially injure the health of the men employed in them.

The following illustration of this ascending scale of unhealthiness is given by Dr. Guy, in his evidence. He examined the state of the men in several unventilated work-shops, consisting of successive floors communicating with each other by an inner staircase, so as to give a free passage upwards for all the hot foul air from below; and states as the result, that in one of these workshops,

“Fifteen men were employed on the second floor, and 17 men in precisely the same way on the third and uppermost floor. On making personal inquiries of each of the men respecting his health, four only out of the 15 on the second floor made any complaint: one was subject to indigestion, a second to cough, the third to

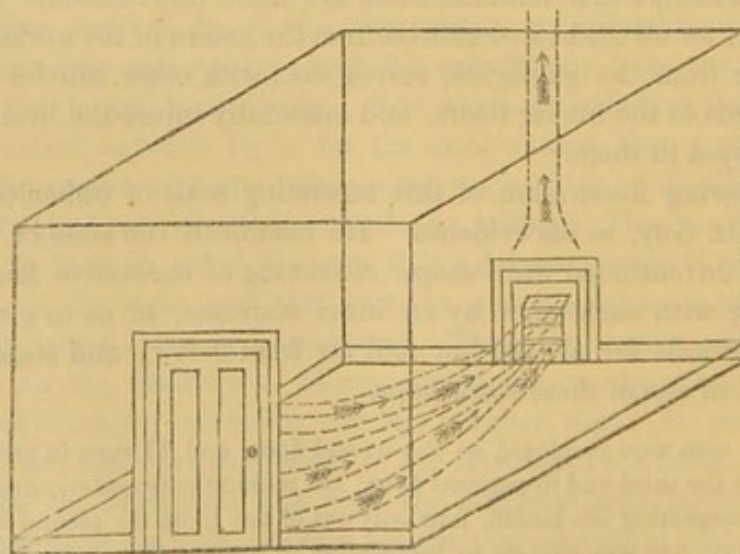
ulcers of the leg, and the fourth was what might be termed a valetudinarian. But of the 17 employed on the uppermost floor, three had had spitting of blood, two were subject to affections of the lungs, and five to constant and severe colds. Ten of these 17, therefore, were subject to diseases affecting the chest, while one only of the 15 in the room beneath had a disease of this nature. * * * Another workshop of the same kind, and constructed in the same faulty manner, gave a similar result: of 20 men in the upper room, two had had spitting of blood, two indigestion, two rheumatism, one subject to headache, one had varicose veins, and two were subject to lowness of spirits (hypochondriasis); making in all 10 invalids in 20. * * * On the contrary, of 15 men employed in the lower room, one only had spit blood, one complained of weakness, and a third of indigestion, making three in all; being at the rate of 4 in 20, in place of 10 in 20 in the upper room."

These facts appear to us to be conclusive on the point, and they ought to impress both masters and workmen with the necessity of attending with care to the ventilation of workshops and manufactories.

EFFECT OF AN OPEN FIRE-PLACE.—If a sitting-room were made perfectly close, the whole air, even to the floor, would become tainted by the breath of persons living in it; but the existence of an open fire-place modifies the state of the atmosphere. The draught of the chimney, in such cases, preserves the atmosphere *below the level of the chimney-piece*, in a state of comparative purity, because, while the foul air is removed by the draught, fresh air comes in below the door to supply its place. But this does not affect materially that portion of the air that is *above the level of the chimney*; and thus, in an ordinary sitting-room, the lower strata of air, which are *not* used for breathing, are comparatively pure, while the upper strata, which *are* used for breathing, are unhealthy. We need hardly repeat the reason, namely, that the impure air, being warmer, remains above.

The following diagram will explain the fact clearly.

FIG. II.—COURSE OF THE AIR IN AN ILL-VENTILATED APARTMENT.



All the air in the lower part of the room is in a state of movement, from the door to the fire-place, and so up the chimney, as is shewn by the direction of the arrows; but all the air above is stagnant and unwholesome.

We are too apt to pride ourselves on what we consider the improvements of our advanced civilization, and hence all kinds of patent grates have been eagerly adopted by the public. One object of most of these contrivances has been to lower the fire as near to the floor as possible; but, from what has been said, our readers will at once perceive that sitting-rooms where such grates are used must infallibly be unwholesome. There was far more wisdom in the lofty fire-places used by our ancestors. They were not unfrequently so high that people could walk erect into them, and pass behind the fire; so that the rooms where such fire-places existed were sure to be well ventilated.

II.—VENTILATING OPENINGS.

We have now ascertained two very important facts: 1st, That impure warm air has a tendency to ascend, and 2ndly, That it accumulates in the upper portion of unventilated apartments; and from these two facts we may easily arrive at the means of removing the impure air, and supplying its place by wholesome air from the external atmosphere. For this purpose, two openings, or sets of openings, are required, one to allow the foul air to escape, and the other to admit fresh air. The first of these apertures should be placed at the *top* of the room, and the second *near the floor*.

FIG. III.



The reason of this can be easily understood by the apparatus made with the lamp glass already mentioned. We have seen, that if there be an opening only at the lower part of the glass the candle will be extinguished, because the hot vitiated air, being lighter than the atmosphere, fills the glass *from above downwards*; but if the cover be slid a little on one side, as in Fig. III., so as to leave an opening of about a quarter of an inch, the candle will burn brightly, and for the obvious reason, that the heated gas escapes with facility upwards into the atmosphere, while fresh air flows in below to supply the flame. Now we have only to imitate this process in our apartments; let there be an adequate opening at the top of the room, and another near the floor, and a ventilating current is at once established. The arrows in the diagram, Fig. III., shew the new direction taken by the current when two ventilating openings are made, and it will be seen that the current passes directly through the unwholesome air, so as to dilute and remove it. On comparing this diagram with Fig. I., the condition of a wholesome atmosphere, as contrasted with the opposite, will be easily understood.

The experiment also points out clearly the proper position for ventilating openings in the stair cases, so as to remove the great unhealthiness of upper rooms, mentioned in the preceding section. In such instances a communication should be made with the external atmosphere, not only from each separate room, but particularly from the top of the stair-case itself, to afford a free outlet for the hot impure air, which, as we have shewn, is ever ready to flow out of its own accord, if we only permit it to do so. We have seen an opening in the wall, close to the roof, produce the best effects in this way; and in other cases, an opening made in the ceiling of the stair-case, and in the roof, protected by a cowl or by louvres, is found to answer equally well.

It is an error to imagine that a single ventilating opening placed at the *top* of an apartment would be sufficient to preserve the air in a pure state. From what has been said, it will be perceived that a proper current could not be established in this way; for if the usual crevices in the doors and windows were not sufficient to supply the air drawn off by the upper opening, a downward current by the *sides* of the opening would take place, while there would be an upward current through its *centre*; and these currents would constantly interfere, so as to obstruct the ventilation, and produce draughts.

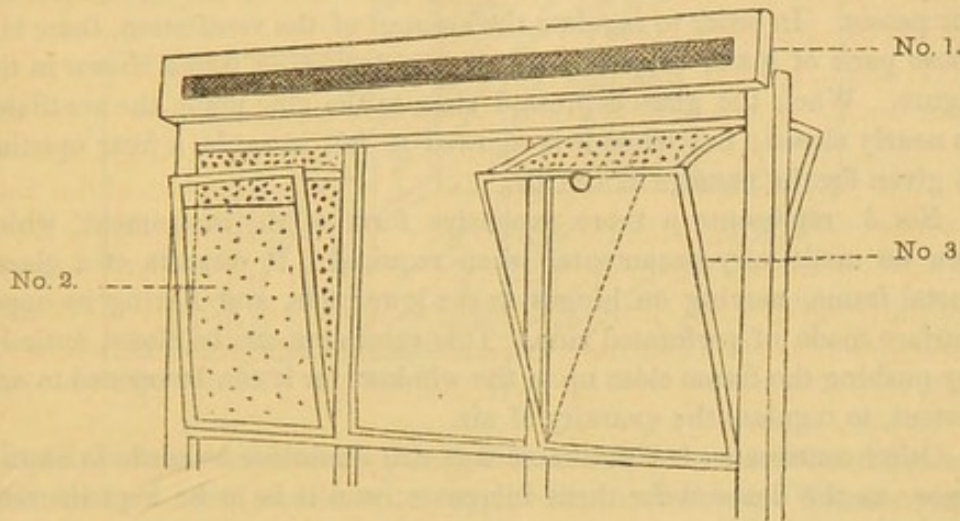
SIZE OF VENTILATING OPENINGS.—The size of the openings must depend on the quantity of air required within the apartment. This is a matter of extreme importance, and must be carefully considered. Dr. Reid, in his work on Ventilation, is of opinion, that to provide for every contingency, no less than 10 cubic feet of fresh air ought to be admitted every minute for each person in the apartment; a quantity sufficient to fill a box 30 inches long, 24 inches broad, and 24 inches deep. This large quantity is necessary to neutralize and remove the various gaseous matters, described in our last number as continually deteriorating the atmosphere in inhabited apartments.

The principles now detailed are very clear in theory, but when we come to put them in practice we are met by difficulties from various sources, which must also be taken into consideration, before we can ventilate effectually any given apartment. Thus, in large buildings it is not always possible to obtain a sufficient current by the mere ascending power of the warm vitiated atmosphere itself, and this leads to means of obtaining an artificial current. Then, again, the influx of cold air through a ventilating opening might occasion disagreeable or hurtful draughts; and hence means must be adopted to break up the column of air into a great many minute streamlets, so as to diffuse it through the apartment as equally as possible. Another source of difficulty proceeds from the draughts of chimneys being unequal, and so disturbing the proper ventilating currents. All of these, and other similar matters, require to be carefully considered. And it is thus that ventilation be-

comes an art, though resting on positive physical laws. It is not to be expected that, as an art, it can be as far advanced as it will yet become; and hence the methods and kinds of apparatus employed are to some extent imperfect. We shall, however, state briefly what has been done, in order to shew, that even with the present limited means much good may be effected, and with the hope of calling the attention of ingenious persons to the subject, so as to lead to practical improvements.

III. — WINDOW VENTILATORS.

FIG. IV.



It is of essential importance that all contrivances for ventilation, especially such as are intended for the use of the labouring classes, should be *simple, cheap, and effectual*. There are several methods now in use, which, to a certain extent at least, fulfil these conditions.

The most obvious means of renewing the air in a room, is to make use of existing openings, such as the windows or doors. By drawing the windows down at the top, and opening the door at the same time, a very effectual ventilation, as every body knows, may be obtained. Where other means cannot be had recourse to, advantage should be taken of this as frequently as possible. But, from the draughts produced, it can never be made effectual to keeping up a constant and steady renewal of the internal atmosphere. Various plans for window ventilators have been contrived to obviate draughts, three of which we have represented in their position in Fig. iv. No. 1. is a very simple and inexpensive instrument, and may be constructed by any working man.

It is made as follows:—Suppose the breadth of the window to which it is to be applied is three feet; a wooden frame, exactly three feet long, and three inches broad, over all, is made. Allowing an inch for the breadth of the wood-work, there will be an opening 34 inches long, and an inch broad, and it is through this space that the air has to pass. In order to prevent draughts, a strip of fine hair-cloth, or close wire gauze,

is nailed over the opening, to diffuse the air. The frame, thus completed, is fastened inside the window, at the very top of the window-frame. When it is desired to ventilate the room, the window is drawn down about two inches, as shewn in the Figure, so as to leave an opening through the hair-cloth, or wire gauze, between the air outside and that inside the apartment, and the ventilation is gradually but steadily effected. We have seen much good result from the use of this ventilator.

Another plan is, to remove one of the top panes of the window, and to insert in its place the ventilator No. 2. This consists of a plate of zinc, the size of the pane, full of very small holes, through which the air passes. In order to regulate the amount of the ventilation, there is a loose pane of glass, supported within the projecting frame shewn in the figure. When the glass is pressed close to the zinc plate, the ventilator is nearly closed; but when it is allowed to fall inwards, a freer opening is given for the passage of the air.

No. 3. represents a more expensive form of the instrument, which can be made very ornamental when required. It consists of a glazed metal frame, moving on hinges at the lower side, and having its upper surface made of perforated zinc. This ventilator can be closed entirely, by pushing the frame close up to the window; or it can be opened to any extent, to regulate the quantity of air.

Other contrivances of the same sort will doubtless be made in abundance, as the demand for them increases; and it is to be kept in mind *that the object is to prevent draughts, while a renewal of the air inside is effected.* No plan which does not effect a complete *diffusion* of the air will ever answer in small apartments, such as cottage rooms. The smaller the apertures used, the better. The perforated zinc in the ventilators described above has 220 holes to the inch.

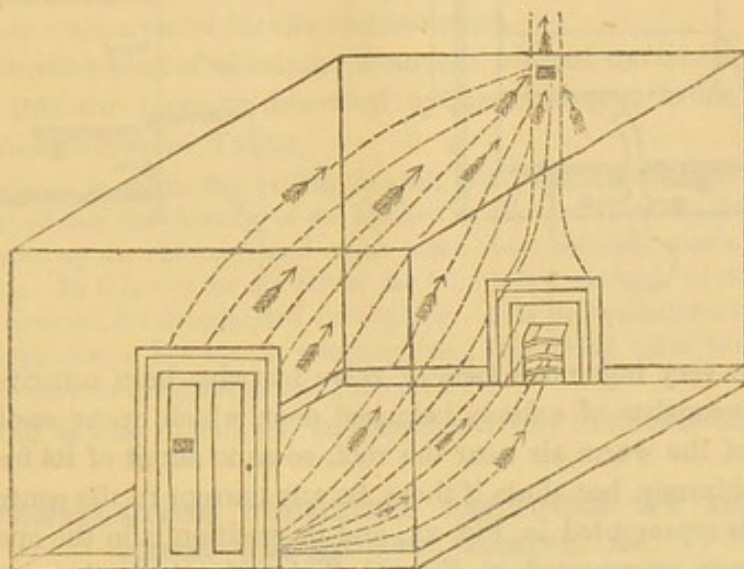
The benefit that has been derived from these simple inventions is very great. Mr. Toynbee, in his evidence, is asked,

“What have you observed of the effects produced by these means of ventilation? The effect on the health of the patient, I have observed, is to accelerate the cure, and to alleviate the symptoms. * * The general observation of the inhabitants as well as the patients is, that the room is ‘much more comfortable and airy.’ * * They have frequently said, that they have been in so much better spirits since they have had these ventilators, and have always been most grateful for them; they have often been more thankful for the ventilators than for the flannel and bread and milk. * * At No. 8, Duke-street, Grosvenor-square, * * I have put ten ventilators on the stairs and landing, and the whole of the people there express a very high sense of the comfort they have experienced. In the first room the smell was so bad, that I could not enter into or remain in it, unless the windows were opened. I can now go there without annoyance. Tailors working at home have told me they can now use the hot irons for pressing with comfort; before the ventilators were introduced, they suffered extremely from the heat and depression consequent thereon.”

The perforated zinc window ventilators can be put up for about 2s.

IV.—CHIMNEY VENTILATORS.

FIG. V.—CURRENTS PRODUCED BY THE CHIMNEY AND DOOR VENTILATORS.



In all chimney ventilators a principle is introduced, somewhat different from what we have mentioned as applicable to windows. When a ventilating opening is made in a window, a kind of interchange takes place through the small apertures, between the purer atmosphere outside, and the unwholesome air within the room, so that the latter becomes diluted. But when an opening is made into a chimney, it is with the intention of establishing a ventilating current, by means of the ordinary draught of the fire. Two or more bricks are removed close to the ceiling, so as to leave a square opening directly into the chimney of the room, and an upward current is produced, as is shown by the arrows in Fig. v. On comparing this diagram with Fig. II., the effect of the chimney ventilator on the atmosphere of a room will be easily understood. The size of the opening must of course be proportioned to the size of the apartment, and there ought to be a valve to regulate the current of air passing through it. The simplest form of this valve was contrived by Dr. Arnott, and is made of oiled silk, which is used as follows:—A square iron tube, the size of a common brick, is introduced into the chimney aperture, so that the draught passes through it into the chimney. The end of the tube opening into the room is covered with coarse wire gauze, and exactly behind it the oiled silk valve is hung inside the tube. The upward current raises the valve, and passes into the chimney; but any back-draught presses the silk against the wire gauze, and stops up the opening.—This apparatus costs 3s., fitted up.

FIG. VI.
DR. ARNOTT'S CHIMNEY VENTILATOR.

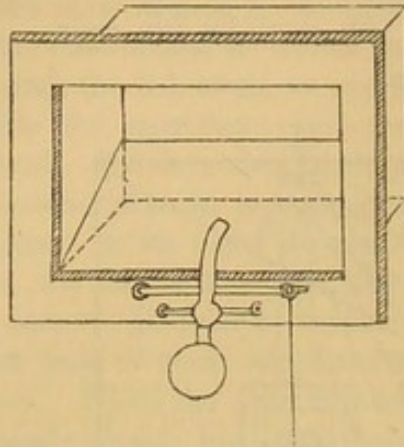
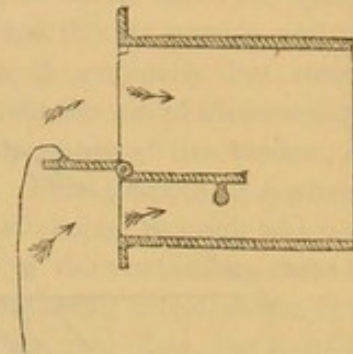


FIG. VII.
DAW'S CHIMNEY VENTILATOR.



Another very ingenious form of valve has also been contrived by Dr. Arnott. It consists of a finely balanced door, which opens easily by the pressure of the warm air near the roof, so as to admit of its free passage into the chimney, but shuts if there be any current in the contrary direction. It is represented in Fig. VI., and its position is in the opening into the chimney, represented in Fig. V. This valve is used to some extent in London, and is found to answer very well in all cases where there is a proper draught. There are 16 in use in St. George's Hospital, where, we believe, they give satisfaction. Dr. Arnott's valve is now made with a contrivance for shutting it by means of a string.

A modification of this ventilator, made by Mr. Daw, is represented in Fig. VII. The valve is not self-acting, but can be opened and shut by a string. It is kept closed while the fire is being lit, and may afterwards be allowed to fall open. The walls of rooms furnished with these ventilators are found to keep longer clean, from the constant renewal of the air.

Daw's Ventilator costs, 3s., if made with an opening the size of two bricks placed on their flat side; and 4s. 6d., the size of four.

It is absolutely necessary to the action of any chimney ventilator that there should be a sufficient draught. No form of apparatus will compensate for the want of this. And the very first thing that must be done in such cases is *to correct the draught before the ventilator is introduced, otherwise it will only lead to disappointment.*

In every case where a ventilating current is established through an apartment, there must be provision made for introducing a proper supply of fresh air, because the quantity which enters by the usual crevices is in most cases insufficient. The leading principle to be kept in view in this case is to pass the current through a great number of minute openings, in wire gauze, hair-cloth, or perforated zinc plate, and thus to prevent draughts by diffusing it as much as possible. In a cottage-room, perhaps the best position for admitting the air would be by an opening in one of

the door panels. The opening being covered with fine wire gauze, and provided with a slide to regulate its size. See Fig. v.

The Samaritan Fund Committee of the St. George and St. James Dispensary, London, have ventilated a great number of poor dwellings by door and chimney ventilators, at an expense of 9s. a room, and the effects have amply compensated for the cost incurred.

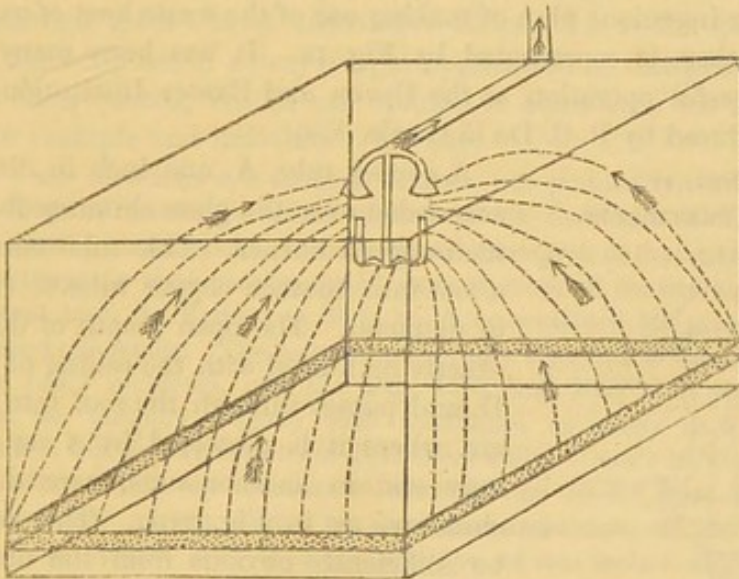
The following plan of obtaining a current without the danger of smoke escaping into the room, is described by Mr. Grainger, in his lecture on the "Unhealthiness of Towns."

"An aperture is cut in the ceiling or wall, and from it a common tin or zinc tube is carried into the chimney of the kitchen or other room where there is a fire: the tube goes up the chimney, and opens some short distance above it, into the external air. In this way the air within the tube being warmed, causes a current, and thus removes the deteriorated atmosphere. It is well calculated for close and crowded work-rooms, bed-rooms, nurseries, &c., care being taken to regulate the size, and to prevent the draught being too great."

The plan is very ingenious, and appears likely to answer the intended purpose.

**V.—VENTILATING CURRENTS PRODUCED BY HOT AIR
FROM GAS-LIGHTS, LAMPS, &c.**

FIG. VIII.



By making use of the rarefying power of the hot air proceeding from lights, it is possible to correct the ventilation in many crowded workshops and public buildings, so that the evil may be made the means of its own removal. There are various methods of accomplishing this object, of which the following is one of the most effectual:—An inverted funnel placed at a short distance above each burner, so as to allow of the passage into it of as much of the foul air of the apartment as possible, and communicating with a tube of proper width carried either into the chimney

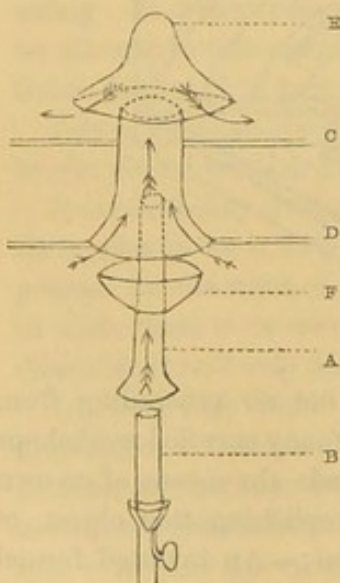
or into the open air, is all that in most cases is required to preserve the health and lives of work people, at present so thoughtlessly sacrificed. The following example given by Mr. Grainger will show what may be done in this way.

"A workroom in London where a number of young dressmakers were employed, and where the temperature at night was as high as *ninety degrees*, was fitted up last winter with such tubes, a fresh supply of air being introduced and gradually diffused through the room by shifting the skirting board a little distance from the wall and closing the slit thus obtained by perforated zinc: ventilators were also inserted in the chimney. In this case (and it is right to mention the improvement was from humane motives introduced by the proprietors, Messrs. Lewis and Allenby, of Regent-street,) the best results have been obtained. The temperature, when I visited the establishment, was reduced to *sixty degrees*, the air was fresh and pure, and the young women stated, they found inexpressible comfort, being relieved from the severe headache, faintness, &c., from which they had previously suffered."

Such an arrangement is shown in Fig. VIII. It also exhibits the ventilating currents produced by a porous skirting board, behind which the fresh air is introduced, and diffused, by passing through perforated zinc into the room. This is one of the most effectual methods of ventilating in existence.

Another ingenious plan of making use of the waste heat of gas burners in ventilating, is represented by Fig. IX. It has been many years in very successful operation at the Devon and Exeter Institution, where it was introduced by P. C. De la Garde, Esq.

FIG. IV.
GAS VENTILATOR.



A copper tube A, one inch in diameter, is suspended over the glass chimney B of a common argand burner. This tube enters about a foot into another copper tube C, two inches in diameter. The open mouth of this tube is exactly on a level with the ceiling of the room D, and passes through the roof into the open air, where it is protected by a cap E, or it may end in another tube, carried into the chimney, as in Fig. VIII. The action will be sufficiently obvious from the direction of the arrows. The tube A takes up all the heated air from the burner, and discharges it into the tube C, which by this means has a strong current set up in it, so as to draw out the foul air from the apartment by its open mouth; and the cup F receives the moisture arising from condensation. The apparatus is

simple, and inexpensive, and it is at the same time self-acting.

EXCLUSIVE GAS BURNERS.—A very good method of withdrawing the

carbonic acid and water proceeding from the combustion of gas, is to enclose the flame within a glass globe, or other similar contrivance, and to have a tube attached to the globe, to remove away the whole products of the combustion, without mixing in any degree with the air of the apartment. Dr. Faraday's gas ventilator is one of the best of these contrivances. It gives a brilliant light, without entailing any one of the consequences which are apt to follow from admitting the products of combustion into a room.

VI.—VENTILATION BY SHAFTS.

There are certain situations where none of the means of ventilating already mentioned will act satisfactorily. These are large buildings, consisting of a number of rooms, the natural draughts of which cannot be easily regulated; or large apartments, in which a sufficient temperature cannot be given to the air to ensure an upward current of the requisite velocity. In such cases we must resort to other means, and one of the simplest of these is to connect all the apartments, by flues, with a common shaft, having a fire at the base of it. An ordinary furnace chimney may be used for the purpose when it can be approached with facility. The strong upward draught is a most efficient agent in removing the foul air, and from its self-action it requires no labour and very little attendance.

Mr. Chadwick gives a most instructive illustration of the good effects following the adoption of a very simple application of this principle. It has been often quoted, but in our opinion it cannot be too frequently held up for example and imitation. He says—

“When I was in Glasgow, a striking instance was pointed out to me of the beneficial effects of ventilation when applied to the dwellings of the working classes connected with factories. I was informed there was in that city an assemblage of dwellings for work-people, called, from its mode of construction and the crowd collected in it, the Barracks. This building contained 500 persons; every room contained one family. The consequence of this crowding of the apartments, which were badly ventilated, and the filth, were, that fever was scarcely ever absent from the building. There were sometimes as many as 7 cases in one day; and in the last two months of 1831 there were 57 cases in the building. All attempts to induce the inmates to ventilate the rooms were ineffectual, and the proprietors of the works, on the recommendation of Mr. Fleming, a surgeon of the district, fixed a simple tin tube, of two inches diameter, into the ceiling of each room, and these tubes led into one general tube, the extremity of which was inserted into the chimney of the factory furnace. By the perpetual draught thus produced upon the atmosphere of each room, the inmates were compelled, whether they would or not, to breathe pure air. The effect was, that during the ensuing eight years fever was scarcely known in the place.”

This case shews the great facility with which benevolent masters may benefit those in their employ; while it proves at the same time that the draught of a chimney may be made a most effectual means of ventilation.

In some instances, separate ventilating shafts, from the top of each

apartment, may be advantageously carried up along with the chimney. The heat communicated to the air within them, by their proximity to the chimney flues, is often sufficient to produce the necessary rarefaction, so as to cause a ventilating current; and they should be made to discharge the foul air in the side of the stalk, in some position where the smoke cannot enter, or they may be protected by cowls.

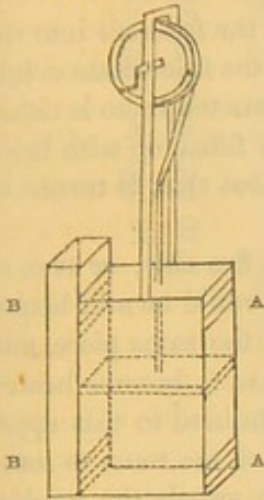
The draught of a chimney may also be turned to good account, in removing hurtful vapours and fine dust arising from certain manufactures. A useful illustration of this is given by Dr. Guy. He relates the case of a workman who used large quantities of aquafortis in his trade, the fumes from which had seriously injured his chest. On examining his place of work, it was found that a wooden funnel was provided for carrying off the fumes, but that it did not act for want of a draught. Dr. Guy observed that there was a tall chimney belonging to a furnace on the premises, and by simply connecting the wooden funnel with the chimney the needful draught to carry off the fumes was obtained, and the workman recovered his health.

VII.—VENTILATION BY MECHANICAL POWER.

Renewing the air by mechanical means is necessary, when shafts or chimneys cannot be used. In all ventilating machines, the great principle to be kept in view is to have as free a passage for the air through them as possible. Atmospheric air is exceedingly mobile, and can be set in motion by a very small expenditure of force. Whenever, therefore, we hear of ventilating machines being worked with much power, we may be certain that the plans are defective. The Archimedes screw, the windmill wheel, various forms of air-pumps and bellows, have been employed for ventilating purposes. The common fan wheel driven by manual labour or steam power has also been used with success, a pleasing instance of which was recently exhibited at Manchester. In one of the worst ventilated factories in the town, the work people frequently fainted from the state of the air; but, by connecting a common "Clarke's blower" with the steam engine, so as to draw the foul air out of the building, the atmosphere at once became healthy. The fan wheel is objected to by Dr. Arnott, because "the waste of force is prodigious;" and he says that "a pumping apparatus, to be worked by one man, might be easily made to do the business which a force of from forty to eighty men would accomplish with common defective machinery."

The air-pump invented by Dr. Arnott, Fig. x., is a very simple and ingenious contrivance. It consists of a wooden box, thirty inches high, and fifteen inches square, closed at both ends, like the cylinder of a steam-engine. The piston is a square piece of wood, moving loosely in it, with a stroke of fifteen inches; and there are four sets of large cloth valves at opposite sides of the box, which open and shut alternately by the

FIG. X.
DR. ARNOTT'S AIR PUMP.



pressure of the air. The valves AA open inwards, and the valves BB open outwards, giving egress to the air from the pump into a square wooden tube, which may be lengthened by any convenient substance, so as to convey the air to any locality. Each valve is made of three strips of prepared cloth, which shut against a piece of open wire-work, filling up the whole valvular opening; and each of the four openings is fifteen inches long, and seven and a half inches broad, so as to be half the area of the piston. The machine can be used either for pumping fresh air into an apartment, or for drawing foul air out of it; and it may be worked by hand or mechanical power. On board ship the utility of this air pump has been

very great, and it ought to be introduced, especially into passenger ships, as extensively as possible. The following facts, related by Mr. Grainger, are sufficient to prove the value of the invention:—

“This air pump was used on board the ‘Anson,’ formerly a 74 gun-ship, which last year carried out to Australia 500 convicts, a larger number than the government had ever before ventured to send in one vessel; there were in addition 300 troops, and the crew, in all about 1,000 persons. The apparatus was worked by one lad, and it was reported that about three times more air was driven in than by the four-wheeled ventilator commonly used, and which required eight men to work it. Only one person, and that an old epileptic, died on the passage; all the others enjoyed singular health during the voyage, and it was remarked when they landed that they had fresh complexions, very unlike what was observed in ordinary cases.”

Dr. Arnett's air pump ventilator is one of the most important contrivances of the kind that has been made, and it adds another to the many benefits he has conferred so freely upon the public. The piston rod is attached to a fly wheel of wood, which may be worked by a treadle. When made of the size described above, each double stroke will discharge about four cubic feet of air; and it is easy to give 60, 70, 80, or even more double strokes a minute, with the treadle.

VIII.—VENTILATION AND WARMING.

It must be obvious to every one, that the introduction of cold air for ventilation in any quantity during winter would be very objectionable, especially in the dwellings of the labouring classes, and hence means must be contrived for raising it to a proper temperature.

It is highly desirable, wherever it can be accomplished, to have two openings; one of which could be used during warm weather, to introduce air at the temperature of the external atmosphere; and the other during winter to supply warm air. Cottages in the neighbourhood of manufactories might easily have their air warmed by waste steam or other waste heat; and there are few ways in which proprietors could confer a greater boon on their work people, than by giving a little attention to

this matter. Where such advantages are not attainable, the heat of the fire-place must be resorted to.

The most obvious method of procedure is to bring the fresh air into the room after it has passed through heated apertures in the immediate neighbourhood of the fire. As grates are at present constructed there is either a vacuity in that situation, or the whole space is filled up with brick work, which takes up and retains a great deal of heat that is turned to no good purpose.

A simple contrivance might be made of burned fire clay, or even of common clay, in the form of a box or tube, or, what would be still better, of a number of tubes or channels hollowed out of the same piece, and placed behind the grate, or in any way around it, so as to become heated by the fire. The cold external air could easily be admitted to this apparatus; carried from thence in a tube round the wall of the room to some convenient locality, and allowed to escape, so as to supply the needful ventilation.

In conclusion, we trust the principles briefly advanced in the preceding pages will be sufficient to elucidate the general subject of ventilation; and we may find opportunities of recurring to more specific details in our future numbers.

A Meeting of the General Committee was held in the Town Hall, on August 12th, Adam Hodgson, Esq., in the chair. After the usual routine business was transacted, the Report of the special Sub-Committee on Mr. Mackinnon's Bill was read and adopted. It was resolved, that the whole question of Interments in Towns should be referred to the same Sub-Committee, with the addition of Mr. Sheil's name to the number. A letter from William Brown, Esq., M.P., with a copy of Lord Morpeth's Bill for the Suppression of Nuisances, was read. The thanks of the meeting were voted to Mr. Brown for his attention to the subject. It was resolved to request Mr. Smith, of Deanston, to deliver a lecture on the application of Sewer Water to Agricultural purposes. It was resolved to request Dr. Guy to deliver a lecture on the Health of Towns. [In compliance with this request, Dr. Guy delivered a very excellent address in the Concert Hall, Lord Nelson-street, on the 21st ult.; Adam Hodgson, Esq., in the chair. The thanks of the meeting were given to the lecturer, on the motion of Mr. John Smith, seconded by Mr. Tinne.]

Two letters, complaining of nuisances in Hill-street and Elliott-street, were referred to the authorities.

ANNUAL SUBSCRIPTIONS.

James Reay, Esq.	£1 1 0
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All communications for the LIVERPOOL HEALTH OF TOWNS' ASSOCIATION, to be addressed to the Committee Rooms, Fenwick Chambers, Fenwick-street.

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