THE IMPROVEMENT OF MANCHESTER.

A REPORT

Private

J. Addhead

THE IMPROVEMENT OF MANCHESTER.

Sanatary

1844

A REPORT

(Being in substance a communication made to the General Purposes Committee of the Town Council, and prepared at their request,)

SETTING FORTH A PLAN PROPOSED BY THE

TOWNS IMPROVEMENT COMPANY,

For carrying out the chief Recommendations of Her Majesty's Commissioners of Inquiry on the Means of Improving the Health of the Population of large Towns and densely-populated districts; which are deemed specially applicable to MANCHESTER; and for effecting, without any interference with the authority hitherto exercised by the Town Council, or involving the necessity for fresh elections, and virtually without any new expense to the inhabitants, the most important provisions of Lord Lincoln's Bill, the preamble of which sets forth that the sewerage and drainage of towns, and the supply of water, are extremely neglected, whereby excessive disease and great mortality have been occasioned,—that the general laws in force are wholly insufficient for the remedy of so great a mischief,—"that it is expedient that the arrangement of the supply of water should be combined, as often as may be practicable, with the management of the paving and cleansing, and of the construction and maintenance of sewers and drains."

THE WATER SUPPLY, DRAINAGE,

AND

TOWNS IMPROVEMENT COMPANY.

(Provisionally registered.)

CAPITAL, £1,000,000.

To be raised in Shares of Fifty Pounds each, with the usual powers and protections, and a limitation of the liability of each Shareholder to the amount subscribed. The capital so raised will be extended as opportunities of beneficial investment are offered. Deposit, 5s. per Share, being the amount allowed under the Act 7th and 8th Vict., cap. 110.

Trustees.

THOMAS BARING, Esq., M.P. | SAMUEL JONES LOYD, Esq.

Provisional Directors.

LORD FRANCIS EGERTON, M.P., CHAIRMAN.

N. ARNOTT, M.D., F.R.S.
EDWIN CHADWICK, Esq.
J. CROSTHWAITE, Esq.
RAIKES CURRIE, Esq., M.P.
SIR JOHN EASTHOPE, Bart., M.P.
VISCOUNT EBRINGTON.
EARL FORTESCUE.
ROWLAND HILL, Esq.
SIR GEORGE LARPENT, Bart.
JOHN MACGREGOR, Esq., of the Board of Trade.
JAMES MATHESON, Esq., M.P.
WILLIAM MILES Esq., M.P.
JAMES MORRISON, Esq, M.P.
ALFRED MORRISON, Esq.
JOHN MOSS, Esq.
J. LEWIS RICARDO, Esq,, M.P.
NASSAU WILLIAM SENIOR, Esq., Master in Chancery.
ROBT. AGLIONBY SLANEY, Esq., of Shrewsbury, one of Her Majesty's Commissioners for inquiring into the Health of Towns.

With power to add to their number.

Engineers.

JAMES SMITH, Esq., of Deanston.
LIEUT.-COLONEL HUTCHINSON, of the Bengal Engineers, F.R.S.
BUTLER WILLIAMS, Esq., Civil Engineer, late Professor of Geodesy to the College of Civil Engineers at Putney.
JAMES VETCH, F.R.S., Captain of the Royal Engineers.
THOMAS HAWKSLEY, Esq., Engineer to the Trent Water-works Company, and also to the Gas Company, Nottingham.
J. ROE, Esq., Engineer to the Commissioners of Sewers for the Holborn and Finsbury division of the Metropolis.
WILLIAM LINDLEY, Esq., Engineer for the Drainage, Rebuilding, and Water Supply of Hamburg.
HENRY AUSTIN, Esq., Architect and Engineer, Secretary to the Metropolitan Improvement Association.
JOHN FREDERICK BATEMAN, Esq.
ROBERT RAWLINSON, Esq., Engineer of the Bridgewater Trust.

Solicitors.

SIR GEORGE STEPHEN & HUTCHINSON, *in London.*
Messrs. J. & W. HERON, Princess-street, and CHARLES GIBSON, St. James's-square, *in Manchester.*

Bankers.

Messrs. CURRIE & CO., Cornhill, London.
Messrs. WILLIAM JONES LOYD & CO., Manchester.
Messrs. JOHN MOSS & CO., Liverpool.

THE MANCHESTER WATER SUPPLY, DRAINAGE, AND TOWNS IMPROVEMENT COMPANY.

THE sanitary improvements of which Manchester stands most urgently in need, are an increased and well distributed supply of pure water, a complete system of house and street drainage, the removal of middens, cesspools, and all accumulations of decomposing filth and other organic matter, and the purification of the rivers.

All who have been called upon to examine the sanitary condition of the town, have declared that the first and indispensable means of improvement is a largely increased and universally-distributed supply of pure water; without which it is impossible to attain the necessary degree of personal and domestic cleanliness, and effectually and quickly to remove from the town the decomposing refuse in our streets and cesspools, the poisonous emanations from which are among the principal causes of the excessive mortality for which Manchester is remarkable.

Manchester, together with Salford and the adjoining townships, requires for its adequate supply, six or eight million gallons daily; but the existing supplies are insufficient to afford two millions. The water required for domestic use should be pleasant to the taste, and as free as possible from all organic or inorganic matter,—soft, suitable for washing, without a great waste of soap. These qualities are also highly important for the supplies of water required for manufacturing purposes. The water at present supplied is very hard, vapid, impure, and sometimes positively disagreeable; and these circumstances, with the high rates of charge, are the principal reasons

of so large a proportion of the population declining to take it. According to Dr. Playfair's *Report on the State of Large Towns in Lancashire*,* out of 57,238 houses in the district of the water-works, they supply only about 30,000; while the rest are dependent on well water, and on rain-water caught and retained in cisterns. Some of the wells yield very good and pleasant water for drinking, though but little of it is fit for other domestic purposes. Many of the springs are, however, polluted by the filtration into them of foul water from drains, sewers, cesspools, and even from graveyards: some of them so seriously so, as to be distinctly offensive to a taste of any delicacy. The water of the smaller wells is frequently intercepted by the larger wells sunk for the supply of manufactories, or diverted by deep sewers. Every year the failure or the pollution of the natural supplies becomes greater and greater; and as the deep sewerage of the town proceeds, it will be still more general. In so smoky a town as this, any dependence upon the rain for a supply of water for drinking or washing is out of the question.†

By means of an extension of the works, and the collection and storage of the water in a hill district, and by the use of the distributing apparatus of the Manchester and Salford Water-works Company, (for which it is proposed to offer liberal terms of purchase,) it is confidently expected that every house in Manchester may be *constantly* provided with pure, cool, filtered water, in as large quantities as can possibly be desired, at an expense not exceeding that which is now incurred in procuring the present very inadequate and unsatisfactory supplies, either from the existing works, from pumps, or by water carriers: so that in effect all the great advantages of the improved plan will be attained *virtually* without any expense to the inhabitants whatever,—the rate which each will be called upon to pay being certainly not more than the direct expenses to which he is now subjected, while to a great majority it will be very considerably less.

At present the lowest charge for water is 5s. a year, and this is for liberty to take water from a stand pipe only, during the few hours when the water is on; this charge is frequently increased to twopence a week to the tenant, the extra charge being made on the plea of its being necessary to cover the landlord's losses and expenses, he being responsible to the company. Under the proposed

* No. 57. † See Dr. Clarke's evidence, First Report, Question 41—42.

arrangements the lowest tenements (those under £5. a year rent) will be supplied at an annual charge of 4s., or less than one penny a week. The pipes will be brought into the houses, and, the water being constantly on, may be drawn at all times, and in indefinite quantity. Enough will be provided to supply every house on the average with a hundred gallons a day, though only fifty or sixty gallons will probably be consumed.

A common charge made for liberty to take water from a pump is a shilling a quarter; it is sometimes less, but frequently more. By this plan the water, which is often of inferior quality, can only be obtained during a few hours each day, as at other times the pump is kept locked. There is much loss of time and labour in obtaining it,—much waiting of each person for his or her turn,—much quarrelling, gossiping, and idleness produced; and after all a very inadequate quantity of water is procured, which has to be kept in a very inconvenient manner in mugs or cans in the rooms, where it absorbs the vitiated air and becomes vapid. By the proposed plan, *at the same charge for the water*, all the extra expense, trouble, inconvenience, and loss of time will be avoided, and a plentiful and pure and fresh supply obtained in a minute, as it is wanted. If the trouble and loss of time of bringing water from a pump be paid for in money, the real economy of the improved plan will be still more evident. Water-carriers charge a halfpenny or a penny a canful, according to the quality of the water, or the distance from which it is brought; and the supply obtained at a cost of a penny a day is very scanty and inadequate. At less than one-sixth of this cost for houses below £5. rent, and one quarter for those below £10., thirty or forty times as much water will be supplied, and all the trouble and inconvenience and the cost of providing vessels in which the water must be kept, and the dampness and dirt occasioned, will be entirely avoided.

The supply of water will be so good, so cheap, and so abundant, that those even who have good pumps of their own (a very small minority of the whole) will generally find it to their advantage to disuse them; the expense of repairs, and loss of time in carrying water into the house,—the expense and inconvenience of rain water cisterns, and the loss from occasional failure of supply, being more than equal to the water charge.*

* Value of soft water. Appendix A.

The advantages of the improved plan to the present tenants of the water-works company, though not so great as to others, are that the quality of the water will be improved; that by its being kept constantly on, the necessity for retaining the water in rooms will be obviated, and they may supply baths, or have large washings or brewings, without interrupting the supply for ordinary purposes. The annual cost of a cistern, with ball, cock, and interest and repairs, is more than equal to half of what need be charged as water rate: by removing the necessity for it, the expense of water is therefore diminished thirty per cent.; besides which, the water direct from the pipes is more pure, fresh, and pleasant, and much dampness in the house or premises, occasioned by evaporation and leakage, will be avoided.

The system which the company will adopt, renders unnecessary the expensive apparatus of butts or tanks, in which water stagnates until it is wanted, and absorbs the soot and dust of the houses and manufactories of the town. The water will be delivered direct into the houses from the distant reservoirs, at the medium temperature of the earth, (43°) fresh and cool in summer, and above the average temperature in the depths of winter.*

Water exposed in cisterns absorbs air, and if that air be foul, as in the town it so frequently is, the water becomes tainted. The absorbent power of water is familiarly known. It is frequently made use of to lessen the annoyance from fresh paint,—a bucket full of water placed in a newly-painted room considerably diminishing the smell of the paint, while the water itself becomes strongly impregnated.

The system of constant supply at high pressure, furnishes the most efficient and most economical means for the removal of refuse from houses, and for the cleansing of streets, drains, and sewers. In those towns where it has been introduced, it has also, as shown in the reports of the commissioners of inquiry into the means of improving the health of towns, occasioned a reduction of one half of the previous average losses by fire, and made a corresponding addition to the security of life as well as of property.†

But the complete attainment of these public as well as private benefits, at low rates of charge, must be dependent on the general

* See Dr. Playfair's Report, No. 55. † Idem, 52, and Mr. Hawkesley's Evidence vol. II., p. 149,

support which the measure shall receive from the inhabitants, as to the requisite arrangements for drainage, being such as may obtain the sanction of parliament.

The proposers of the present measure are impressed, from the evidence afforded by recent investigations, with the conviction, that it is the interest of the consumers in the town to pay fairly and generally for the advantages extended to them, ON THE COMMERCIAL PRINCIPLE OF LOW RATES FOR ABUNDANT SUPPLIES TO THE WHOLE POPULATION, INSTEAD OF HIGH CHARGES FOR SUPPLIES RESTRICTED TO THE HIGHER AND MIDDLE CLASSES OF THE COMMUNITY, ACCORDING TO THE COMMON PRACTICE. The risks of loss, and the future disturbance of the capitalist's investments, will be the best avoided by consulting carefully the wants and conveniences and true interests of the consumers, and by conforming, as closely as practicable, to all such comprehensive arrangements as have been recommended by impartial and competent inquirers.*

A fundamental arrangement, recommended for adoption by the Commissioners of Inquiry into the Means of Improving the Health of Towns, is, that the drainage and cleansing of towns and the supplies of water should be united under one and the same management.†

In the preamble of the bill laid before parliament by Lord Lincoln, the principle of this recommendation is recognised; and there is little doubt that measures will be proposed for carrying it into effect. The preamble sets forth, that it is expedient 'that the supply of water for domestic use, and for the cleansing of sewers, drains, houses, courts, alleys, and streets, should be combined, as often as may be practicable, with the management of the paving and the cleansing of the surface of courts, alleys, and streets, and the construction and maintenance of the drains, sewers, and other works, subservient to the maintenance of streets and other places in a good and proper condition.'

Now the reasons for these recommendations will, on consideration, appear sufficiently strong for voluntary adoption as a commercial measure, independently of the authoritative recommendations which have in view the general public interests.

In most towns where the water is distributed by public com-

* Addendum to Dr. Playfair's Report, Appendix C. † Twelfth and seventeenth recommendations.

panies, the supply direct to the private houses has been restricted, as in Manchester, chiefly to the houses of the higher and middle classes of society; the poorer classes deriving their supplies chiefly from common stand pipes, or from public pumps. With one evil attendant on this mode the public are very familiar,—quarrels and assaults arising out of the desire of numbers to obtain supplies of water at the same time.* The poorest labourer might well afford the payment of a penny or twopence a-week extra rent, to avoid these disagreements, as well as the disagreeable labour to his wife or daughter of fetching water in all weathers. Where houses of several stories are let out in separate tenements, it is proposed to give facilities for carrying the distributaty apparatus into the upper rooms, by which the saving of labour and time to those whose labour should be most economised, would often be even greater than the saving of labour by the horizontal distribution of water into the several houses of a small court or street. The frequently recurring circumstances in the poorer houses, where such service is most needed, are thus stated in the evidence of Mr. Toynbee:—

"As to the state of the household economy, have you observed any effects apparent from water not being conveniently accessible or laid on in the rooms which form separate tenements?—I have observed the same water, which is very filthy from having been used in washing some clothes, used again to wash others. They have told me, indeed, that they have done this to avoid the inconvenience of fetching water from a distance, and from the inability to carry the water up stairs, when the rooms inhabited have been on the upper floor. My informants on this topic, it should be remembered, are patients, sickly people, weakened by sickness, and who cannot afford to pay for attendance. To the mothers who are debilitated, the carrying water up stairs is a great exertion; mothers not daring to leave a child in the room, have to carry the child in one arm and the vessel of water with the other. I have had even sick children neglected and left dirty, and the excuse given has been the inability to fetch the water. Recently I have had a case of this kind. I have attended three children, two of them with scrofulous inflammation of the eyes, the other of them with a scrofulous affection of the throat; all of them rarely washed, and in an extremely filthy condition. The mother is a poor woman, who has been in a respectable condition, but she is now so far advanced in pregnancy as to be incapacitated from going up and down stairs to fetch water. She continually deplores her condition of having neither the strength to fetch a sufficient supply of water, nor the means of paying for it being brought to her.

"In these cases the water is laid on in outer yards?—Yes; in the outer yards generally. A considerable obstruction to the proper cleanliness arises, not only from the inability to bring fresh water up, but from the inconvenience and inability arising from the want of proper sinks, to take dirty water down stairs. One source of dampness and smell I have frequently found is the vessels of dirty water retained in the room. The common excuse for this retention is, 'We are so knocked up with the day's work that the water must wait until to-morrow, when we shall be able to remove it.'

"If an increased rental were requisite for these improvements, instead of there being generally reductions of existing charges, and if they were to fall as new charges upon occupants, such as those whom you have alluded to, do you believe they would defray them cheerfully?—I have no doubt of it. Having been informed of the practicability of laying on pure water constantly at a penny a week, I have asked a great number of the patients whether they would consent to pay an additional rent of 2d. a week to have the water laid on in their rooms, and they have expressed warmly their willingness to pay even more; that such payment would be but a trifle for such a 'blessing,' as they have termed it. They have not complained, because they never imagined the practicability of an amendment."

The chief obstacle to the extension of the supplies into the lowest tenements, has been the expense of the pipes, cocks, and apparatus for conveying the water into the houses, and of providing sinks and drains for carrying the refuse away. The quantity of water required for the complete supply of this town, it is estimated, on the experience of other similar places, will be about six million of gallons a day. The house drainage is so defective—as in the dower districts it is inevitable—that when such an addition of surplus and waste water is made in the town, provision should be made, on a scale equally comprehensive and systematic, for carrying it away, without leaving it to the individual householders and owners to contend with the difficulty separately. The trouble and expense cast upon each private individual, of engaging plumbers and bricklayers, is often excessive, and the apparatus provided unsuitable and defective, and expensive to maintain.*

The company will be enabled to simplify all such apparatus, and by providing them on a large scale, to supply them at reduced prices. To overcome the obstacle to the extension of direct supplies to the houses of the working classes, it is recommended by the Commissioners of Inquiry into the Means of Improving the Health of Towns, that the parties providing the main distributary apparatus

* Evidence of Mr. Milne, of the New River Company. First Report; vol. 1, p. 104—5. Also evidence of Mr. Quick, of the Southwark Water Company, p. 116—17.

for water should be required and enabled to supply the whole of the branch apparatus, and to provide and maintain the sinks, waste and return pipes, and house drains; and that the necessity of any tenants' or owners' immediate outlay should be done away with, by charging for them an additional rental. To this recommendation the company would conform, giving to owners or occupiers the option of selecting any apparatus which they deem appropriate, and of redeeming the small additional rental by an immediate payment. The advantages of this course are thus adverted to by Dr. Lyon Playfair, in his Report on the Sanitary Condition of the Towns in Lancashire:—

"'To reduce these observations to a condensed form, I show the present system and the suggested improvement in a tabular form, introducing, at the same time, the expense for the introduction of water, as detailed at paragraphs 50 to 60.

TABLE *showing the present Charges for House Drainage and Water Supply and the reduced Charges under the proposed system.*

	Old Charge.	Reduced Charge.	Annual addition to the Rent at 5 per cent. interest, and equal instalment of the principal.
House drain	£4. 7s. 6d.; 30 feet at 2s. 11d. per foot.	Improved pipe drains, 6d. per foot, including repairs; total, 15s.	10½d.
Water-pipe and Apparatus.	£4. for butt, ball, cock, and other apparatus.	For a pipe only, the butt being dispensed with by the introduction of a constant, instead of intermittent supply, 6s. 6d.	5d. †

"'By this illustration it will be seen, that instead of at once demanding £8. 7s. as on the present system, the demand will be for 1s. 3½d. annually, or for ¼d. per week; but, if the owner prefer immediately to pay off the cost of improvement, he will be charged £1. 1s. 6d. instead of £8. 7s.'"

The company propose, however, for a small annual rent charge, to introduce more perfect apparatus for removing all refuse from the houses. It is proposed to have the existing privies converted into simple water closets, provided with self-acting flushing apparatus, which will work without valves or anything liable to get out of order; to fill up the present middens, or to have them converted into

* Mr. Rushton's evidence, Stipendiary Magistrate of Liverpool.

† This does not, however, include the expense of putting down the apparatus, which would somewhat raise the charge.

receptacles for dry ashes only; to provide a cheap, fixed wash-hand basin and sink, which, with the house drain, may all be effected for the payment of an annual sum not exceeding the charges for water,—that is, about a penny a week for the lowest tenements, and a proportionably higher sum for those of higher rent, where a superior style of fitting would be desired. The fact is established by ample experience—that the tenants will gladly pay the slight addition to their rent necessary to purchase the great advantages of a dry, clean house, provided with these conveniences.* But even if the tenants were not charged with the extra rate, the landlord would find it economical to have his property secured from the effects of dampness and other sources of dilapidation at a charge so moderate. It is found by experience, when such facilities for cleanliness as the company proposes to supply are furnished, that habits of order and regularity are gradually engendered, and that a better class of tenants is obtained. It will be speedily found in Manchester, that the cottage of £5. a year rent is more increased in value than twopence per week, for being adequately supplied with water, properly drained, and furnished with water-closet, sink, and fixed wash-hand basin.† Of course it would be impossible to provide such advantages at so low a charge, unless all contribute their quota to the expense, for it is only by working on a very large scale that such economy is attainable.

Besides undertaking the delivery of the water into the houses, the company propose to undertake, by their servants, the watering of the streets to lay dust in the summer time, and the cleansing of the foot-pavements and occasionally the roadways, (so far as the road-pavement will admit of it,) by jets of water, to remove all mud, in winter. In summer time the streets would be watered twice a day. They would be enabled to effect this street-watering for a rate of about one-third of a penny per house, and the complete cleansing, winter as well as summer, for an additional charge of one penny weekly. The saving of furniture and goods from dust, and of clothes from mud, and the reduction of the expense of washing, will make this street-cleaning rate the means of saving money, as well as of increasing the comfort and salubrity of the town.

To meet this charge, however, no extra rate will be necessary; on the contrary, it is expected that the cost of cleansing the streets in this

* Mr. Ashton's evidence, First Report, vol. II., p. 99.

very superior manner will be less than it now is. It is believed that by combining the use of Mr. Whitworth's automaton street sweeping machine, with the employment of the jet, a degree of strict cleanliness may be economically obtained, as much superior to the present, as that produced by Mr. Whitworth's machine is to the old system. In fact we shall have the power, at an insignificant cost, of producing an artificial shower whenever it is desired, by means of which all that is left on the streets by the machine will be as effectually swept away, and the air be rendered as sweet and pure, as it now is by a thunder storm, which, unlike the artificial shower, sometimes comes when it is not quite convenient. By means also of jet pipes, it will be easy occasionally to wash the windows and fronts of public and private buildings, and free them from the dust and smoke with which they are disfigured. The policemen might very soon be instructed in the use of the jets, and it is desirable that they should be so, as they would then be capable of acting as most efficient firemen.

In Philadelphia, and in other towns where the constant supply of water is in use, it is found of great advantage to have an apparatus in common and *daily* use, such as the hose and street-cleansing apparatus, that may be at once applied to the extinction of fires. On the occurrence of a fire, or in one minute after an alarm, a hose may be got, fixed to the street plug, and at once brought to bear upon the fire before it gets a-head. But under the best of the common arrangements, an engine has to be sent for to a distant part of the town: and, supposing the engine to be in a good working condition,—which it seldom is where it is seldom used, and supposing, moreover, that when it arrives, a full supply of water is in readiness, the fire has had fifteen or twenty minutes' time to rage: and even in the metropolis, where the arrangements of fire-engines are the most perfect, in the majority of instances, the most that remains to be done by the fire-brigade is the protection of the adjacent premises.

Mr. Samuel Bradley, superintendent of the fire brigade at Preston, and who was sixteen years in the fire brigade of Manchester, (one of the most efficient in the country) after giving most decided evidence in favour of the superiority of the hose over the fire engine, is asked by Dr. Playfair,—

"From your experience in the fire-brigade in Manchester, do you

think that by means of the hose screwed to the water-plug you can extinguish fires more quickly than could be done in Manchester with the engines?—In Manchester there was some delay, owing to the water being off at times. Here they can put on water in thirty seconds after reaching the fire, and the pressure being stronger at night in the main than in the day, (owing to there being no use for it at that time), I am sure the system pursued here is more effectual and rapid.

"Would it not be much better to have a hose-reel, or hoses, in different parts of the town, instead of dragging up to the fire a heavy engine, which you do not use?—It would be very much better, and I am very anxious that the commissioners of police would enable me to do so. The reel must be on a spring cart, in order to carry the ladders also. The ladders are very useful in the case of the hose. I am sure if we had a reel I could reach a fire in a quarter of the time that it now requires with the engine."

Dr. Playfair proceeds to remark:—

"The spring cart referred to under the term 'hose reel' is now obtained, and has abundantly answered the expectations expressed, as I have ascertained by the following experiment. Arriving in Preston one day at eleven o'clock, I proceeded immediately to a factory distant 1,100 yards from the fire-office, to which place an alarm of fire was sent by one of the town officers. In fifteen minutes after the despatch of the messenger, the spring-cart drawn by a horse, was, with ten firemen, at the seat of the supposed fire; in two minutes* more the hose was unwound, attached to the plug, and the water thrown up to the highest story of the factory; in another minute a second was in full play; and in a short time a third: the height to which the water was thrown was not visibly altered by the three openings. One man was sufficient to manage each hose, so that the rest of the firemen were available for any contingencies which might arise. It is a vulgar error to suppose that the calls for water during the day diminish so materially the pressure as to render it unavailable for the extinction of fire without the use of an engine. Experiments instituted at my suggestion, to ascertain the force of this objection,

* Short as this time was, the experiment was unfair to the fire brigade, for to avoid an alarm to the town, the firemen were summoned by messengers sent from the fire-office to their places of work, instead of by the fire-bell.

(First Rep., vol. II. p. 149,) show that the actual difference of height to which water can be thrown by means of the hose, is about four feet in favour of the night. Similar results follow from the experiments made on the mains and services of the Southwark Water-works Company, recited in (vol. II. p. 66) Mr. Hawksley's evidence. The experience at Preston shows that the fears of a failing supply or diminished force, by the use of several jets at the same time, are quite unfounded. At present in that town, the only obstacle to the employment of a sufficient number of jets, is the distance of the plugs from one another, as shown in the following evidence of the manager of the water-works:—

'At what distance are the fire-plugs from each other?—Where we have mains, every 100 yards throughout the whole town.

'Is the distance of 100 yards sufficient?—The distance is too great to be of service to every house; they should only be 50 yards distant.

'According to your rate of £2. per plug (in other towns £1.,) supposing them to be placed at intervals of 50 yards, making each house not farther distant than 25 yards, the original cost to each house would not be above four shillings, or about fivepence annual charge on each house, for the security and protection against losses by fire?—That is the correct way of viewing the question.'

"Now for £2., plugs can be fitted up, so as to screw on two hoses to each, and thus to furnish two jets; or in other words, for the sum of fivepence per annum, each house in the town may be supplied with arrangements for the extinction of fire, *equivalent to four or five engines kept constantly at its door for its exclusive use.** The experience at Oldham amply confirms that at Preston. Mr. Emmott, the manager and engineer of the Oldham Water-works, describes the practice in that town in relation to fires:—

'In five cases out of six, the hose is pushed into a water-plug, and the water thrown upon a building on fire, for the average pressure of water in this town is 146 feet; by this means our fires are generally extinguished even before the heavy engine arrives at the spot. The hose is much preferred to the engine, on account of the speed with which it is applied, and the readiness with which it is used, for one man can manage a hose, and throw as much water on the building on fire, as an engine worked by many men. On this account we very rarely indeed use the engines, as they possess no advantage whatever over the hose.'"

Dr. Playfair shows, moreover, that where this system has been in action, the losses have been reduced more than one-half. The

* The plugs spoken of are large stop-cocks.

estimated value of this reduced insurance risk, in Manchester and Salford, &c., is more than £20,000. a-year. *

Now of the twopence weekly (the proposed charge on the average, if *all* the houses pay) one halfpenny or penny per week would, to the poorest family who have property to lose, be a low payment to insure the peace of mind arising from the security of having so immediate and certain a relief against the spread of conflagration.

At Nottingham, the system of the constant supply of water is getting into use for watering gardens. On the scale of charges proposed, 1,000 gallons may be delivered by the jet for 2½d., which is equal to an ordinary shower of rain.† In Manchester the cost will be much less. This mode of supply will be available for suburban gardens, and for fountains, as well as for baths. In various other ways, the mode of supply will admit of many useful applications.

The necessity of the free use of water for house cleansing and for water-closets and soil-pans, the use of which in other places is rapidly extending from the middle class to the lower class of houses, need not be pointed out. The usual charges of water companies, for such service, commonly as much as for a house itself, are unjustifiable, and it is proposed to reduce them, and include this service in the water-rent. The necessity of the full, immediate, and free use of water, for flushing house-drains and sewers, and immediately removing from under the sites of habitations all foul and decomposing matter, forms one of the chief grounds of the necessity of the combination of the water supply and drainage, insisted upon by the Commissioners of Inquiry into the Means of Improving the Health of Towns, and which cannot be foregone, except upon narrow views of immediate and more convenient profits from the water supply alone, regardless of the conveniences of the population.‡

There are, however, many streets in Manchester into which supplies of water may be taken, where not only are there no proper house-drains, but no proper culverts to receive and convey away the waste water and refuse from the house-drains.

This opens the next great evil, the want of a complete system of sewerage.

* See Appendices B. & C.

† Vide First Report of the Commissioners of Enquiry, page 65.

‡ Mr. Holland's Report, first rep., vol. I., p. 211—12.

It is now established by extensive evidence, that no town is or can be healthy where there is not a complete system of drainage, for then the site must be saturated with the soakage of cess-pools.

The fact is established upon evidence beyond all question, that those towns, and those parts of towns, and even those individual streets, are most insalubrious, (as is shewn by their respective rates of mortality,) in which the removal of the refuse matter being most neglected, the air is most polluted by exhalations from its decomposition. The rate of mortality bears, indeed, a very close relation to the degree in which the air is so polluted. No doubt other circumstances exert powerful influences upon the healthfulness of the population; but there is no known circumstance which has been *proved* to have anything like so powerful an influence upon it, as the purity or impurity of the air. When the causes of the impurity of the air are diminished, the rate of mortality diminishes also, as Mr. Holland has shewn by his examination of the rate of mortality in the individual streets of Chorlton-upon-Medlock, where in twenty streets, inhabited by about 3,500 persons, the rate of mortality has fallen from 110 to 89 per annum, after, and no doubt in consequence of, the streets being properly paved and drained.

Similar facts have been established by Mr. Gardiner and Mr. Noble. In certain streets in St. George's district, during the years 1838-9, the deaths amounted to 495; in 1841-2, after the streets were paved and sewered, the deaths were only 432, being a diminution of 63, or about one-eighth. In a district in Ancoats a diminution of 40 deaths out of 270, being about one-seventh, followed a similar improvement.

Supposing it be possible to improve the *average* condition of the whole town in the same proportion as it has been improved in the streets in which Mr. Holland has shown a diminution of mortality from 110 to 89 per annum, the number of lives annually saved in Manchester alone, would exceed 1100; a number sufficient to people a considerable village. It is true that the particular streets referred to were in an unusually bad condition, and that it is impossible to improve all in the same degree *by the same simple means;* but it is not impossible to improve most districts as much, and many more, by the adoption of the plan proposed, as

may be shewn by the results of a partial drainage in Leicester, as shewn by the different rates of mortality in streets inhabited by persons nearly of the same class of life, only differing largely in the condition of the drainage of the streets they inhabited.

COMPARATIVE MORTALITY in the DRAINED and UNDRAINED DISTRICTS of the TOWN of LEICESTER.

Streets.	1840. Average age of death.	1840. Proportion of deaths.	1841. Average age of death.	1841. Proportion of deaths from Epidemics.	1842. Average age of death.	1842. Proportion of deaths from Epidemics.	Average age of death for the three years.	Total proximate loss of life in the undrained districts.
East District.	Years.		Years.		Years.		Years.	
Culverted.....	23½	¼	24	1-12th	26½	1-12th	24⅔	
Partly culverted ..	17½	⅓	21	⅛	21½	⅛	20	4⅔
Not culverted	13½	½	18		17½	1-7th	16⅓	8½
West District.								
Culverted.....	20	1-6th	30	1-12th	29	1-12th	26½	
Partly culverted ..	21	1-5th	23½	⅛	22	1-11th	22	4½
Not Culverted	14½	¼	21	1-7th	17½	1-9th	17⅔	7½
Total of—		The 3 years			These years were taken because the year 1840 was remarkable for the increase of disease, and of the number of deaths throughout the town.			
Streets culverted..	25½	average						
Partly culverted ..	21	21 and						
Not culverted	17	rather more.						

Here we find the extraordinary amount of seven or eight years' loss of the average duration of life in the undrained, as compared with the drained districts!—an effect confirmed in various degrees by the experience of other places.

By diminishing the causes of insalubrity, we add largely to the desirableness as well as to the duration of existence, and we induce moral habits.

The causes of insalubrity have a direct tendency to engender habits of intemperance, by producing a morbid excitement which gin drinking, though it permanently aggravates, temporally allays. Whenever any class of men are, *as a class*, intemperate, we may reasonably suspect some cause of insalubrity; instead of saying they are unhealthy because they are intemperate, it would frequently be more correct to say, they are intemperate because they are unhealthy.*

* Vide Sanitary Report, pp. 130, 131.

The inhabitants of this as well as other towns enjoy many important advantages over those of the country. They have for the most part a greater command over the comforts and necessaries of life. The rate of their wages is higher, while the expense of food, lodging, and clothing is much the same. They have greater ease of access to medical assistance in case of illness or accident, and they are less exposed to the severity of the weather; and yet the rate of mortality is 50 per cent. higher in the town than in the country. Doubtless this result is owing to the general impurity of the air, from deficient ventilation, and the existence of collections of putrifying organic matter; to a deficiency of the supply of pure water for drinking, cooking, for personal and domestic cleanliness, and especially for carrying away refuse to a distance from our habitations. Other circumstances, such as the want of opportunities for out-door exercise and healthful recreation, habits of dissipation and intemperance, and greater mental toil and anxiety, concur; but those above mentioned are the principal causes, and these we can, in a great degree, remove.

That the causes of the very high rate of mortality are not inseparable to town life are evident from these circumstances, that the rate is not equally high in all towns, nor proportionate to their size, but rather to the attention to or neglect of their sanitary condition. In Liverpool, which is universally acknowledged to be in a most disgraceful state,—badly supplied with water, with numerous courts densely inhabited, unsewered, unpaved, uncleansed,—the rate of mortality was in 1840-1-2, 3.5 per cent., in Manchester it was 2.9, in Birmingham 2.7, in the Metropolis 2.6, in Leicester 3, in Hull 3. The different parts of towns differ even more widely in their respective rates of mortality. In some of the districts of London it is as high as in Liverpool, in others lower than in the most healthy counties. In a group of twenty-five of the unhealthiest districts it was 3 per cent., while in a group of the healthiest it was 1.8 per cent.,—thirty thousand per annum dying in the former, and only eighteen in the latter. From Mr. Holland's analysis of the rates of mortality in every individual street in Chorlton upon-Medlock, a similar result is obtained, while the connexion between the effect and the alleged cause is still more unequivocally shown. In some few of the worst-conditioned streets the rate of mortality was twice, or even three times the average; and in whole groups of streets the correspondence between their condition and the rate of mortality was most remarkable, The streets were classed in three divisions, according to their apparent sanitary condition—that is, according to their width, degree of ventilation, usual state of cleanliness, pavement, and sewerage: those which were in a satisfactory condition in those respects were placed in the first class, those which were in a very faulty state in the third, and those in an intermediate condition in the second class. Each class was further separated into three subdivisions, according to the apparent sanitary condition of the houses; and the rate of mortality in each of these nine sub-groups of streets is exhibited in the following tables:—

Class of Street.	Class of House.	Rate of Mortality per cent.	Mortality, 1 in
Well-conditioned. 1	1 well.	1.95	51
	2 indif.	2.2	45
	3 ill.	2.7	36
Indifferent. 2	1 well.	1.8	55
	2 indif.	2.6	38
	3 ill.	2.8	35
Ill-conditioned. 3	1 None	in this group	
	2 well.	2.8	35
	3 ill,	4.	25

TABLE *exhibiting the rates of Mortality in different Class of Streets, the Houses being of all Classes.*

Class of Street.	Rate of Mortality per cent.	Mortality, 1 in	Excess per cent. over 1st Class Streets.
1 well.	2.2	46	
2 indif.	2.6	39	18
3 ill.	3.7	27	68

TABLE *exhibiting the rate of Mortality among the Inhabitants of different Classes of Houses, the Streets being of all Classes.*

Class of House.	Rate of Mortality per cent.	Mortality, 1 in	Excess per cent. above 1st Class Houses.
1 well,	1.9	52	
2 indif.	2.5	40	31
3 ill.	3.4	29	78

It will be observed how close is the correspondence between the actually ascertained rates of mortality, and what would be expected by those who attribute high rates of mortality to their real causes. So close indeed is the correspondence, that a very fair approximation to a correct estimate of the rate of mortality may be made, by those who are accustomed to such investigations, by mere inspection of the apparent sanitary condition of a district.

From undeniable evidence, upon which the best informed actuaries would wisely proceed, every one who lives in Manchester will lose several years of his life, if the atmospherical impurities arising from the removable causes in question be not diminished. A residence for a short time in the country, and out of the reach of these impurities, will give visible evidence of this. Surgeons well know that operations which may be safely performed in the country, are unjustifiably hazardous here, and there is no doubt that if the Infirmary, for instance, were in the country, the treatment of severe accidents, and all other cases, would be far more satisfactory and successful.

With respect to street sewers and pavements, it is proposed that they should remain under proper supervision by the municipal authorities, but that the company should offer to make and maintain, for a term of years, such works as the town-council shall direct, by way of contract. It is further proposed to conform to the recommendation of the Health of Towns Commissioners, and to allow the cost of construction of such works to be repaid in annual instalments, which will frequently be a great convenience to the owners of property, and will often avoid inflicting upon them the great injustice of requiring them to pay for the permanent improvement of property in which they have only a temporary interest.*

By the plan at present in operation, the cost of making sewers and pavements falls upon the owners of property, that of maintaining them upon the general rate. Those who direct the formation of these works have no interest in promoting economy of construction, while they manifest a strong desire to diminish the cost of maintenance; and it is probable that a large first expenditure is frequently imposed upon the owners, in order to save a very small current addition to the

* Evidence of Mr. Alderman Hopkins, First Rep., Appendix, p. 176, and of Mr. Corbet, p. 173, and tenth recommendation of Commissioners.

rate. True economy evidently requires that the sum of the two charges,—interest of the first outlay, added to current expenses of maintenance, should be reduced to the lowest possible amount. For example, it is wise economy to expend a large amount of capital in the formation of a road where large traffic is expected, because by doing do so more is saved in costs for repairs than is lost by charge for interest: but if the traffic be very small, it is wasteful to expend so much in the formation, because a smaller annual sum than the charge for interest will keep the road in good order. What is the proper proportion which the charges should bear to each other, will differ in every case, and can only be determined by accurate observation.

The arrangements proposed as equitable, are, That owners should be called upon to pay the costs of forming sewers and pavements in the manner which is now usual, which they may, if they please, pay in annual instalments, with interest, spreading the charge over a period of years not exceeding thirty; That a highway rate be laid proportionate to the present expenses of maintaining the highways; That the council contract for the making and maintenance of the sewers and pavements with any parties who will do it cheaper and better than they can themselves, and it is expected that the company, by working on the large scale, avoiding retail profits, and being directed by men of the highest eminence and most extensive experience, will execute such works better than either the officers of the corporation or any private contractors can do; while, being a permanent body, it can give ample security for fulfilling any contracts, however lengthened. The council will then make contracts with the company, or with individuals, for making and maintaining such sewers and pavements as they shall direct; they will charge the owners for the making in the same proportion as they have hitherto been charged; the same proportionate highway rate as hitherto will be levied, and any balance resulting from the improved system will remain in its hands, as a sanitary improvement fund. By such an arrangement the public generally, and not particular individuals, only will have the benefit of the improvements introduced.

If Lord Lincoln's bill pass, it will be enacted that the control of sewering and paving should, along with many other matters hitherto under the control of the town councils, be transferred to new bodies of commissioners. It will be observed that this company proposes to

effect some of the principal objects of this bill, without, in any degree, interfering with the authority hitherto exercised by the town council, but acting as contractors under them, according to their directions, and under the supervision of their officers. This arrangement will relieve the council of attention to many minute details, and tend to render it what it ought to be, less of an executive body than one for local government, superintendence, and control.

With the aid of a staff of engineers of extensive and varied practice, and distinguished by their having effected successful improvements, the company may undertake works with perfect confidence that they will secure to the consumer an efficiency and economy which cannot be obtained through the medium of persons whose experience is limited to their own districts, or who are habituated to imperfect works, and modes of management which the public wants require to be amended or superseded. The neglect of distant experience in the formation of such works as those in question, is frequently attended by an increased outlay. The company will certainly be able to carry out the improvements in question much more cheaply than they could be carried out by immediate taxation on the inhabitants themselves, were that practicable to the required extent. All immediate outlays for such purposes levied from retail dealers, must be levied from a capital which, to enable them to live and pay rents, must bear a profit of twenty per cent., and if from the capitalist or the wholesale manufacturer, ten per cent. The company, by taking a lower rate of interest, render unnecessary any diversion of private capital from other employments, or of the public capital or rates from concurrent improvements in town ventilation by widening streets. The company will take such small instalments of the principal, and such interest for the house as well as main drains, as will render the charge light, as compared with the benefits derived by the consumers. They propose to distribute a fair proportion of the shares within the town, and from the shareholders in Manchester ask the aid of a local committee, to superintend the execution of the works, to hear and determine complaints, and to see that the officers do their duty; to consult the convenience of the consumers, and to prevent any just grounds of dissatisfaction.

It appears to the provisional committee to be practicable, with the support of the town, to attain the first objects recommended by

the Commissioners of Inquiry, viz., the means of a complete system of house and street and main drainage, without the multiplication of elections, or any increase of the social evil of party feeling, and without multiplying officers, or the creation of new and expensive establishments.

But what is of far greater moment, the company will, if their set of measures, proposed by the most competent and impartial inquirers, be adopted, save not less than one year's delay in the constitution of a new body, and probably another year's delay in instructing it and setting it to work, and they will thus save at the least one year's excess of mortality. They will save the risk of general legislation, not adapted so closely to Manchester as that which has been wrought out on careful local survey; and they will insure the execution of a more complete measure for the town than that proposed, which, from the difficulty of providing for all places, contains no distinct provisions for the application, by the same machinery, of the refuse of towns to agricultural production; and moreover, they will save the risks of the execution of the best devised law, arising from the election of changing bodies of men, with uncertain qualifications, and limited means of instruction or guidance to carry out new works. The company will rest their claims to legislative sanction to their undertaking upon any examination of competent engineer officers, that they carry out at once the main works which the Commissioners of Inquiry have recommended as necessary, and that they carry them out on as fair and liberal terms as any body of public trustees might be expected to award to respectable contractors, who find the capital and the requisite skill, and undertake the risks of its application.

To recapitulate the parts of the set of works to be carried out:—For a rate of twopence per week, then, the company would carry improved supplies of filtered water to every house; to the poorest families for a penny a week. For another penny per week every house may be drained, and the refuse carried away; and for a halfpenny per week per house, the foot pavement and the roadway may be kept clean by washing with the jet.

By these works, and at these charges, all refuse will be carried from the houses and streets, and so far great improvements will have been attained. But it will still be carried no further

than to the stagnant river, where it will pollute the water, and become an additional source of injurious emanations; less injurious indeed than when decomposing immediately around our habitations, and in the streets before them, but still so injurious as to be most seriously detrimental, as stagnant water of *any* kind is, especially that which is polluted by such matter as the *excretæ* of a town.*

This evil of the pollution of the natural water sources, and of the canals which intersect the town, it is proposed to remove by a set of works to be undertaken and managed as a necessary part of the same plan; but without rent or charge to the town, and on entirely distinct grounds in respect to compensation.

Any measure of drainage would be incomplete which did not provide for the removal of the refuse of the town without polluting the rivers; and it cannot be expected that the refuse will be farther removed (except at an enormous expense, which the town would not bear), unless it can be applied so productively as to pay for its removal.

Extensive practical experience in the application of such refuse to agricultural production has been consulted; and the company propose constructing works to divert the sewer water from the river, as early and as extensively as fields for its practical application are obtained. The experience of Edinburgh,† Milan,‡ and other places, enables the directors to assure capitalists that the return for the application of the sewer water will repay them for the risks and the expense of constructing the necessary works for conveying it in the direction of demand, and eventually returning a surplus as a sanitary improvement fund for the use of the town. §

From experiments made last year in Lancashire, at the instance of Mr. Edwin Chadwick, which were stated to the Royal Agricultural Association, by Dr. Lyon Playfair, it appears that eight tons of sewer water per acre were found to be superior to fifteen tons of farm-yard manure, costing four shillings per ton, and to 3 cwt. of guano, the guano costing eight shillings per cwt. The experience of the expense of distributing sewer water over the land, leaves no doubt of the practicability of delivering upon the land the town

* See Mr. Holland's First Report, Appendix, p. 68.

† Mr. Chadwick's Report, page 49.

‡ First Report, Appendix, p. 209. § Appendix D.

manure in the most effectual form for application,—the liquid form,—with a very good profit to the company, and yet at a price greatly below that which the farmer pays for the mere cartage of an equivalent quantity of night soil or stable dung, supposing the manure to cost him nothing; and for far less than the price of an equivalent quantity of guano. Some of the most able agriculturists have been consulted, and they acknowledge the advantage they would derive from the proposed supplies of the liquid manure when conveniently delivered.

It will be perceived, then, that the principle of the company is to provide the necessary supply of water and the means for house drainage, and to be repaid by a rent-charge calculated so as to produce a mere return for the capital required;—to effect street sewerage and pavement on terms of contract; and to seek its profit from an undeveloped source of income,—the application of the refuse of the town for the purposes of agriculture.

The works necessary for collecting the refuse, conveying it out of town, and applying it to the land, the company will effect at its own exclusive cost and risk; and in return for the manure, which is at present of scarcely any pecuniary value, in consequence of the great cost of the present mode of its removal, the company will agree to pay over to the town council, for a sanitary improvement fund, half of the net proceeds from this source of income, after paying to the shareholders *eight* per cent. upon the capital engaged on this part of the work. It is necessary to fix a high rate of maximum profit, or else capitalists would not be found to incur the risks of so new an undertaking. No one would think a possible return of ten per cent. too much for such an employment of capital as this. The proposition of *dividing* all produced above eight, is better both for the public and the company, than one for *paying over* all produced above ten per cent.; for it is confidently expected that the returns will exceed twelve per cent., in which case the proprietors will divide more than ten, while more than two per cent. will be paid over as an improvement fund. While it may be very safely concluded, that an agreement to pay over all produced above ten per cent., by taking from the directors all motive to improved economy and management, after their maximum per centage has been attained, would prevent much profit above ten per cent. being ever realised. An agreement such as that proposed,

however, by leaving a motive for still greater and greater improvement, however great may be the profitableness of the undertaking, will cause constant advances to be made, and each year a larger and larger profit will be divided among the shareholders, and each year a larger and larger addition made to the sanitary improvement fund.

It may be thought by some that the town council might employ the refuse more profitably themselves,—that they might commence a manufacture of manure, and sell it at large profit; and the most extravagant notions are entertained by imperfectly informed persons as to the profitableness of such undertakings. Those which have been talked of are mainly dependent upon hand labour and cartage, and are in principle wholly erroneous. If any gentleman of the council shall use either capital collected from the rates or borrowed on the town security, and construct any works for the profitable application of the refuse experimentally,—and if by the assiduous application of his own time, and the aid of men of skill and science, obtained by means of such capital, he succeed in applying the refuse of the town productively, then he surely will deserve, and ought fairly to receive, for such public service, a much higher reward than the amount of dividend over the common rate of interest of capital, in the hope of receiving which the company will undertake the risk of the work. The plan which the company proposes to adopt will be directed by men of the highest eminence, as engineers, chemists, and agriculturists, while the amount of capital employed will be limited only by the opportunity for its profitable occupation; it is therefore exceedingly improbable that the town council, whether acting by its own officers or by way of agreement with private individuals, can make the application of the refuse half as profitable as the company, with such advantages, may do, and will have every inducement for doing. A business of this kind, requiring constant and varied attention, and frequently-recurring negotiations with numerous individuals, is one little suited for a changing body successfully to manage. It is one, too, accompanied by such chances of failure from mismanagement, that parliament is little likely to sanction its being undertaken at the risk of the public, more especially when a company offers to the public a liberal share of the profits, without requiring the council to run any risk or trouble whatever.

It should, moreover, be deeply impressed on the minds of the inhabitants, that it is highly for their interest, for the protection of their health, as well as for the preservation of their general comfort, (as foreseen by the Commissioners of Inquiry,) that the supply of water, and the machinery for its distribution, should be in the hands of those, and of those only, who have an interest in applying it abundantly for the immediate removal of all decomposing refuse, as well as for the other purposes specified. Such an interest is constituted by the proposed privilege of applying the refuse to agricultural production. Without such combination of the water supply, and without a powerful motive to its application, the extension of street and house drainage will often be in Manchester as it has been in the Metropolis and elsewhere, only an extension of cesspools, and underground collections of liquid filth, and the means of diffusing more widely offensive and pestilential exhalations.* For this company, however, it would be most wasteful extravagance to allow any filth to remain decomposing in the town, which, if washed away into the irrigating conduits, would be to them a valuable source of income; and as by their command of water they will have the means of quickly removing the refuse, we may be assured that their interests will compel them quickly to remove it. Without complete drainage, an ample supply of water would often be a nuisance and an injury—without an ample supply of water well distributed, house drains could never, and street drains could seldom, be kept clear of noisome deposits. The combination of the two is necessary for safety, and a motive for making this combination complete is supplied by the proposed application of the refuse to profitable purposes.†

An example of the failure of even an abundant distribution of water, to effect one of its most important objects, when carried out as a single and separate measure, is thus stated in a letter to Mr. Chadwick, written by a medical gentleman of high attainments, resident in New York:—

"The necessity of the harmonious action of the various means which conduce to a given end is continually exemplified when we attempt to gain such ends by any number of means less than the correlated whole. An illustration of this we have in the city of New York, which I have watched with much interest.

* See Dr. Laycock's evidence, First Report, Appendix, p. —

† See Captain Netch's evidence, idem, p. 367—8—9.

The insufficient supply of water and its ill qualities goaded the citizens into the magnificent undertaking of bringing the River Croton into our city from a distance of forty miles. That is accomplished, and we have now great abundance of pure water. This abundance has led to its profuse use in sweltering summer days, in watering the streets, by means of the hose of private citizens. To understand the evil of this seeming good it is necessary to state that, notwithstanding 'city ordinances' of most stringent 'words,' it is customary to throw refuse vegetables and other garbage into the streets. The evil of this uncleanly practice was but partially developed before the use of the Croton. Under our fierce sun the garbage soon became dry, and comparatively harmless; but now it is soaked hour after hour, as fast as it shows an approach to dryness, and is thus kept incessantly fermenting and putrefying, to the great annoyance of delicate olfactories, and the deterioration of the common air.

"Then again the city, with probably the best natural advantages of any large city in the world for perfect drainage, is drained very imperfectly. Before the introduction of the Croton, the inhabitants had to obtain their supply of water from wells sunk in all parts of the city,—the continual pumping from which kept the ground somewhat drained, notwithstanding the universal use of cesspools and privies; but now, for lack of drainage, many sub-cellars have become covered with water, and a great number of basements and cellars have become damp. I am satisfied that the citizens will be constrained, in self-defence, to become more cleanly in their streets, ta resort to a thorough system of sewerage, to connect waste pipes, or small sewers, with the street sewers, instead of using cesspools, and to introduce water-closets communicating with the sewers, in place of the disgusting system of open sinks, now in general use. When these measures are adopted, the sanitary means conducive to cleanliness will be in harmony, and then, and not till then, shall we reap the full advantage of even the pure and copious Croton River. Indeed, until these correlative measures are adopted, our abundant supply of water will conduce to many positive injuries."

The last example is peculiarly applicable to some of the lower districts in Manchester in this respect. The inhabitants are greatly indebted to the corporation for having adopted a better system of street cleansing, and carrying it out more completely than in any other town in the empire; for promoting ventilation as well as traffic by widening thoroughfares; for their proceedings against powerful manufacturers to abate the smoke nuisance, and to compel the pavement of old as well as new streets, and the drainage of houses: but in respect to that part of the business of town cleaning which provides for the reception and removal of night soil, it is confidently submitted, on unanimous medical testimony, and all the evidence taken before the Commissioners of Inquiry, that they have been ill advised as to their mode of proceedings, which the health

of the population requires should be retraced. They have required an apparatus of soil pans of the nature of a water closet to be provided for the worst class of the population,—the prisoners in the Borough gaol; and for the protection of *their* health there would have been an authoritative intervention at the instance of the medical officers having care of them, if privies had been ordered to be made, such as the corporation have ordered to be made for the labouring classes living in the densely crowded neighbourhoods. The privies are not only noxious to the occupiers, and, by the filtration through springs and evaporation, to their neighbours, but in their construction and management the most expensive to the owners.

Mr. Thomas Cubitt, the most extensive builder in London, was asked by the Commissioners of Inquiry:—

"Has it been your habit, in the construction of buildings of an inferior class, to place water-closets in them?" Replies, "I scarcely build any house, however small, without having a water-closet attached to it, and *not* a common privy. I believe the last twenty years I have not built any stable or coach-house, in which accommodation has been made for persons to live, without making a water-closet in the upper story; and I found that the mews in which those stables have been built has been generally kept clean: the effect has been that they would do all their dirty work within, and keep every thing offensive out of sight, and that the mews has been very clean, and consequently the place more healthy. The places I have built are generally very free from any bad smell, and there is nothing worse there than the stable dung."

The improved model tenements built expressly for the labouring classes at Birkenhead, are all provided with water-closets or soil-pans acting on that principle, on each landing occupied by a separate family.

The cost of the privies varies from £3. to £10. It has frequently occurred that a cottage worth £4. or £5. per annum, has been required to be pulled down to make four privies, and the privies cost £10. or £15., making the cost for twelve houses £4. or £5. per house, and often more, for which an early payment is required from the person in receipt of the rents, who frequently has only a short interest in the premises thus supposed to be improved.

It was doubtless intended by the corporation to provide better accommodation, and to substitute well-conditioned for ill-conditioned

cesspools; and not having the control of the supply of water, no better course would appear to be available.

The absolute necessity of providing and enforcing the adoption of an improved system of accommodation in this respect, forms one of the chief grounds for preventing the separation of the works for the supply of water from those for house and street drainage, and for practically establishing the conclusions of the Commissioners of Inquiry, that they properly form parts of one machinery, and that to allow possession to be taken of one part by separate authorities, must do as it always has done—derange the action of the whole. An example of this, is the practice of the old water companies to charge as much for the use of water for one closet, as for the whole of the water for the supply for one, or even for two houses of the third or fourth class.* This charge, of most noxious effect as an obstacle to the most important sanitary improvement, the company propose to abolish entirely, if they be enabled, by the support of the town, to carry out the whole plan.

The middens of cottage privies are almost always in close connexion with the walls, and not unfrequently extend under the adjoining house. It is difficult to prevent fœtid fluid filtering through the walls and into the subsoil of the houses, and impossible to prevent the putrid gases extending their poisonous influence into the narrow streets and crowded dwellings of the poor. The only effectual remedy is the entire removal of this source of ærial poison from amongst us.

It appears, then, that the company may, if properly aided, effect the following objects with advantage to the town, and with a reduction of existing charges to the townspeople; and with a fair return for the labour and skill employed, and for risk of the capital invested:—

That it may, at less than the common existing charges, substitute for the present imperfect and objectionable supply of water, a supply of pure and filtered water, carried into every tenement for domestic use, for cleansing and household purposes;—

That it may drain private houses, and supersede entirely

* Vide even the charges of the Nottingham company, vol. 1, page 228 of the first report of the Commissioners of Inquiry into the Health of Towns, where 5s. is charged for a lower class tenement, and 10s. for one water closet.

the necessity of cess-pools, middens, or other collections of putrefying filth, provide sinks and fixed wash-house basins at a weekly charge of a penny for the smallest houses, with the simplest style of fitting, and proportionately higher where superior fittings are desired;—

That it may effect a more thorough cleansing of the streets, with a reduction of the present charges, freeing them as completely from mud or dust, and rendering them as sweet and fresh, as they would be by a daily thunder shower;—

That by entirely superseding the necessity for middens and cess-pools, the nuisance and injury and pollution of air resulting from them, and from the use of manure carts, will be avoided;—

That it may keep on supplies of water, at high pressure, night and day, for the extinction of fires, the protection being as complete as would be afforded by a fire engine with a party of firemen being constantly on duty in every street;—

That it may apply the refuse of the town beneficially to agricultural production, and especially to the increase of the production of the land in the vicinity of the town.

In having attained these objects, and effected the complete drainage of the town, and laid down a system for the immediate removal of all refuse from amidst habitations before decomposition can have gone on, the company will have achieved the removal of the chief source of atmospheric impurity, by which it has been proved that the general health of the population is depressed.

And here it may be proper to revert to the many losses involved in the depression of the public health, as claims for coöperation with the company, independently of the higher grounds,—the prevention of sickness, the diminution of pain, of premature deaths, of bereavements, and of orphanage.

In illustration of this point, we cannot do better than quote the following letter by Dr. Playfair to the Editor of the *Manchester Guardian*, with the prefatory remarks on its republication in the *Manchester and Salford Advertiser:*—

"We hope we need not disclaim, either for Dr. Playfair or ourselves, any intention of estimating the loss from insalubrity in pounds, shillings, and pence. Human beings are something more than mere

producers of wealth, and their life or death, their happiness or misery, their virtue or their vice, are the alternatives of attention to or neglect of sanitary laws. But nevertheless it is useful, when we are calling upon a money-loving community to expend large sums in order that all may live longer and happier, that we should show them that the advantages which may be anticipated far outweigh the cost of their purchase, and that the capital thus employed will, considered merely as a pecuniary transaction, prove a most profitable investment. And because we do this, we do not fear being suspected of considering the lives and sufferings of our fellow-creatures, the bereavements of friends, the privations of widowhood, the perils of early orphanage, and the long array of giant evils that we are seeking to diminish by removal of their causes,—things that must be submitted to, even if the cost of that removal should exceed tenfold the pecuniary gain. Any sacrifice of wealth is true economy when expended in the purchase of happiness; and no expenditure can be wiser than that which tends to the preservation of the general health, of that health without which riches and rank are but burdens. Though this no one will dispute, nevertheless the proof, that pecuniary economy, as well as humanity, demands the expenditure required for sanitary improvement, is the removal of a serious, though not an insurmountable impediment to our progress; and as such we use the following document, believing that this was evidently the purpose for which it was published by Dr. Playfair:—

"'ON THE PREVENTIBLE MORTALITY OF SICKNESS IN MANCHESTER.

"'Manchester possesses the unenviable celebrity of being the second most unhealthy town in England, whether we view the rate of its mortality, or the average age of death, as the best index of excessive insalubrity. To those unacquainted with vital statistics, it is difficult to explain the pressure of the removable causes of disease. I will, therefore, compare the state of Manchester with that of Ulverstone, a district of average mortality, calculating the excess of deaths as indicated by the experience of the latter, according to the difference in population.

"'The experience at Ulverstone, compared with that of Manchester and Salford, shows that there is an *annual excess* in the latter of 3,147 deaths, which might be prevented by proper sanitary regulations; and of these preventible deaths 1,908 are those of adults above twenty years.

"'The total loss of life to each member of the community in Manchester, is 18 years and 9 months; and in Salford, 21 years. Every *adult* in Manchester is deprived of 11 years and 3 months, and in Salford, of 11 years and 1 month, of the natural course of his life; and, therefore, from premature old age, of more than that

period of working ability. It will not be considered an extravagant assumption, in a manufacturing town such as this, to rate the value of an adult labourer to his family, or to those whom he maintains, at ten shillings per week. In that case, allowing four weeks per annum to be lost from natural sickness and other incidental causes, the total *annual loss* of money, the value of adult productive labour in Manchester, is £676,890., on the 2,507 deaths of adults who have been deprived of 11¼ years of their existence; while, in Salford, the annual loss amounts to £200,564. on the 754 adult deaths which occur 11 1-12 years before the natural period. In this calculation, I estimate the pecuniary loss on each adult, by premature death, at £270. in Manchester, and £266. in Salford.

"'The direct expenditure resulting from the annual excess of mortality may be more easily admitted by those who are not accustomed to view life as an investment, in which capital is sunk for the rearing and education of each individual before he becomes a productive labourer. We may estimate the cost of each death, in funeral expenses, at least at £5. (by the returns of 232 burial clubs I find the average expenditure to be £8. 12s.,) then the annual loss to Manchester and Salford, by the excess of funerals, is £15,735. But each case of death implies 28 cases of sickness, as shown by the returns of the Infirmary and the Dispensaries; and, as ascertained by the experience of the latter, each case of sickness lasts on an average, 3 weeks 2½ days,—or in round numbers, three weeks.

"'According to this estimate, (which, as it does not include the more serious cases of illness sent to infirmaries, is an approximation at all events below the truth,) there are 88,116 preventible cases of sickness annually in Manchester and Salford; each of which cases may be presumed to cost, from expense of medicine, incidental expenditure, and loss of labour to the person sick—or in the case of a child, to the adult attendant—one shilling per day, or above £1. on each case. On this assumption, the cost of preventible cases of sickness, in Manchester and Salford, is above £88,000. per annum.

"'I am far from desirous of estimating by their money value the loss of life, the sorrows of bereavement, or the miseries of a sick bed; but I wish to show that all the money which the town may expend in its own improvement, is capital upon which an enormous interest will be repaid to the community. By the calculations, the data of which I have also given, in order that you may yourself determine their proper value, I estimate that Manchester and Salford lose every year, by their preventible excess of deaths and sickness, and by the premature termination of adult life, a sum no less than £981,189.

"'There are many other public burdens which ought to be added to this sum, did your space or my time permit. I will merely mention one, that you have 1,656 births per annum more than you ought to have by the experience of Ulverstone. It is a vulgar error to suppose that the excess of deaths in any district is necessary to prevent the increase of the population; for it has been clearly proved by the recent researches of vital statisticians, that excessive mortality always conduces to excessive births, not only as a direct consequence to supply the excess of deaths, but also by inducing a large number of premature marriages. All the evidence

collected on this subject points out clearly, that excessive mortality does not retard the increase of population.

"'It would be easy, then, to show, were it necessary, how your excessive births increase your pecuniary burdens; and it would be easier to point out how much the public burdens are increased by the large preventible amount of dependent widowhood and orphanage.

"'Consider that in Manchester nearly one-half of all the children born are swept off before they attain five years of age; consider that the chances of life to all your inhabitants from the time of birth are not above 22 years, and in some districts, such as Ancoats and St. George's, not above 14 years; consider that your adults who survive the dangers of childhood are swept off at the untimely age of 49 years, and in some parts of the town, such as Deansgate, at 45 years; that not two-tenths per cent. of the population ever reach the age of 90,—and you will see the necessity for much improvement in the sanitary condition of the town.'"

It might have been sufficient merely to advert to the advantages of the proposed improvements to the health, comfort, and morality of the population, (while the pecuniary interests of the consumer are also duly consulted,) as cogent motives to hearty coöperation. It is, however, strictly on the basis of profitable returns that the company is founded, as it is on that basis only that those advantages may be expected to be rapidly, economically, and completely realised to the whole community, or that the capital can be justly expected to be raised, and science applied to the works in question; all of which, it is now proved, must, when completely carried out, effect large reductions of various existing money charges, to landlords as well as to, even the lowest class of, tenants.*

There are, on principle, fundamental objections to gratuitous benefits, and the labouring classes are never eventually benefited by them. Prosperous times and high wages, which induce close confinement, it is proved, do not avert the noxious effects of damp, of bad

* The insurance charge upon the poorest families, to provide for the relief of sickness involving a loss of from twenty to thirty days' labour per annum, (vide Sanitary Report, pages 225 and 6) would be one shilling and fivepence weekly. The cost of these chief measures for the prevention of sickness, would, to such a family, be no more than threepence weekly. It is not fair, however, to reckon these as sanitary expenses, for the other advantages resulting over and above improved health, are well worth their cost. The expense proposed for street cleansing is already charged for the present imperfect method, and that for water supply is less than the present expense,—that for house drainage will save more in lessened injury to the houses from damp.

water, of defective drainage, and of filthy houses and streets; and these evils render bad times still worse, by inducing the feebleness of disease, and bodily inability to struggle against them. Threepence weekly,—*i. e.*, one penny per week for a constant supply of pure water; one penny per week for drainage and house cleansing; one penny, in round numbers, for a more effectual street cleansing and watering, per house, or per family of five,—would be a highly advantageous means of reducing, by prevention, the insurance charge for the mitigation of the effects of sickness and premature mortality, which for such a family would, in the present state of things, be rarely less than one shilling and sixpence weekly.

Throughout this report the weekly charges have been stated, not to disguise the large expenditure which will be required, or the annual rentals; but that the annual rental may not, as is commonly done, be fallaciously set against the daily and weekly convenience.

It is evident that, to effect these purposes, new powers must be obtained from parliament.

Besides a general bill or a charter for incorporating the company, enabling it to raise capital, limiting the responsibility of the shareholders, and regulating its government, a local bill must be procured; for which it is intended that the company, the town council, and the water-works company, shall be joint applicants. This bill must contain provisions, empowering the water-works company to transfer its property and privileges to the new company, on terms agreed upon and to be specified,—to empower the new company to extend the works so as to command an ample supply of water,—to enact that the pipes shall be kept filled with pure filtered water, at high pressure, constantly on, night and day,—that pipes be laid to all houses in streets which are sewered, or which are about to be sewered,—that such proper fire plugs as shall be directed by the council, on competent examination, be constructed, to be paid for out of the borough fund, and such other fire plugs for the protection of private property as the owners shall tender payment for,—and water allowed to be drawn at all times for the extinction of fire. In return for which, the company will be empowered to levy payment, according to the scale in the schedule to the bill. The new works constructed at such expense as shall be sanctioned by parliament, the cost of additional pipes laid, and capital value

of the existing works reckoned as equal to £60. per share, shall be considered the capital employed for the water supply; and any sum remaining, after paying five per cent. net profit upon the total capital so reckoned, shall be divided,—one moiety among the shareholders as a bonus, the other paid over to the borough treasurer as a sanitary improvement fund.

The company will be authorized to make and maintain, in every house supplied by it with water, such house drains, water closet, and sink, as the council shall direct,* or as the owner shall agree to; and be repaid by such a rent-charge, payable by the owner, as shall be equal to eight per cent. upon the cost; that is, four per cent. for interest, three per cent. for depreciation, and one per cent. for risk. It is calculated that the cost of such house works, if constructed in the simplest manner, such as would be necessary for houses of the lowest class, will be less than £3.; the annual charge for which would be 4s. 10d., or about a penny per week for those below £5. rent; three-halfpence for those below £10.; for those above £10. the owners would probably desire a superior style of fitting, and the company will be empowered to do whatever is agreed upon with the owners, repayment being secured if the owners choose, by a proportionate rent-charge. The company may be empowered to contract with the town council and surveyors of the highways, for the construction and maintenance of any street, sewers, pavements, or other like works, on terms of mutual agreement, either for immediate repayment, or for repayment spread over a term of years not exceeding thirty.

The company should be empowered to construct and maintain collecting conduits, as described in the schedule which will be annexed to the bill. Such conduits will be conducted, for the most part, along the banks of the rivers Irwell, Irk, and Medlock, and will convey all the sewerage of the town to covered tanks, situated near Throstle

* This power may be given to the council by a very small extension of the existing law. They already have the power of compelling the erection of a privy to every house hereafter built, and of one privy for every three not yet provided for. They also have the power of compelling owners of houses to construct such house drains as they may consider necessary. As it has been shewn that the conveniences now proposed can be provided at far less cost than those imperfect ones which the council now order, no reasonable objection can be urged to such extension of their powers as will increase the comfort of the occupiers without entailing any additional expense upon the owners.

Nest, whence the liquid part of it will be conveyed either in pipes or covered conduits, in such a way as to be no annoyance to the public; to the land where it will be employed as manure.* The solid part may be removed in boats, or manufactured into inodorous manure, or otherwise disposed of as shall be found most profitable. Lastly, it will be enacted that the company shall pay over to the borough treasurer, as a further addition to the sanitary improvement fund, half of all net profit resulting from the disposal of the refuse, after paying the shareholders a dividend of *eight* per cent. upon the capital engaged in carrying out this part of the undertaking.

On such experience as has been collected on this subject, little doubt is entertained that the net proceeds from this branch of the undertaking will be, at least, twelve per cent. upon the capital engaged. This will afford ten per cent. dividend, including bonus, to the capitalists, (being eight per cent., and half above eight per cent.) while two per cent. will be paid towards the sanitary improvement fund. It is expected that difficulties will, at first, be met with in the introduction of this new method of manuring; and in the estimated income it has been assumed that one-half only of the agriculturists whose farms are within reach, will be sufficiently awake to their own interests to avail themselves of the large sources of profit offered to their acceptance, and those only to a very imperfect extent. These difficulties will, no doubt, be gradually overcome, and it is believed that, in a very few years, the surplus to be paid over for public uses will be much increased; while a similar, though smaller proportionate addition, is made to the shareholders' receipts.

Whilst it is proved that large public benefits are conferred by the proposed plan, it is clear that it is good as an investment for capitalists; for of three-fourths of the capital, (that which is required for the water supply, house and street drainage, and public works,) a moderate but perfectly safe interest is secured by a rate, or by rent-charges, while, for the remaining fourth, (that which is required for the irrigation apparatus,) eight or ten per cent. may be confidently expected. It now remains to consider the private interests which may appear to be affected by the plan.

The rights to the running water for the feeding of the Duke of

* See Reports by Mr. Corbet and Mr. Holland. First Rep. App. p. 172, pp. 68—70.

Bridgewater Canal and the Irwell and Mersey Navigation, were to the water in a pure or in a less impure state, and the intrusion and growing addition of these impurities must be detrimental to the property which is entitled to protection; and arrangements will be requisite, that when the impurities are diverted, the water courses also are not diverted, or that proper compensation be made. It is hoped the less objectionable waste water used for baths, public wash-houses, and other works, will serve to a great extent to compensate for the sewer water which will require to be diverted from the Irwell.

Merely dispensing with the waters of the Medlock in the canal, would be simply transferring its filth to the Irwell, already strongly contaminated with the sewerage of Manchester and Salford, as well as by the numerous dye works, &c., on its banks. The plan proposed not merely prevents this increase to its contamination, but will very considerably diminish that which already exists, by excluding from it almost entirely the impurities above mentioned.

The owners of mills, dyeworks, &c., on the river, will be benefited, inasmuch as they will have tolerably clean water for their engines and other purposes; instead of the heterogeneous compound they are now obliged to use. If it be found expedient, it would be easy to employ the existing reservoirs at Beswick, (for which the company will have little use,) for impounding the night water, and so increasing the stream during the day. Larger reservoirs, in which to impound flood water, would still further increase the value of the river. The expediency of their construction may hereafter be taken into consideration.

The owners of the poorer description of houses may be expected to oppose anything of the appearance of a new charge, until they are fully informed (which may not readily be done), that if the works be completely carried out, they will be the means of reducing existing charges, and increasing the value of their property; of reducing the charges of dilapidations arising from damp; of reducing the losses of rent from inability to pay arising from sickness, of losses of rent from frequent changes and "flittings" of the tenants arising from discomfort,—losses which in some districts amount to a very serious proportion of the rental.* That the improvements will add to the

* Mr. J. Little's evidence:—"I have decidedly found that the rent is best got from the most healthy houses; three out of five of the losses of rent have arisen from the sickness of tenants among working men.—First Report, p. 303.

actual value of this as every other class of houses, and retaining the best class of tenants, forms part of the ground on which the consent of the owners ought to be cheerfully given. Amongst these benefits are to be enumerated, the reduction of the charges upon the poor's rates, of sickness, premature widowhood, and orphanage, which in some townships are the principal sources of expense in the relief of the poor.

Scarcely any other private property will be interfered with. On the proposed plan, the conduits for conveying the liquid manure will be carried, for the most part, along the banks of the canal and river, and may perhaps form a foundation for a new or improved towing-path. The pipes will be carried along the public roads underground, and the consent of the trustees will be required on easy terms, for the plan will tend to diminish the quantity of manure carried over the roads, which, though it causes much wear, pays no toll, and will increase the quantity of agricultural produce to be conveyed, which is a source of income.

Opposition may be expected from the inhabitants of the districts intended to be irrigated, arising from the fear of being injured or annoyed by the manure with which the land will be so plentifully supplied. Such opposition is, however, groundless, for manure applied in the liquid state is much less injurious and offensive than that spread as it now is, and decomposes on the ground, while the putrid gases escape into the air.* The company will have the power, and it will be their interest, to proportion, with tolerable accuracy, the quantity of manure provided to the absorbent powers of the vegetation: whenever manure becomes offensive, it is evident that this quantity is exceeded, and that there is waste. As to the tanks and conduits, no injury or annoyance whatever need be apprehended from them, as they will be covered, and an inward draught created by a furnace and chimney, by which all the gases which may be evolved will be decomposed, and rendered innoxious and imperceptible.

The rights of the owners of water-mills will require fair compensation, either in money or by the construction of such reservoirs as will impound flood water, to be given out again so as to supply the streams in time of drought. The expense of these has been included

* Vide the examination of Mr. Dean, the Agricultural Engineer: First Report of the Head Commissioners of Inquiry, page 408—9.

in the estimates; and the real value of the streams will be improved to the mill-owners by the adoption of the plan. Of course, some of the claims for these rights will only be determined by litigation, but the evidence is daily growing stronger of the reduced value of water power, and the increased cheapness and convenience of steam power.

It will be observed, that by the adoption of the plan proposed by the company, the two boroughs of Manchester and Salford and the adjoining district, which constitute what is properly called Manchester, will all be brought under one system of water supply, and the drainage be effected according to the natural area, irrespective of mere artificial boundaries. The governing authority of each district, whatever that may be, will make a separate and independent arrangement with the company. Salford being separated by the natural boundary of the river from Manchester, might have its separate system of drainage and cleansing, and even of the supply of water, if the district were not already occupied by the pipes and plant of the same company which now supplies Manchester. But connected as both boroughs are; by locality and by business, both may have the advantages of a higher order of establishment, and larger and more efficient, and at the same time more economical service, than if each were to have its separate establishment. The intervention of the company will be the means of giving each the benefit of a reduction of expenditure. The inhabitants of Pendleton and of the other townships would object to any union which might entail upon them a heavier share of the burthens than they feel themselves called upon to bear; but in forming, separately, a common contract with the company, which can have no party or local objects other than the fair commercial gain, they will be freed from all such grounds of apprehension, whatever they may be. Each, if it have fault to find or complaint to make, may deal independently with the contracting company, rather than with the neighbouring corporation.

The division of the surplus profits may easily be arranged. An annual balance sheet will be made out, showing the payment of water rate from each township, and the annual receipts and expenditure. The mount of salvage may be fairly assumed to be proportionate to the consumption of water for household purposes. An annual payment may therefore be made to the borough treasurer, or other

officer authorised to receive it, of that portion of half of the net profits of the water works above 5 per cent., and half of the net profits from the irrigation above 8 per cent., as is proportionate to the water rate paid for each township respectively. Thus, besides effecting the most important sanitary improvements required, without imposing any new burden on the public, a fund will be created for other such improvements, arising—not from taxes or rates, but from a source of enormous wealth hitherto almost entirely undeveloped.

To conclude. By the set of works comprehended in the present plan, the results set forth in the following passages in the evidence of Dr. Southwood Smith, will be attained:—

"You think, under proper regulations, it would be found practicable to make the very refuse removed go far towards defraying the expense of constructing and managing the drains and sewers by which it is removed?—Yes; and I think there is a reason for this expectation which has a deeper foundation than is apparent on a superficial view of the subject. There are certain adjustments established between the physical and the organic kingdoms, and between the two great divisions of the organic kingdom, which we should do well to bear in mind even in the most practical consideration of this matter. We know that atmospheric air is equally necessary to the life of plants and animals, but that they produce directly opposite changes in the chemical constitution of the air: the plant giving off as excrementitious that principle of the air on which the animal subsists, and living upon that part of it which the animal rejects as excrementitious; while the animal in its turn restores to the air the principle which constitutes the food of the plant, and subsists on that which the plant has rejected as no longer useful to it. In this manner these two great classes of organized beings renovate the air for each other, and everlastingly maintain it in a state of purity and richness. On this beautiful adjustment depends this further principle, equally at the foundation of all rational and efficient sanitary regulations,—namely, that the very refuse of the materials which have served as food and clothing to the inhabitants of the crowded city, and which, if allowed to accumulate there, invariably and inevitably taint the air, and render it pestilential,—promptly removed and spread out on the surface of the surrounding country, not only give it healthfulness, but clothe it with verdure, and endue it with inexhaustible fertility. These are great laws of nature, which are now well known to us; a due conformity with which would bring us health, plenty, and happiness, but which we cannot disregard, any more than we can disregard any other physical law, without suffering, and perhaps destruction. Do we act in conformity with these laws? I turn to the Report on the Sanitary Condition of the Labouring Population, and I find the following account of the actual state of things:—'Within the towns we find the houses and streets filthy, the air fœtid; disease, typhus, and other epidemics, rife amongst the population; bringing in the train destitution, and the need of pecuniary as well as medical relief; all mainly

arising from the presence of the richest materials of production, the complete absence of which would in a great measure restore health, avert the recurrence of disease, and, if properly applied, 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 removable, is not more certain than that their removal would be attended by reductions of existing burdens, and might be rendered productive of general advantage, if due means, guided by science, and applied by properly qualified officers, be resorted to.'"

APPENDIX A.

The water that will be supplied by the company is remarkably soft, and free alike from insects or vegetable matter, and from mineral impurities. The most important economical advantages result from these circumstances:—First, there will be a great saving of soap and soda for washing, a saving more than equal in amount to the total cost of the water. Dr. Clark has ascertained that the total quantity of soap consumed in the Metropolis is about 12,000 tons, which, at £50., costs £600,000., and of soda for washing, about 3,000 tons, which, at £10., is worth £30,000.; in all £630,000. a year. At least one half of this expense would be saved, if water of the quality of that which will be supplied to Manchester by the company were used. The quantity of soap and soda consumed in Manchester must be greater in proportion to the population than in London, because of the large quantity used by bleachers, dyers, printers, and other manufacturers, and the water now supplied by the company is of about the same degree of hardness as that supplied to London, while much spring water is harder. It is a very moderate estimate to assume that the saving will be proportionate. The population is about one-sixth, the saving will be, therefore, equal to at least one-twelfth of the total value of soap and soda used in London; that is, at least £52,600. a year. Dr. Playfair has arrived at a nearly similar estimate of the probable saving by another mode of calculation:—

"In considering the best means for the extension of this benefit to the working-classes, or in sanctioning the formation of new water-works, it would be highly advisable to obtain evidence as to the quality of the water, particularly with regard to its hardness.—(Evidence of Dr. Clark, First Rep. fol., Q. 104.)

"The value of attention to this point will be obvious, when the difference of consumption of soap is considered. I found by various trials in summer, that the Manchester water possesses a hardness equivalent to what would be obtained if 13 or 14 grains of chalk were dissolved in a gallon of pure water.

"Now, in Aberdeen, the hardness of water is only 1 degree—*i. e.* equal to 1 grain of chalk per gallon; and, in some towns in Lancashire, not more than 4 degrees. The annual consumption of soap in Great Britain is 7½ lbs. per head of the population, which at 50s. per cwt., is an expense for soap of 3s. 4d. incurred annually by each person. As the consumption of soap increases according to the hardness of the water, we may fairly estimate the annual consumption for each person in Manchester, the water of which is 14 degrees, at 15 lbs., or the same as that of London, the water of which place has 12 degrees. Thus the hard water of Manchester may be regarded as increasing the water-rent to a family of five individuals, 16s. 8d. per annum, or £49,363. per annum to the whole town, a sum nearly double that of the present gross water rental. But large as is the cost entailed upon a town by a bad selection of water, in the unne-

cessary consumption of soap, still greater loss is incurred in the wear and tear of clothes. Whilst, therefore, the nominal price charged for water in a town may appear tolerably low, the hard quality of the water itself may involve a very considerable additional expense.

"It is also extremely important to have a clear filtered water for domestic use, instead of the dirty water, generally abounding with visible animalcules, which is too often met with throughout the whole country, and in Lancashire as well as in other parts. Those who are acquainted with the habits of the poor, know well how easily they are induced to leave the natural beverage and resort to stimulating drinks; and a powerful incentive to this is the disgusting appearance of the water as it issues from the main. I have already forwarded to you, in the examination of Mr. John Graham, partner in the extensive print-works of Messrs. Hoyle and Sons, evidence as to their experience in filtering water. (First Rep. fol., App. p. 170.) He there states, that for £156. per annum, (exclusive of the rent of land) half a million of gallons daily may be filtered, or 182½ million of gallons per annum. This estimate is for filtration by the 'Lancashire method,' a very efficient and economical system; and by its adoption every labourer's tenement, assuming his consumption at 40 gallons daily, could have his water perfectly clear and filtered for 3d. additional to his annual rental, a sum which would willingly be paid. One public filter must be infinitely more economical than 20,000 private filters, as Mr. Hawksley says, 'with 20,000 different cares, cleansings, and renewals.'"

It is not, however, in soap and soda alone that a saving arises from the use of soft water in washing; labour and wear and tear are much diminished, and these are probably the more expensive items. Clothes are also more perfectly cleansed, and keep a better colour when washed in soft water, the insoluble soap produced by hard water, forming the curd, being one principal cause of the yellowness and the unpleasant smell which clothes washed in hard water frequently acquire.

The comfort of washing the person with soft water every one knows, and this is a comfort very difficult of attainment in a smoky town like Manchester, except by the means proposed, that of bringing soft, pure, fresh mountain water from the distant country.

For brewing, tea-making, cooking generally, dyeing and calico printing, soft water is invaluable. For the use of steam engines also, it is most important that the water should be pure, not only to avoid priming of the engines, but also the formation of fur in the boiler, which causes a great waste of heat, and rapid destruction of the boiler, and is a source of very considerable danger of explosion. In consequence of these advantages, a very large increase of income for the use of water for trading purposes may be expected. It must not be forgotten, that, as all the net profit the company makes above 5 per cent. will be divided with the public, the public interest requires that that profit should be as large as possible.

APPENDIX C.

ADDENDUM TO DR. PLAYFAIR'S REPORT ON THE MEANS OF SECURING CHEAP AND CONSTANT SUPPLIES OF WATER TO THE LOWER CLASS TENEMENTS.

Observations on a Table obtained since the completion of the Report on the Sanitary Condition of the Chief Towns in Lancashire.

The case of the population of the large urban district, forming one town, comprising the township and municipal borough of Manchester—the township and municipal borough of Salford—may be adduced to illustrate the great economy, and the interest of all classes (and most of the labouring classes) in securing, by a general and compulsory rate for the payment on a contract in their behalf, on the lowest terms, of a general, abundant, and constant supply of water at high pressure. The case will show the heavy additional tax imposed on the labouring classes by the old, or what is called the voluntary, system of supply of this first necessary of life.

For the supply of 66,000 dwelling-houses, and about 2,800 warehouses, factories, and other tenements, on a plan adopted by the old water company, and agreed to by many of the influential inhabitants, of the constant supply of water, for all purposes, domestic, trading, and public, night and day, at high pressure, an income of £40,000. per annum is stated to be requisite. The expenses of management are estimated at £8,000.,* the repairs £2,429., and £10,000. per annum is required to pay interest on a new loan of £250,000., and the rest to pay the dividends of the existing shareholders of a capital of the estimated value of £350,000. previously invested.

On this plan, which proposes that the expense shall be levied by a general rate, the old company, instead of having indefinite proprietary rights, would be lessees or contractors for the works, and managers for an annual income, to pay the interest on capital and the expenses of management; this annual £40,000. per annum, it is proposed shall be raised by a rate of 1¼ per cent. on the rental of manufactories, 2½ per cent. on warehouses, and 5½ per cent. on the rental of the 66,000 dwellings.

To illustrate the principle in question, of the economy of an universal rate for an immediate and general supply, it may be assumed that the whole of the new plan, and every part of the works, and the purity of the water, is complete and unexceptionable,—that the annual remuneration to the company for management, *plus* the interest on capital, is fair, and the distribution of the charge and the rating of the factories and warehouses equitable; and, in short, that the gross sum, £28,636., required from 66,734 dwelling houses, or 8s. 7d. per annum, or 2d. per week per house, one with another, for a constant supply of pure water, night and day, is just and necessary.

* This includes rents, rates, &c. The whole estimate is rather higher than will be required.—Ed.

DWELL HOUSES OF THE UNDERMENTIONED ANNUAL VALUE.

Under...	£5.	£10.	£20.	£20. to £40.	£40. to £60.	£60 to £100.	£100. to £900.	Totals.
Number of dwelling-houses	24,367	25,020	10,627	4,289	1,386	687	358	66,734
Amount of rental* of each class	£90,845 2s. 11d.	£169,307 1s. 11d.	£139,291 2 4	£119,687 12 5	£60,331 8 10	£51,856 3 0	£53,971 9 6	£691,490 0 11
	49,387							
	£260,152. 4s. 10d.							
Water rents, about 4½ per cent. on rental.	£4,873 8s. 0d.	£6,880 10s. 0d.	4,597 9 0	5,501 5 0	2,979 10 0	2,019 5 0	1,784 15 0	28,636 2 0
Or, each house, yearly rents	4s.	5s. 6d.	0 8 7¾	1 5 8	2 3 0	2 18 9¾	4 19 8½	0 8 7
		4s. 9d.						
" weekly rents		1¼d.	0 0 2	0 0 6	0 0 10	0 1 1½	0 1 11	0 0 2
		1 1-10th						
Proportion per cent. of cottages to the whole number	36¾	37½		6¼	2	1	¼	.....
Proportion per cent. of the pecuniary contribution of each class to the whole	17	24	16	19¼	10¼	7	6¼	.....
		41	16					
Amount of money to defray the outlay which must be levied upon the middle and higher class of tenements so long as those under £10. per annum are not rated or do not contribute:—								L. s. d.
Total amount of extra rates	.....	.....		8,763 0 0	4,803 0 0	3,432 0 0	3,255 0 0	28,636 0 0
Extra rate per house, yearly	.....	.....		2 0 10	3 9 4	5 0 0	9 5 9	1 13 0
" weekly	.....	.....		0 0 9¾	0 1 4	0 1 11	0 3 7	0 0 7¾
Remaining share assessed on factories, &c. (viz. warehouses and trading offices for domestic uses only, £166 65., at about 2¾ per cent.; factories, &c., for domestic purposes only, £72,181. 15s. 1d. at 1¼ per cent.):—								
Total rate	.....	.....	7,040 0 0	7,601 0 0	4,147 0 0	2,928 0 0	2,732 0 0	24,448 0 0
Per house, yearly	.....	.....	0 13 3	1 15 5¼	3 0 0	4 5 3	7 12 7½	1 8 2
" weekly	.....	.....	0 0 3	0 0 8¾	0 1 2	0 1 7¾	0 2 11¼	0 0 6¾

* It should be stated assessment, which is about five-sixths of the rent. The scale of rates is not precisely the same as that proposed by the new company: by it houses under £10. will be charged rather more—6s. 6d., or three-halfpence a week; and houses above £20. rather less than the sums mentioned in the table. Large houses do not consume so much more than small ones to justify so very great a difference in the rates of charge.

The preceding table, for the data of which I am indebted to the zeal of Mr. Oxley, shews the number of tenements of each chief class, and the amounts which the occupiers would have to contribute, if all were rated, at once to the works, and the burthens which must be thrown upon the rest, if any one class were to be omitted.

Another instance of the proportions of the lower class of tenements is afforded by the city of Cork. Out of the whole number of houses there were in 1841 of

4th class, or mud cabins, having only 1 room	156
3rd class, or mud cottages, of 2 to 4 rooms and windows	1834
2nd class, or houses in small streets, having 5 to 9 rooms and windows	4950
1st class, or houses of a better description than the foregoing	1833
Total	8773

Proportion per cent. of Houses of each Class, to the whole number.

4th class	1¾
3rd class	21
2nd class	56¼
1st class	21

The number of Parliamentary electors in respect of £10. households, in the city of Cork, in January, 1842, as by return of Parliament	3086
The proportion per cent. of houses under the value of £10. to the whole number of houses, was therefore	65

From the above instances a judgment may be formed of the amount of burthen cast upon all the other classes, by the omission to rate so important a mass of buildings as those occupied by the working classes, and how impossible it would be to exempt them, on the grounds of charity.

On the proposed rate of remuneration for management and risks of failure, of 1½ per cent., or 2 per cent. beyond the ordinary market rate of interest for such loans,—a rate of remuneration which is generally admitted to be at present the lowest, and would scarcely be safe or liberal to reduce, or allow to be reduced by wasteful competition,—the whole of the charge must be at once distributed over the whole body of consumers. Every diminution of the numbers contributing, or delay to accept the arrangement, must be at the expense of the rest, on whom the expense must at once fall, unless it fall upon the capitalists. It will be perceived from the examination of the table, with relation to the proportions of the several classes of houses at Manchester and Salford, that if the class of tenements under £10. be not at once rated, all the middle and higher class of tenements must at once be taxed to the amount of £11,573., or upwards of 4s. per house. In other words, by the exemption of 74 per cent. in number of the smaller tenements (those under £10.), the other classes must be taxed with 41 per cent. of additional outlay, because the owners of this lower class of houses, where the necessity for improved supplies is the greatest, refuse to have their existing charges *reduced* by a general arrangement for the advantage of the occupiers, and ultimately for their own benefit. In the case of Manchester it is literally so, and it will generally be found to be so in most other cases. A large proportion of the houses occupied by the labouring classes in Manchester are supplied with water from wells sunk

in back-yards, which wells are never far from a cesspool, and commonly are each surrounded by several cesspools. As the neighbourhoods become more dense, and as the population increases, the pollutions of these wells increase. The poor pay now at the least 1d. per week to 1s. per month, or 3d. per week for the liberty to draw water, hard and polluted, from these sources. They are besides taxed with the cost of more expensive labour of pumping and fetching and carrying the water, in wet or in cold, to their houses, and are consequently sparing of the use of the water, even where it happens to be fitted for use. Under the arrangement proposed—in no instance for more money than they now pay directly, and always for much less than they pay indirectly—pure water may be secured to them, and it may be carried into their houses, and up to the tops of the highest rooms, at a rate of less than three-farthings for a ton, or for 108 pails full at two gallons the pail, supplied as they may wish it.

But the owners of the poorest tenements, who in this town, as in most others, are frequently labouring men, are not themselves above the occupiers in intelligence, and rarely consent to any immediate outlays; and it may be presumed will not in this case at once give up their pumps, from which they *appear* to derive an additional rent. The expense of the repairs of a common pump seldom cost less than 5s. per annum. The common expenses of sinking a well and erecting a pump are stated to be, in Lancaster, £17. The rental and repairs together will seldom be set down at less than from 20s. to 30s. per annum for each pump. So that when the labour and trouble of collection is taken into account, the owner of this description of property gains little from it, even where there are several occupiers to charge; but where one pump is erected and maintained for each house, there is a mutual loss to the owner as well as the occupier, as compared with the supply of water at the above rates and charges by a company.

Under these circumstances these questions are submitted:—Would the legislature be justified in allowing the middle and higher classes of tenements to be taxed in additional charges, in deference to the blind ignorance which delays improvement at the parties' own expense, and at the expense of the rest of the community in various ways, and, amongst others, in the relief of sickness from the poor's rates, to which this the lowest class of property commonly escapes contribution? Is it not a paramount duty of the legislature to act upon its own perception of the evidence demonstrative of the advantage of the proposed arrangement in respect to the public health, and declare that ample supplies of water are "as essential to the population as the possession of a roof to a house, or due space for ventilation," and secure those advantages to the labouring classes by a compulsory rate? When complete assurances and guarantees may be secured under contracts for the attainment of the end proposed, is it either morally or politically justifiable to accede to the ignorance which is proved to be productive of so much filth, sickness, and other evil?

But there are other economical and moral, as well as administrative grounds for supporting a universal and compulsory rate for maintaining a general and constant supply of water, namely, to prevent or to extinguish fires.

The effect of the constant supply of water, night and day, at high pressure, will be to diminish, (as proved on the experience of towns where it has been applied,) the actual risk of fire one-half. The insurance charge against fire on 66,000 houses in Manchester, with a rental of £729,780., would be, on the houses alone, at common risks, £25,200., and on other property, £15,000., per annum, or a gross sum of £40,000. per annum, at the average rate of insurance, which would be 2s. per centum, duty 3s.; total 5s. per centum on the houses; and on stock in trade, machinery, furniture, utensils, at least 6s. per centum.

Mr. Corbett, who was for several years a member of the fire committee at Manchester, being asked "If a system of the constant supply of water had been in action there, (meaning the part of the town within the jurisdiction of the municipality,) what amount or proportion of loss from fire do you think might have been saved to the town?" replies, "I think it fair to estimate that one-half of the losses by fire would have been saved. I am not prepared to estimate that saving with very great accuracy, but I feel very confident that it would have been upwards of £100,000. during seven years;" that is to say, £14,000. per annum. On the whole, the prevention of the like amount of loss for the future, in the whole district, would justify a rate for the complete extension of the mains, with fire-plugs, &c., for the constant supply through that whole district, of £20,000. per annum for fire prevention alone.

The cleansing of the roadway and pavements in the front of 66,000 houses would justify a rate of £4,500., at 1s. 6d. per house per annum; a very low estimate.

There are as yet no precise data for readily estimating the value of an increased and constant supply of water for the simple purpose of flushing house-drains and sewers, and keeping them constantly clean, if such a supply were separable from the domestic supply. An equal sum to that proposed for a supply of water for surface-cleansing would also be a low estimate. So that of the whole annual income required for a complete supply of water to the population, it would be a good economy to levy two-thirds, by an equal rate, for the public purposes alone, if no new supply whatsoever were required for domestic purposes. If, indeed, the town were entirely clear of any old apparatus or demands for compensation, and everything was to be done *de novo*, the whole expense of the new works would be justified by the public purposes last specified—the saving of loss from fire and the service of cleansing the streets, the house-drains, and the sewers.

It has been stated, on competent authority, that a contracting company, in such a case as that of Manchester, with peculiar obstacles to the early voluntary adoption of a supply of water by the smaller owners, and without any guaranteed return, but left to take their chances as to the progressive adoption of the water supply, must justly require a rate of charge from 16s. to 20s. per annum, in respect of the dividend, and probably 4s. or 5s. more in respect of the working expenses attending the supply.

A scattered and irregular demand for water, for the lowest and poorest classes of tenements, can only be supplied to them at a proportionately increased expense.

The delay of the fair general rating of all classes must therefore be the cause of protracting the evils in question, or it must cause unequal and unfair burthens on one part of the community, and further protract the voluntary and cheerful adoption of the proved measures of amendment which it is so necessary to promote.

A compulsory rating of the lower classes of tenements is, therefore justifiable for the purpose of extinguishing fires; and for cleansing the streets, drains, and sewers: and the rating is justifiable for these purposes alone considered as measures of police. The completion of the proposed arrangements, and the imposition of undue burthens upon one portion of the community, upon any voluntary system, surely cannot fairly be delayed until the busy have leisure to inform themselves, until the ignorant are educated and made to understand a scientific arrangement, and every one is induced to contribute to it voluntarily! Capitalists can calculate on the intelligence of the middle and higher classes for the early and voluntary adoption of beneficial arrangements; but they must doubt the progress of conviction and voluntary change amongst the lower classes, and reckon upon much trouble with them, and must therefore require a higher inducement for the risks and delay of any voluntary arrangements.