of the fever cases occurred in the low wynds and dirty narrow streets and courts, in which, because lodging was there cheapest, the poorest and most destitute naturally had their abodes. From one such locality, between Argyll-street and the river, 754 of about 5000 cases of fever which occurred in the previous year were carried to the hospitals. In a perambulation on the morning of September 24th, with Mr. Chadwick, Dr. Alison, Dr. Cowan (since deceased, who had laboured so meritoriously to alleviate the misery of the poor in Glasgow), the police magistrate, and others, we examined these wynds, and, to give an idea of the whole vicinity, I may state as follows:—

"We entered a dirty low passage like a house door, which led from the street through the first house to a square court immediately behind, which court, with the exception of a narrow path around it leading to another long passage through a second house, was occupied entirely as a dung receptacle of the most disgusting kind. Beyond this court the second passage led to a second square court, occupied in the same way by its dunghill; and from this court there was yet a third passage leading to a third court, and third dungheap. There were no privies or drains there, and the dungheaps received all filth which the swarm of wretched inhabitants could give; and we learned that a considerable part of the rent of the houses was paid by the produce of the dungheaps. Thus, worse off than wild animals, many of which withdraw to a distance and conceal their ordure, the dwellers in these courts had converted their shame into a kind of money by which their lodging was to be paid. The interiors of these houses and their inmates corresponded with the exteriors. We saw half-dressed wretches crowding together to be warm; and in one bed, although in the middle of the day, several women were imprisoned under a blanket, because as many others who had on their backs all the articles of dress that belonged to the party were then out of doors in the streets. This picture is so shocking that, without ocular proof, one would be disposed to doubt the possibility of the facts; and yet there is perhaps no old town in Europe that does not furnish parallel examples. London, before the great fire of 1666, had few drains and had many such scenes, and the consequence was, a pestilence occurring at intervals of about 12 years, each destroying at an average about a fourth of the inhabitants.

"Who can wonder that pestilential disease should originate and spread in such situations? And, as a contrast, it may be observed here, that when the kelp manufacture lately ceased on the western shores of Scotland, a vast population of the lowest class of people who had been supported chiefly by the wages of kelp-labour remained in extreme want, with cold, hunger, and almost despair pressing them down—yet, as their habitations were scattered and in pure air, cases of fever did not arise among them.

"Edinburgh stands on a site beautifully varied by hill and hollow, and owing to this, unusual facilities are afforded for perfect drainage; but the old part of the town was built long before the importance of drainage was understood in Britain, and in the unchanged parts there is none but by the open channels in the streets, wynds, and closes or courts. To remedy the want of covered drains, there is in many neighbourhoods a very active service of scavengers to remove everything which open drains cannot be allowed to carry; but this does not prevent the air

from being much more contaminated by the frequent stirring and sweeping of impurities than if the transport were effected under ground; and there are here and there enclosed spaces between houses too small to be used for any good purpose but not neglected for bad, and to which the scavengers have not access.

"Another defect in some parts of Edinburgh is the great size and height of the houses (some of them exceeding ten stories), with common stairs, sometimes as filthy as the streets or wynds to which they open. By this construction the chance of cleanliness is lessened, the labour of carrying up necessaries, and particularly water for the purposes of purifying is increased; and if any malaria or contagion exist in the house, the probability of its passing from dwelling to dwelling on the same stair is much greater than if there were no communication but through the open air. Illustrating how malaria may be produced, I may state that in making a round of observation with Mr. Chadwick, attended by the Police Superintendent, and others, we visited a house at the back of the Canongate, which in former days had been the chief inn of the city, but now, with its internal court-yard of steep ascent, is occupied by families of the labouring classes. In the court-yard a widow of respectable appearance, who answered some of our questions, occupied a room which appeared on the ground-floor, as seen from the court, but was above a stable, now used as a pigsty, opening to the lower level of the external street. A little while before, on the occasion of the dungheap being removed from the pigsty, two children who lived with her, a daughter and a niece, were made ill by the effluvia from below, and both died within a few days.

"The facts here referred to go far to explain why fatal fever has been more common in Edinburgh than from other circumstances would have been anticipated."

It might admit of dispute, but, on the whole, it appeared to us that both the structural arrangements and the condition of the population in Glasgow was the worst of any we had seen in any part of Great Britain.

II.—PUBLIC ARRANGEMENTS EXTERNAL TO THE RESIDENCES BY WHICH THE SANITARY CONDITION OF THE LABOURING POPULATION IS AFFECTED.

I now propose to bring under consideration those parts of the various local reports and communications which most prominently set forth special defects that apparently admit of specific remedies.

The defects which are the most important, and which come most immediately within practical legislative and administrative control, are those chiefly *external* to the dwellings of the population, and principally arise from the neglect of drainage. The remedies include the means for drainage simply, *i. e.*, the means for the removal of an excess of moisture; and

The means for the removal of the noxious refuse of houses, streets, and roads, by sewerage, by supplies of water, and by the service of scavengers and sweepers.

Town Drainage of Streets and Houses.

The sanitary effects obtainable by an efficient town drainage, independently of all other measures, is exhibited in various parts of the country by such particular instances as the following:—

Dr. Baker, in his report on the sanitary condition of Derby states:—

"At the back of the whole row (on the north side of the street) there runs a series of little gardens, each house possessing one, in width equal to the frontage of the house it belongs to, and in length 56 feet. To every five houses there is a pump; and at the bottom of each garden a double privy, answering for two houses, the cess-pool shallow, and open to the air; and to this nuisance many have added a pig-sty, and dung or rubbish heap. The inhabitants of this street are poor people, chiefly silk-weavers, and what are here called frame-work-knitters or stockingers.

"There are on this (the north) side of the street 54 houses, and between October, 1837, and the latter part of March, 1838, the families inhabiting six adjoining houses in the middle of the row were grievously afflicted with typhus fever, whilst those who dwelt in the remaining 48 houses were comparatively healthy.

"The following list will give at one view the details of this visitation.

"The houses are numbered from the bottom of the hill towards the top.

Number of the House.	Name of the Family.	Number of Persons ill with Fever.	Remarks.
No. 25	Langton .	3	Children, all of whom recovered.
„ 26	Dearn . .	4	Man and wife, the former died.
„ 27	Bailey . .	1	Man, who recovered.
„ 28	Nettleship.	4	Three children, and subsequently their mother. The children, after many weeks, recovered, but the poor mother (who was pregnant), being much weakened by the fever, and long attendance upon her children, died soon afterwards in child-bed.
„ 29	Curzon. .	5	First a lodger, named Elizabeth Sherwin, (recently confined) and her infant, both died. Then three of Curzon's children, who recovered.
„ 30	Hatfield .	1	A girl, who recovered.

"In all 16 persons attacked with typhus fever, of whom five died.

"Here then we have a very interesting subject for investigation; namely, how was it that in a row of 54 houses, uniform in situation, size, and construction, tenanted by the same description of persons, the inhabitants of the six centre houses should have been attacked by a malignant fever, from which those who lived in the 24 houses above and 24 below them altogether escaped?

"By a careful inspection of the whole row I obtained the following information and facts:—That before this street was built, the natural moisture of the land, and any sudden rush of water caused by rain, was carried away by a ditch running down the whole length of the hill, where the present gardens terminate. Also, that in the gardens of the upper 21 or 22 houses this ditch had been filled up; and sinks and drains, communicating with the main sewer, that passes down the middle of the street, had been placed between each garden and the dwelling-house. At this point too there is a brick wall, carried down to the bottom of the garden, and dividing this property from the adjoining, and it is very probable that this wall assisted in checking the spread of the fever from the six infected houses, at which part of the row we have now arrived.

"The state of the premises belonging to these ill-fated houses was as follows:—The ditch already alluded to as passing at the bottom of the gardens was here not filled up; there were not any sinks and drains, and the cess-pools were overflowing into the ditch, which, here and there obstructed, formed a succession of foul and stinking pools, from four to six feet wide; whilst the earth of the gardens was perpetually saturated with the offensive moisture exuding from them.

"The want of drains, or their faulty construction, may render any situation unhealthy; nor must it be supposed that because high lands in the open country seldom require draining, that it is therefore little needed in elevated portions of a town, for in the latter there are always dirt and slops that require carrying away from the houses that produce them. And inasmuch as drains in high situations never get such a thorough washing out by rain and natural moisture as those do which, from being in lower grounds, receive a swollen and accumulated stream, the former require the greater attention to keep them from becoming foul and obstructed: and it is not a little remarkable that three elevated parts of the town of Derby are hardly ever exempt from fever. They are the Burton-road (district No. 2 in the table), Litchurch-street (district No. 3), and Parker's Flats (district No. 12).

"In the latter end of the year 1837 and beginning of 1838, Litchurch-street afforded a striking instance of a situation which promised exemption from malaria and disease, being heavily visited by typhus fever, caused, as I shall show, by the most wilful inattention to drainage.

"Litchurch-street is situated in the southern suburb of Derby, from which indeed, although forming a part of the Derby union, it is separated by intervening fields and nursery-grounds belonging to the General Infirmary. Its course is nearly east and west, running down the side of a gentle declivity. The houses in Litchurch-street have not been built many years; are rather small, but are double houses, having a front and back room on the ground floor, and over these a front and back bedroom.

"Descending the hill to the remaining 24 houses (below those infected), and which, from their standing upon lower ground, might reasonably be expected to have fared worse, I soon discovered from whence their protection came. The land adjoining the Litchurch-street gardens belongs, as I have already stated, to the General Infirmary, and the governors of that institution had eight years before built a wall in the former course of the ditch, before spoken of, which wall extended from the foot of the hill as far up as the house No. 24; at the same time they had filled up the ditch, carrying its contents by a drain away from the gardens below and into the nearest public sewer: now reference to the list detailing the amount and progress of the fever on this occasion will show that No. 25 was the first house affected. The connexion therefore

between the facts here furnished and the tragedy of the six houses is too obvious to require further comment.

"I shall conclude this part of my subject by adding, that from motives of both humanity and economy, the Board of Guardians and the governors of the infirmary jointly exerted themselves to get rid of so serious a nuisance, that the latter, at an expense of more than 50*l*., extended the wall of separation between Litchurch-street and their own lands, but that, in all other respects, the evil remains now (two years since) as it was then; nor was there found any law that would compel its removal, the place complained of being private property.

"My friend Mr. Harwood, surgeon of the Derby union, informs me that in Canal-street (district 5 of table 1) five sisters in one family were successively attacked with typhus fever, caused by the escape of foul air from a drain.

"It appears that a drain, coming from some neighbouring privies, had been carried so near to the house in which they resided as to form part of the boundary wall of the cellar, which had for some time previous become too offensive to be used.

"Four months elapsed before this family became free from disease; no return of which, however, has taken place since the removal of the drain, which now passes at a greater distance.

"Taken altogether, I think that in large towns (and villages also) there is hardly any source of disease more powerful as to its pernicious influence, or more general as to extent, than defective drainage."

Mr. John Rayner, the medical officer of the Stockport union, states in his report on the condition of that town:—

"There is a street of about 200 yards in length, the houses of which are of excellent construction, with very few exceptions, and without those unhealthy places, viz., cellar dwellings. The upper third of it is unpaved and without sewerage. It is 10 yards wide, and the inhabitants are generally very clean, as respects both their persons and dwellings; and notwithstanding they are, without exception, well fed and clad, fever has gradually prevailed, *but only on the north side* of the street. The situation is not a confined one, neither do the houses differ either as to convenience or cleanliness on this side of it.

"In the 10 houses at the upper end of this street (three of which are untenanted) there has been 21 cases of continued fever. Every house, with three exceptions, has had several cases, in some of them as many as four in number. In one, five cases have occurred.

"Seeing this fact, I examined the adjoining yard and gardens, and found a stagnant pool of water and an open ditch about two feet wide, into which the refuse water from the houses, and from two pigsties, was allowed to accumulate. It is about 15 or 20 yards in length. Adjoining the gable end of one of the untenanted houses were found heaps of ordure and other refuse matters undergoing the process of decay.

"The west end of this street opens into some gardens, where free ventilation may easily take place, and, I have no doubt, has prevented the spread of infection to the south side of it."

The following is the comparison of the different mortality in a drained and an undrained district, made by *Mr. Crowfoot,* surgeon, of Beccles, one of the most eminent of the medical practitioners

in Suffolk. In a letter to Mr. Twisleton, the Assistant Commissioner, he states—

"You are aware that these two towns of nearly equal population are nearly alike as to natural advantages of situation, &c., except that Bungay, having a larger proportion of rural population inhabiting the district called Bungay Uplands, ought to be more healthy than Beccles, which has nearly its whole population confined to the town. About 30 years since, Beccles began a system of drainage, which it has continued to improve, till at the present time every part of the town is well drained, and I am not aware of a single open drain in the place. Bungay, on the contrary, with equally convenient opportunities for drainage, has neglected its advantages in that respect, has one or two large reservoirs for filth in the town itself, and some of its principal drains are open ones. The result you will see is, that Bungay, with a smaller proportion of town inhabitants, has become of late years less healthy than Beccles. I have carefully taken the number of burials from the parish registers of each town for the last 30 years, and dividing them into decennial periods, I have calculated the proportion which the deaths bore to the mean population, between one census and the other, during each 10 years; the only possible source of fallacy is the want of the census for 1841; but in its absence I have supposed the same rate of increase as took place between that of 1821 and that of 1831 for each place. Sinking fractions, the following has been the proportion of deaths to the population in the two towns:—

	Beccles.	Bungay.
Between the years 1811 and 1821	1 in 67	1 in 69
" 1821 and 1831	1 in 72	1 in 67
" 1831 and 1841	1 in 71	1 in 59

You will therefore see that the rate of mortality has gradually diminished in Beccles since it has been drained, whilst in Bungay, notwithstanding its larger proportion of rural population, it has considerably increased.

The Ditchingham Factory may have given a greater increase of population to Bungay than I have allowed for, but, on the other hand, the Roman Catholics and the Independents bury many of their dead in their own ground, which I have not calculated upon. Since writing the above, I have been over to Bungay, to examine more particularly the state of its drainage, which is much worse than I had any idea of. If their population should much increase, their mortality will increase much faster."

A frightful picture of a considerable proportion of the labouring population of Leeds in respect to sewerage and drainage is afforded by the report of *Mr. Baker,* who gives the following instance of amendment:—

"In one of the streets of Leeds where stagnant water used frequently to accumulate after rain, and where there was perpetually occurring cases of fever of a malignant character, a deputation of females waited upon me in my capacity of town counsellor to ask if any remedy could be applied to this nuisance, which they declared was not only offensive but deadly. I directed them to communicate with the owner of the property, and to say that if the grievance was not remedied I should take further steps to enforce it. Never hearing again from the deputation, I

presumed that the remedy had been applied, and had forgotten the circumstance until the house surgeon of the fever hospital in 1840, in noticing the localities from whence fever cases were most frequently brought to the institution, remarked that ' formerly many cases of malignant fever were brought in from ——— street, but for two or three years there had been none or not more than one or two.' "

Mr. John Wright, the relieving officer of the Tamworth union, states, that the following extracts exhibit the condition in which large masses of the population are kept by the neglect of the proper means of town drainage, and of the house cleansing, practicable by means of drains :—

" Some of the houses in the back streets and courts of Tamworth, particularly those comprised in Class No. 1, are in a wretched state with respect to the common conveniences of life, being adjacent to stagnant ditches and pools of water, and having only one privy, common to many houses, and hemmed in with piggeries, &c., most of these houses having no back doors, the consequence of which is, that fevers and other disorders, generated by filth and malaria, are very prevalent, particularly in humid weather."

Mr. Elias Barlow, the relieving officer of the Wolstanton and Burslem union, states that—

" The townships of Knutton and Chesterton have been visited with fever for several months ; and it still continues its raging influence, particularly in Knutton, the reason of which appears to me to be want of drainage, owing to the houses having been built upon low marshy ground ; and also want of ventilation, owing to the houses being too small and having no back doors ; it first made its appearance in the lowest class of houses, but has since extended to others."

The condition of the labouring population of Liverpool, in respect to drainage, is thus described in the report of *Dr. Duncan :*—

" The sewerage of Liverpool was so very imperfect, that about 10 years ago a local Act was procured, appointing commissioners with power to levy a rate on the parish for the construction of sewers. Under this Act, which expires next year, about 100,000*l.* have been expended in the formation of sewers along the main streets, but many of these are still unsewered ; and with regard to the streets inhabited by the working classes, I believe that the great majority are without sewers, and that where they do exist they are of a very imperfect kind unless where the ground has a natural inclination, therefore the surface water and fluid refuse of every kind stagnate in the street, and add, especially in hot weather, their pestilential influence to that of the more solid filth already mentioned. With regard to the courts, I doubt whether there is a single court in Liverpool which communicates with the street by an underground drain, the only means afforded for carrying off the fluid dirt being a narrow, open, shallow gutter, which sometimes exists, but even this is very generally choked up with stagnant filth.

" There can be no doubt that the emanations from this pestilential surface, in connexion with other causes, are a frequent source of fever among the inhabitants of these undrained localities. I may mention two instances in corroboration of this assertion :—In consequence of finding

that not less than 63 cases of fever had occurred in one year in Union-court Bannstre-street, (containing 12 houses,) I visited the court in order to ascertain, if possible, their origin, and I found the whole court inundated with fluid filth which had oozed through the walls from two adjoining ash-pits or cess-pools, and which had no means of escape in consequence of the court being below the level of the street, and having no drain. The court was owned by two different landlords, one of whom had offered to construct a drain provided the other would join him in the expense ; but this offer having been refused, the court had remained for two or three years in the state in which I saw it ; and I was informed by one of the inhabitants that the fever was constantly occurring there. The house nearest the ash-pit had been untenanted for nearly three years in consequence of the filthy matter oozing up through the floor, and the occupiers of the adjoining houses were unable to take their meals without previously closing the doors and windows. Another court in North-street, consisting of only four small houses I found in a somewhat similar condition, the air being contaminated by the emanations from two filthy ruinous privies, a large open ash-pit and a stratum of semi-fluid abomination covering the whole surface of the court.

" From the absence of drains and sewers, there are of course few cellars entirely free from damp ; many of those in low situations are literally inundated after a fall of rain. To remedy the evil, the inhabitants frequently make little holes or wells at the foot of the cellar steps or in the floor itself ; and notwithstanding these contrivances, it has been necessary in some cases to take the door off its hinges and lay it on the floor supported by bricks, in order to protect the inhabitants from the wet. Nor is this the full extent of the evil ; the fluid matter of the court privies sometimes oozes through into the adjoining cellars, rendering them uninhabitable by any one whose olfactories retain the slightest sensibility. In one cellar in Lace-street I was told that the filthy water thus collected measured not less than two feet in depth ; and in another cellar, a well, four feet deep, into which this stinking fluid was allowed to drain, was discovered below the bed where the family slept !"

He also states,—

" There are upwards of 8,000 inhabited cellars in Liverpool, and I estimate their occupants at from 35,000 to 40,000."

He adds that—

" In a Report lately made by the Surveyors, appointed by the Town Council to examine the condition of the court and cellar residences within the borough, it is stated that of 2,398 *courts* examined, 1,705 were closed at one end, so as to prevent thorough ventilation. Of 6,571 *cellars*, whose condition is reported on, 2,988 are stated to be either wet or damp, and nearly one-third of the whole number are from 5 to 6 feet below the level of the street."

Dr. Jenks, in his report on the condition of the town of Brighton, states,—

" Owing to the imperfect and insufficient drainage of the town, the inhabitants are compelled to have recourse to numerous cess-pools as receptacles for superabundant water, and refuse of all kinds ; and to save the inconvenience of frequently emptying them, they dig below the hard

coombe rock till they come to the shingles, where all the liquid filth drains away. The consequence is inevitable; the springs in the lower part of the town must be contaminated."

But even in Birmingham, which, as will be seen, enjoys almost an immunity from fever in consequence of the fortunate position of the town conferring advantages in respect to drainage, and the good construction of the houses, it appears from the report made by the physicians and surgeons, that the drainage is in many places extremely defective.

"The great sewers of the town open into the Rea, or into the rivulets which discharge their contents into that stream. In some places these rivulets are now covered over and constitute sewers. The present sewers, which are numerous and large, appear to be sufficient to carry off any storms or floods to which the town is liable, and no part of the town is subject to inundations. The principal streets are well drained, but this is far from the case with respect to many of the inferior streets, and to many, or rather most, of the courts, which, especially in the old parts of the town, are dirty and neglected, with water stagnating in them. These require immediate attention, and care ought to be taken that the depth of the main drains is sufficient to drain the cellars of the adjoining premises, which is not the case in some parts of the town. It is also important that a system of proper drainage should be enforced at the commencement of the building of any new streets or houses. The want of some regulations in this respect often causes the accumulation of putrid water in ditches and pools in the immediate vicinity of newly-erected buildings. In some parts of the borough, as at Edgbaston, there are but few public underground sewers, and the water from the houses is discharged into the ditches or gutters by the sides of the roads, where it stagnates. In the courts the drains are often above ground, and not covered in, and discharge their contents into the gutters or kennels in the streets. We do not think that much advantage is derived from having small under-ground drains in the courts if the gutters are laid upon a proper slope and are kept in proper repair, for the weirs or grates of small under-ground drains are very apt to be out of order, or to become choked, in which case accumulations of filthy fluids take place above them."

The inquiry into the sanitary condition of the towns in Scotland shows that similar defects stand equally in need of remedy in that part of the empire. *Mr. Burton,* in his report on the provisions of the Police Act for the city of Edinburgh, observes:—

"Until very lately the Cowgate, a long street running along the lowest level of a narrow valley, had only surface drains. The various alleys from the High-street and other elevated ground open into this street. In rainy weather they carried with them each its respective stream of filth, and thus the Cowgate bore the apect of a gigantic sewer receiving its tributary drains. A committee of private gentlemen had the merit of making a spacious sewer 830 yards long in this street at a cost of 2000*l.* collected by subscription. The utmost extent to which they received assistance from the police, consisted in being vested with the authority of the Act as a protection from the interruption of private parties. During the operation they were nevertheless harassed by claims of damage for

obstructing the causeway, and their minutes, with a perusal of which I have been favoured, show that they experienced a series of interruptions from the neighbouring occupants, likely to discourage others from following their example."

In a communication from *Mr. William Chambers,* he observes—

"Within these few years, the practice of introducing water-closets into houses has become pretty general, wherever it is practicable; but in the greater part of the old town nothing of the kind can be accomplished from the want of drains. There are drains in the leading thoroughfares, but few closes possess these conveniences, and water is also sparingly introduced into these confined situations. You will therefore understand that a want of tributary drains and water is a fundamental cause of the uncleanly condition of the town. Of water of the finest kind there is indeed a plenteous supply, but unfortunately this is a monopoly in the hands of a joint-stock company, and excepting at two or three wells, all the water introduced into the town has to be specially paid for, in the form of a tax upon the rental, by those who use it."

As in England, the ignorance or neglect upon this matter is not confined to the labouring population of the capital. *Dr. Scott Alison,* in his report on the condition of Tranent and the adjacent districts, observes that—

"There is nothing like an efficient system of drainage in Tranent and the other villages in the district. There is a piece of drain here and there, but it is very inefficient. There is not even a sufficient water-course in the main streets of Tranent; and it frequently happens, during and after a heavy fall of rain, that the carriage-road is covered with water, and that some of the lower class of houses are inundated. In a few parts of the town the water-course is covered with stones or flags. These occasionally fall in, and openings are made. These openings are generally left unrepaired, and are not filled up. People frequently get hurt by stepping into them when it is dark. I have myself met with an accident; and serious mischief would very frequently occur did people not pay particular attention to avoid them."

Dr. Sym, in his report on the sanitary condition of the town of Ayr, states that—

"A good covered sewer traverses the principal streets of the new part of Ayr; but the old part of the burgh, and both Newton and Wallacetown have merely shallow open gutters along the sides of the causeway. These gutters receive all the liquid refuse from the closes and alleys which communicate with the street, and which are generally causewayed in such a way that one side is considerably higher than the other, so as to permit water to find its way to the opposite edge. This sort of drainage might suffice for all useful purposes in our dry sandy soil if we had an adequate establishment of scavengers; but the gutters in many of the streets, and in all the closes inhabited by the poor are so much neglected, that they are never free from the stinking residuum of foul water. In Newton and Wallacetown, the drainage is exceedingly imperfect; indeed, in most streets of the latter it may be said scarcely to exist, and as the surface is very flat, almost the whole of the liquid putrescence and filth which are thrown out from the houses is allowed to

filter through the sand, or evaporate in the sun, leaving a most offensive paste at the sides of the streets, and in the passages through the houses. This is the more to be regretted, that the beautiful state of cleanliness of the new part of Ayr, shows with how little labour it might be obviated with the aid of our absorbent soil and free atmosphere. There are some streets, the main street of Newton in particular, which have such inequalities in the causewayed footpaths, and such want of escape by the gutters, that it is impossible to find one's way through them in a dark night, without many a plunge into the filth. There is everywhere sufficient slope toward the river to render drainage perfectly effectual, if properly executed."

Mr. Forrest, the surgeon, in his account of Stirling, states that—

"The drains or sewers, called in Stirling '*sivers,*' are all open and sloping. On the public streets they are, in general, well constructed, but in the closes their construction is so very bad that scarcely any of them run well. The only supply of water, so far as I know, which they receive, is from the heavens. The inhabitants of Stirling, during many months of the year, do not obtain water sufficient for their domestic wants, and they cannot, therefore, have any to spare for their sewers. There is a regularly appointed service of scavengers, but it is inefficient. A few old men sweep the public streets from time to time, and the sweepings thus collected are removed in a cart, without any apparent attention to time or order. Sometimes the sweepings remain on the streets for many days. To show how matters of medical police are neglected, I shall state a few facts which are known to every person in Stirling. 1st. The filth of the gaol, containing on an average 65 prisoners, is floated down the public streets every second or third day, and emits, during the whole of its progress down Broad-street, Bow, Baker-street, and King-street, the principal streets in the town, the most offensive and disgusting odour. 2nd. The slaughter-house is situated near the top of the town, and the blood from it is allowed to flow down the public streets. 3rd. The lower part of a dwelling-house, not more than three or four yards from the town-house and gaol, is used as a 'midding,' and pigsty, the filth being thrown into it by the window and door. 4th. There are no public necessaries; and the common stairs and closes, and even the public streets, are used habitually as such, by certain classes of the community. 5th. Two drains from the castle, convey the whole filth of it into an open field, where it spreads itself over the surface, and pollutes the atmosphere to a very great extent. 6th. A dwelling-house in the Castle-hill, the greater part of which is inhabited, is used by a butcher as a slaughter-house; and some of the butchers kill sheep and lambs in their back shops, situated under dwelling-houses. 7th. The closes where the poor dwell, and where accumulations of filth most abound, are, I may safely say, utterly neglected by the scavengers. In some situations, the ventilation around the residences is good, but in many others, and especially in the closes, it is very bad, and in my opinion, quite irremediable."

Before quitting this class of instances, it may here be necessary to guard against the conclusion that neglect of drainage is confined to towns, or to numerous and crowded habitations. Similar instances may be presented, even of single and isolated houses,

and of small groups of rural cottages, in almost every district. Of this last class of cases I give only one instance, supplied by the evidence of *Mr. J. Thomson,* of Clitheroe:—

"Have you not had amongst your own people an instance of pestilence occasioned by the neglect of removable causes of disease?—In the summer of 1839 some remarkable cases of fever occurred in my immediate neighbourhood amongst the inhabitants in my employment, of a small cluster of houses called Littlemoor. The situation of this little spot has always been considered, and justly, as remarkably healthy and agreeable, the soil around it being dry, and not marshy, as the name would seem to imply. It is situated on gently sloping ground, about a mile from the town of Clitheroe, and freely exposed on all sides to the wind. It contained six houses and 21 inhabitants at the time of the fever. The houses are built in three distinct groups, round an irregular area of from 50 to 60 feet square. A single, inadequate, and half-choked-up drain, originally constructed more than 40 years ago, for the only cottager, then existing on the spot, was the only under-ground outlet for the filth, and sink, and surplus water of these habitations; the rest was carried off by a deep and open ditch filled with grass and weeds; this ditch spread out, about 100 yards to the north, into a shallow stagnant pool, in summer green and fœtid; from which was conveyed all the water that could flow during that season past and amongst the cottages at Littlemoor. Into the centre of the open area or yard was poured all the filth of the houses in open channels, and thence, by the above-mentioned under-ground drain, conveyed away. This state of things was bad enough, but was rendered still worse by the erection recently of a pig-sty, the litter and filth of which not only obstructed the drain, but occasioned a pool of abomination of the most perilous and disgusting nature. At the time I saw it—the commencement of the fever—it was overflowing into the foundation of the principal habitation, and had infected the whole house with its stench, and was making its way by innumerable black and fœtid streams through a small shrubbery, the area of which it wholly covered, into the deep and open ditch. Believing this to be the source of the pestilence, I had the sty instantly pulled down, the filth removed, and a large drain brought up to the centre of the yard, terminating in small covered troughs to each habitation. This was in the middle of August, and from the hour of the removal of the filth no fresh case of fever occurred. The first case was on the 12th of May, and was followed by another in the same house on the 27th. In June there were three cases; and in July six; in August four; in all, 15; of which nine were the resident inhabitants, in a population of 21; and the remaining six, nurses and attendants on the sick, obtained from the immediate neighbourhood. No fever prevailed at the time in Clitheroe. One case was fatal, and the health of a most valuable member of that small community was so seriously affected by the fever as to cause his death in a short time. A visitor and attendant on the funeral of the person deceased at Littlemoor, and who took the fever, died also. This spot has remained, and I doubt not will continue, healthy ever since.

"The medical gentleman, Mr. Garstang, of Clitheroe, who attended the preceding case, has communicated to me the equally striking and instructive statement I subjoin:—At Chatburn, a village to the north of

Clitheroe, he was called to attend a patient in fever, in the month of May of the same year 1839. The first object that struck his eye on approaching the house was a long pole, with a bunch at the end, black and filthy from its recent use in forcing a choked-up and inaccessible drain, which passed between and under the gable-ends of two closely contiguous houses, only a few inches apart, one of which contained his patient. From this single case and house Mr. G. ascertained that 11 cases arose, by which means the fever was spread through the country, where it prevailed with great severity, and terminated, in many instances, fatally. There was no fever but what could be traced to this, and no other discoverable source."

Street and Road Cleansing: *Road Pavements.*

The local arrangements for the cleansing and drainage of towns, &c., generally present only instances of varieties of grievous defects from incompleteness and from the want of science or combination of means for the attainment of the requisite ends. Thus the local reports abound with instances of expensive main-drains, which from ignorant construction as to the levels, do not perform their office, and do accumulate pestilential refuse; others, which have proper levels, but from the want of proper supplies of water do not act; others, which act only partially or by surface drainage, in consequence of the neglect of communication from the houses to the drains; others, where there are drains communicating from the houses, but where the house-drains do not act, or only act in spreading the surface of the matter from cess-pools, and increasing the fœtid exhalations from it in consequence of the want of supplies of water; others again, as in some of the best quarters of the metropolis, where the supplies of water are adequate, and where the drains act in the removal of refuse from the house, but where from want of moderate scientific knowledge or care in their construction, each drain acts like the neck of a large retort, and serves to introduce into the house the subtle gas which spreads disease from the accumulations in the sewers.* Other districts there are where their structural arrangements may be completed, and water supplied, and the under drainage in action, and yet pestilential accumulations be found spread before the doors of the population in consequence of the defective construction, and the neglect of the surface-cleansing of the streets and roads. Recently a remonstrance was made to an able and active member of a Commission of Sewers, for taking no steps to extend the drainage in a wretched district of the metropolis. The reply was, a statement, that a drain had been cut through a portion of it, but that it had done no good; and the remonstrant was invited to inspect the district himself, and judge whether, with

* See the evidence on this subject taken before the Committee of the House of Commons, on the sewerage of the metropolis; see also the evidence of *Mr. Oldfield*, an extensive builder, *post*.

streets: that were unpaved and uncleansed, wet and miry, with deep holes full of refuse, it were possible by any under drainage to remove the evil complained of. Other districts there are in which the Road Commissioners or the Paving Board appears to have done their duty; but the benefit is prevented, and the road is kept continually out of repair by the neglect of the service of scavengers.

All these local defects again are referred back to the defective construction of the Acts of Parliament,—which generally either presume that no science, no skill is requisite for the attainment of the objects, or presume both to be universal,—which in some instances actually prohibit the only effectual mode of drainage, namely, that from the houses into the main-drains; and in others, prescribe cleansing by house-drains without supplies of water; or prescribe the construction of roads independently of drains, and direct the execution of only part of the necessary means, leaving other essential parts to the discretion of individuals.

Between a town population similarly situated in general condition, one part inhabiting streets which are unpaved, and another inhabiting streets that are paved, a general difference of health is observed. The town of Portsmouth is built upon a low portion of the marshy island of Portsea. It was formerly subjected to intermittent fever, but since the town was paved, in 1769, it was noticed by Sir Gilbert Blane, that this disorder no longer prevailed; whilst Kilsea and the other parts of the island retained the aguish disposition until 1793, when a drainage was made which subdued its force.

Such strongly marked effects on the health of the population have followed in many places the complete cleansing of the streets, as are stated by *Mr. Bland*, medical officer of the Macclesfield Union:—

"To show the value of police regulations in removing any improper accumulations of foul and putrid matter, where a deadly poison is generated, I have a distinct recollection that, when the cholera appeared in Macclesfield, not only was that fatal disease arrested somewhat in its progress by the active vigilance exercised by the gentlemen in seeing that in their several districts all offending deposits were removed, and all pest-houses cleansed, that for several months after the town had undergone this salutary inspection, and the people made alive to the pernicious effects of the dunghill, fever of the worst or contagious form scarcely appeared in the usual localities, although it was at the autumnal season of the year. I likewise noticed in spring-time following, when the filth had begun to accumulate on the surface in certain parts of the town, a severe return of contagious diseases, fever in all its stages, and a very fatal epidemic small-pox."

Similar cases were frequently noticed in the reports from Scotland; but when the alarm passed away, the habitual neglect of this description of cleanliness returned.

In the consideration of the evidence about to be submitted a

to the condition of the streets on the external condition of the residences of the labouring classes, it should be borne in mind that the external condition of the dwelling powerfully and immediately affects its internal cleanliness and general economy.

The description of a large proportion of the streets inhabited by the working classes in Manchester by Dr. Baron Howard, and those of Leeds by Mr. Baker, those of Liverpool by Dr. Duncan, might be extended to Glasgow and other places. *Dr. Howard* states:—

"That the filthy and disgraceful state of many of the streets in these densely populated and neglected parts of the town where the indigent poor chiefly reside cannot fail to exercise a most baneful influence over their health is an inference which experience has fully proved to be well founded; and no fact is better established than that a large proportion of the causes of fever which occur in Manchester originate in these situations. Of the 182 patients admitted into the temporary fever hospital in Balloon-street, 135 at least came from unpaved or otherwise filthy streets, or from confined and dirty courts and alleys. Many of the streets in which cases of fever are common are so deep in mire, or so full of hollows and heaps of refuse that the vehicle used for conveying the patients to the House of Recovery often cannot be driven along them, and the patients are obliged to be carried to it from considerable distances. Whole streets in these quarters are unpaved and without drains or main-sewers, are worn into deep ruts and holes, in which water constantly stagnates, and are so covered with refuse and excrementitious matter as to be almost impassable from depth of mud, and intolerable from stench. In the narrow lanes, confined courts and alleys, leading from these, similar nuisances exist, if possible, to a still greater extent; and as ventilation is here more obstructed, their effects are still more pernicious. In many of these places are to be seen privies in the most disgusting state of filth, open cesspools, obstructed drains, ditches full of stagnant water, dunghills, pigsties, &c., from which the most abominable odours are emitted. But dwellings perhaps are still more insalubrious in those cottages situated at the backs of the houses fronting the street, the only entrance to which is through some nameless narrow passage, converted generally, as if by common consent, into a receptacle for ordure and the most offensive kinds of filth. The doors of these hovels very commonly open upon the uncovered cesspool, which receives the contents of the privy belonging to the front house, and all the refuse cast out from it, as if it had been designedly contrived to render them as loathsome and unhealthy as possible. Surrounded on all sides by high walls, no current of air can gain access to disperse or dilute the noxious effluvia, or disturb the reeking atmosphere of these areas. Where there happens to be less crowding, and any ground remains unbuilt upon, it is generally undrained, contains pools of stagnant water, and is made a depôt for dunghills and all kinds of filth."

Of 687 streets, inspected by a voluntary association in that town, 248 were reported as being unpaved, 112 ill ventilated, 352 as containing stagnant pools, heaps of refuse, ordure, &c.

"The state of some of the streets and courts examined was found by the inspectors abominable beyond description, and exhibited a melancholy picture of the filthy condition and unwholesome atmosphere in which a large portion of our poor are doomed to live.

"As an example I will extract the description given of Little Ireland from the proceedings of the Special Board of Health, which I have been permitted to examine through the kindness of the borough-reeve, John Brooks, Esq.:—

"'The undersigned having been deputed by the Special Board of Health to inquire into the state of Little Ireland, begs to report that, in some of the streets and courts abutting, the sewers are all in a most wretched state, and quite inadequate to carry off the surface water, not to mention the slops thrown down by the inhabitants in about 200 houses. The privies are in a most disgraceful state, inaccessible from filth, and too few for the accommodation of the number of people, the average number being two to 250 people. The upper rooms are, with few exceptions, very dirty, and the cellars much worse, all damp, and some occasionally overflowed. The cellars consist of two rooms on a floor, each nine or ten feet square, some inhabited by ten persons, others by more; in many the people have no beds, and keep each other warm by close stowage on shavings, straw, &c.; a change of linen or clothes is an exception to the common practice. Many of the back-rooms, where they sleep, have no other means of ventilation than from the front rooms. Some of the cellars on the lower ground were once filled up as uninhabitable, but one is now occupied by a weaver, and he has stopped up the drain with clay to prevent the water flowing from it into his cellar, and mops up the water every morning.'

"The above description represents as faithfully the present state of this place as it did its condition eight years ago. In addition to the circumstances here mentioned, the unhealthiness of this spot is further increased by its low and damp situation, in a deep hollow, bounded on one side by a filthy and stinking brook, which readily overflows after rain; on another, by a very steep embankment; and on another, by a high wall, which separates it from the gas-works, and surrounded moreover by numerous high factories. * * *

"In the open space in the centre, which was formerly uncovered, numerous pigsties are now erected, which add, if possible, to its insalubrity. All the streets on the west side of the square are blocked up at the end by a high wall, so that each forms a *cul-de-sac*, a mode of construction which precludes the possibility of effectual ventilation. Close to this wall, at the upper end of these streets, are placed filthy and dilapidated privies, with large open cesspools, which are frequently full to overflowing. The present condition of those in Bent and James Leigh-streets are disgusting and offensive beyond description."

Mr. Baker in his report on the sanitary condition of the residences of the labouring classes in Leeds, thus describes their external condition:—

"The river Aire, which courses about a mile and a half through the town, is liable suddenly to overflow from violent or continued rains, or from the sudden thawing of heavy falls of snow. The lower parts and dwellings, both in its vicinity and in that of the becks, are not

unfrequently therefore inundated; and as the depth of the cellars is below the means of drainage, the water has to be pumped out by hand-pumps on to the surface of the streets. In those parts of the town, and particularly where the humbler classes reside, during these inundations, and where there are small sewers, the water rises through them into the cellars, creating miasmatic exhalations, and leaving offensive refuse, exceedingly prejudicial to the health as well as to the comfort of the inhabitants. It was stated, on the authority of one of the registrars, that during a season remarkable for an unprecedented continuation of hot weather, that in one of these localities, the deaths were as three to two, while in other parts of the town, at the same period, they were as two to three. The condition of the Timble Bridge beck is doubtless much worse for drainage purposes than formerly, for the bottom has been raised by continual deposits, until the oldest water-wheel upon it has had to be removed as useless and inoperative; and stepping-stones, once the means of passage over it, are at this moment said to be buried under the accumulation of years, as much as one or two feet in depth. It is quite clear, therefore, that that which was once the main receptacle for the drainage of an entire district is, in its present state, no longer capable of fulfilling that purpose; and that though a considerable amount of drainage might still be effected by it, yet, unless emptied of its superfluous matter, it cannot now be made available for the wants of the entire population on its course.

"In an inundation about the period of 1838 or 1839, which happened in the night, this beck overflowed its boundaries so greatly, and regurgitated so powerfully into petty drains communicating with houses 100 yards distant from its line, that many of the inhabitants were floated in their beds, and fever to a large amount occurred from the damp and exhalations which it occasioned. Of the 586 streets of Leeds, 68 only are paved by the town, *i. e.*, by the local authorities; the remainder are either paved by owners, or are partly paved, or are totally unpaved, with the surfaces broken in every direction, and ashes and filth of every description accumulated upon many of them. In the manufacturing towns of England, most of which have enlarged with great rapidity, the additions have been made without regard to either the personal comfort of the inhabitants or the necessities which congregation requires. To build the largest number of cottages on the smallest allowable space seems to have been the original view of the speculators, and the having the houses up and tenanted, the *ne plus ultra* of their desires. Thus neighbourhoods have arisen in which there is neither water nor out-offices, nor any conveniences for the absolute domestic wants of the occupiers. But more than this, the land has been disposed of in so many small lots, to petty proprietors, who have subsequently built at pleasure, both as to outward form and inward ideas, that the streets present all sorts of incongruities in the architecture; causeways dangerous on account of steps, cellar windows without protection, here and there posts and rails, and everywhere clothes-lines intersecting them, by which repeated accidents have been occasioned. During the collection of the statistical information by the Town Council, many cases of broken legs by these unprotected cellars, and of horsemen dismounted by neglected clothes-lines hanging across the streets, were recorded.

"It might be imagined that at least the streets over which the town surveyors have a legal right to exercise control would be sewered. But this is not the case; of the 68 streets which they superintend, 19 are not sewered at all, and 10 are only partly so; nay, it is only within the three or four years past that a sewer has been completed through the main street for two of the most populous wards of the town, embracing together a population of 30,540 persons, by which to carry off the surface and drainage water of an elevation of 150 feet, where, indeed, there could be no excuse for want of sufficient fall. I have seen, in the neighbourhood to which I now refer, an attempt made to drain the cottage houses into a small drain passing under the causeway, and which afterwards had to be continued through a small sewer, and through private property, by a circuitous route, in order to reach its natural outlet, and the water from the surveyors' drain regurgitate into the cutting from the dwellings. It only needs to be pointed out that the sewer which has subsequently been made, and is most effective, is an evidence of the previous practicability of a work so essential to the welfare of the people; but, I may add, that many of the inhabitants of districts a little further distant from the town, where fever is always rife, are yet obliged to use cesspools which are constructed under their very doors, for the want of the continuation of this desirable measure.

"Along the line of these two wards, and down the street which divides them, and where this sewer has been recently made, numbers of streets have been formed and houses erected without pavement, and hence without surface drainage—without sewers—or if under drainage can be called sewers, then with such as, becoming choked in a few months, are even worse than if they were altogether without. The surface of these streeets is considerably elevated by accumulated ashes and filth, untouched by any scavenger; they form nuclei of disease exhaled from a thousand sources. Here and there stagnant water, and channels so offensive that they have been declared to be unbearable, lie under the doorways of the uncomplaining poor; and privies so laden with ashes and excrementitious matter as to be unuseable prevail, till the streets themselves become offensive from deposits of this description; in short, there is generally pervading these localities a want of the common conveniences of life.

"The courts and *culs-de-sac* exist everywhere. The building of houses back to back occasions this in a great measure. It is in fact part of the economy of buildings that are to pay a good per centage. In one *cul-de-sac*, in the town of Leeds, there are 34 houses, and in ordinary times, there dwell in these houses 340 persons, or ten to every house; but as these houses are many of them receiving houses for itinerant labourers, during the periods of hay-time and harvest and the fairs, at least twice that number are then here congregated. The name of this place is the Boot and Shoe-yard, in Kirkgate, a location from whence the Commissioners removed, in the days of the cholera, 75 cart-loads of manure, which had been untouched for years, and where there now exists a surface of human excrement of very considerable extent, to which these impure and unventilated dwellings are additionally exposed. This property is said to pay the best annual interest of any cottage property in the borough."

Mr. Shaw, the medical officer of the Hindley district of the Wigan union, after giving a similar description of the streets of that town, adds:—

"The greater number of cases of fever in Tuce is in a great degree to be accounted for from the extremely filthy state of those places where it has been worst. Some of the cases were much worse than others, several being of the malignant kind of typhus. Most of the cases happened in Broom-street, in Tuce, a very uncleanly place, whole pools of stagnant water, decayed animal and vegetable matter, and many other nuisances of a like description lying in heaps from one end of the street to the other. It is extremely probable a little attention to these matters would save the inhabitants from many of the diseases with which they are now continually affected."

Dr. Waite, in his report on the condition of the population at Lynn, states:—

"I have seen typhus fever rage in families, where the refuse of a market-gardener was suffered to accumulate in a hole, immediately before three or four houses, whilst families at fifty yards distant from it were perfectly free."

The report by *Mr. Anderson,* solicitor, on the sanitary condition of Inverness, exhibits the external features of the condition in which large proportions of the town population in Scotland are still allowed to remain in respect to all these defects:—

"From the very open or porous character of the subsoil, the grounds in and around Inverness are seldom retentive of surface-water; and as there is also a considerable inclination of the plain towards the river, a good *drainage* could be easily procured from almost every part of the town. With the exception, however, of the principal streets or thoroughfares, in which the best houses and shops are situated, there are but few covered common sewers; and in the suburbs generally, and from all the side alleys and closes, rain-water and other accumulations pass away only by means of surface or open drains. Hence among the dwellings of the poorer classes *stagnant pools* very frequently occur, and the drainage in these places, naturally bad enough, is often purposely obstructed by the people, for the purpose of adding to their *dunghill* heaps or middens, which, as manure for their potatoe-grounds, form the chief treasures of the poorer cottagers and labourers. A gas and water company, established some years ago, has afforded a great increase of comfort and cleanliness to the buildings along the main thoroughfares; but to the back closes and suburbs such *luxuries* have not yet been extended, and hence the want of order, decency, and comfort are painfully observable among them. *Water-closets* and *public privies* are both rare, the consequences of which, morally as well as physically, may be easily imagined, and no doubt much infectious disease, if not occasioned, is harboured and perpetuated by the want of them. The disgusting state of all the bye-lanes and roads about Inverness proves what the people must suffer on this account.

"As already stated, the dwellings of the humbler classes are in general only *one* story high, that is, they consist of a ground-floor divided into two or three small apartments, with two or three garret-rooms in the roof above, which is covered externally with turf or straw thatch. Such buildings are often intermixed with houses of a better description, and from being but seldom painted or whitewashed, they have not a cheerful nor cleanly aspect. Most of them are provided with small back courts or gardens, in which a few common vegetables are grown; but their principal value is as stances for *pig-houses* and dunghills, which in many instances are improperly allowed to rest upon or touch the dwelling-houses; while it is not to be disguised that cases exist where the *pig*, the *horse*, and the *cow* all live under the same roof with their owners, and the manure allowed to accumulate there also. It is very common for a labourer's *family* to have only a single apartment, or a room and a closet, while one room is the usual accommodation rented by single persons, and that frequently without a particle of ground attached.

"Amidst such a combination of unwholesome circumstances, it is rather wonderful that malignant fever does not very greatly prevail in this town. It is scarcely ever entirely free of it, and occasionally it breaks out in some of its most contagious and dangerous forms, such as measles, scarlet and typhus fever, and sometimes even small-pox, spreading upwards among all classes of the community. The writer is strongly inclined to believe that the comparative healthiness of Inverness, notwithstanding its low and undrained position, is owing chiefly to the salubrity of its climate, as influenced by its situation, and the natural porousness of the soil."

The Provost of Inverness, at the time the report was made, gives the following description of the town:—

"Inverness is a nice town, situated in a most beautiful country, and with every facility for cleanliness and comfort. The people are, generally speaking, a nice people, but their sufferance of nastiness is past endurance. Contagious fever is seldom or ever absent; but for many years it has seldom been rife in its pestiferous influence. The people owe this more to the kindness of Almighty God than to any means taken or observed for its prevention. There are very few houses in town which can boast of either water-closet or privy, and only two or three public privies in the better part of the place exist for the great bulk of the inhabitants. Hence there is not a street, lane, or approach to it that is not disgustingly defiled at all times, so much so as to render the whole place an absolute nuisance. The *midden* is the chief object of the humble, and though enough of water for purposes of cleanliness may be had by little trouble, still as the ablutions are seldom, MUCH filth in-doors and out of doors *must* be their portion. When cholera prevailed in Inverness, it was more fatal than in almost any other town of its population in Britain."

Such is the absence of civic economy in some of our towns that their condition in respect to cleanliness is almost as bad as that of an encamped horde, or an undisciplined soldiery. Mr. Baker applies to Leeds the observations made by Sir John Pringle in his Treatise on the Diseases of the Army, but they are equally applicable to the districts occupied by the labouring classes wherever this inquiry has been carried:—

" 'The chief cause of dysentery appears to be the foul straw and the privies; for as soon as we had left that ground on which we had been long encamped the sickness visibly abated.' And again he says, 'The greatest source of dysenteric affections appears to be the privies.' And again, speaking of bad air as producing epidemics, he systematizes the mediate agent thus; ' 1st, Marsh effluvia; 2ndly, Encampment near trees; 3rdly, The privies and foul straw of a camp; and 4thly, A pent, corrupt, and vitiated atmosphere.' "

The discipline of the army has advanced beyond the civic economy of the towns. In the standing orders given and enforced by the late General Crauford there are the following from Article 2, on the interior regimental arrangements on arriving in camp or quarters :—

" It must be explained to the men, as a standing order, that when no regular necessaries are made, nor any particular spot pointed out for easing themselves, they are to go to the rear, at least 200 yards, beyond the sentries of the rear guard; all men disobeying this order must be punished.

" The captain of the day and the quarter-master under the commanding officers, are particularly responsible for the cleanliness of the camp of each regiment; and the field officer of the inlying piquet, who is charged with the superintendence of the police, and cleanliness of the camp or quarters of the brigade, will give such orders upon the subject as may be necessary to the captain of the day."

The towns whose population never change their encampment, have no such care, and whilst the houses, streets, courts, lanes, and streams, are polluted and rendered pestilential, the civic officers have generally contented themselves with the most barbarous expedients, or sit still amidst the pollution, with the resignation of Turkish fatalists, under the supposed destiny of the prevalent ignorance, sloth, and filth.

Whilst such neglects are visited by the scourge of a regularly recurring pestilence and ravages of death more severe than a war, it may be confidently stated that the exercise of attention, care, and industry, directed by science in their removal, will not only be attended by exemptions from the pains of the visitation, but with exemptions from pecuniary burdens, and with promise even of the profits of increased production to the community.

This will appear from an examination of the present mode of removing the refuse from towns, and contrasting it with improved methods; and first with relation to the refuse of the houses :—

It is proved that the present mode of retaining refuse in the house in cesspools and privies is injurious to the health and often extremely dangerous. The process of emptying them by hand labour, and removing the contents by cartage, is very offensive, and often the occasion of serious accidents. But the expense of this mode operates, as the reports from the large towns show, as

a complete barrier to all cleanliness in this respect in the dwellings or streets occupied by the labouring classes. The usual cost of cleansing cesspools of a tenement in London is about 1*l.* each time. With a population generally in debt at the end of the week, and whose rents are collected weekly, such an outlay may be considered as practically impossible, and the inferior landlords delay incurring the expense until the nuisance becomes unbearable. In London the expense and annoyance of the cleansing of such places is avoided for years, until they are in the condition described by *Mr. Howell,* one of the council of the Society of Civil Engineers, who has acted extensively as a surveyor in the metropolis :—

" I would," he states, " instance a recent case in my own parish, where I was called to survey two houses about to undergo extensive repairs. It was necessary that my survey should extend from the garrets to the cellars: upon visiting the latter, I found the whole area of the cellars of both houses were full of night-soil, to the depth of three feet, which had been permitted for years to accumulate from the overflow of the cesspools; upon being moved, the stench was intolerable, and no doubt the neighbourhood must have been more or less infected by it. I should mention, that these houses are letting at from 30*l.* to 40*l.* a-year each, and are situated in a considerable public thoroughfare.

" I would mention another case, amongst many more in St. Giles's parish: I was requested to survey the dilapidations to several houses in the immediate neighbourhood of High-street, upon passing through the passage of the first house, I found the yard covered with night-soil, from the overflowing of the privy, to the depth of nearly six inches, and bricks were placed to enable the inmates to get across dry shod; in addition to this, there was an accumulation of filth piled up against the walls, of the most objectionable nature; the interior of the house partook something of the same character, and discovering, upon examination, that the other houses were nearly similar; I found a detailed survey impracticable, and was obliged to content myself with making general observations. My duties, as one of the surveyors to a fire-office, call me to all parts of the town, and I am constantly shocked almost beyond endurance at the filth and misery in which a large part of our population are permitted to drag on a diseased and miserable existence. I consider a large portion, if not the whole, of this accumulation of dirt and filth is caused by the bad and inefficient sewerage of the metropolis. I am acquainted with numberless houses in Westminster where the cellars are constantly flooded, and having no drainage, the occupiers are obliged to pump out the water, which, from being stagnant, is foul and offensive. If in the performance of this necessary duty the matter becomes known, they are summoned to the public office and fined 5*l.*; however much, therefore, the evil is felt in permitting the continuance of stagnant water, the alternative of the fine for pumping out is worse; they submit therefore to the lesser evil, and leave the water in the cellars. * * *

" I am quite sure, from much observation, that the occupiers of houses in all neighbourhoods are much influenced in their habits of cleanliness by the facilities afforded for draining, and by the want of carriage and

foot-paving in the streets; and it is equally certain that both health and life are frequently sacrificed by the constant damps and unwholesome smell, occasioned entirely by the absence of all means to carry off the impurities, which, in densely populated neighbourhoods, increase with such fearful rapidity."

It might have been expected, from the value of the refuse as manure (one of the most powerful known), that the great demand for it would have afforded a price which might have returned, in some degree, the expense and charge of cleansing. But this appears not to be the case in the metropolis. It is stated that at present, with the exception of coal-ashes, which are indispensable for making bricks, some description of lees, and a few other inconsiderable exceptions, no refuse in London pays half the expense of removal by cartage. The cost of removal, or of the labour and cartage, limits the general use or deposit of the refuse within a radius which does not exceed three miles beyond the line of the district-post of the metropolis, that is, about six miles. It is stated that, partly from the nature of the holdings, and from other circumstances within this limited district, agricultural improvements are not so great as might be expected where the facilities are so easy for obtaining any quantity of manure. Some idea may be formed of the loss of value of this manure from the metropolis, occasioned by the expense of its collection and removal, from the evidence of a considerable contractor for scavengering, &c., who states, with respect to the most productive manure,—"I have given away thousands of loads of night-soil: we knew not what to do with it." *

In the parts of some towns adjacent to the rural districts the cesspools are emptied gratuitously for the sake of the manure; but they only do this when there is a considerable accumulation, and any accumulation of any decomposing material which offends the smell is injurious to the health, especially in a town where all miasma is less diluted with fresh air, and where the population is less robust. For the saving of cartage, as well as the convenience of use, accumulations of refuse are frequently allowed to remain and decompose and dry amidst the habitations of the poorer classes. *Dr. Laurie* in his report on the sanitary condition of Greenock, furnishes an example. He says,—

"The first question I generally put when a new case of fever is admitted, is as to their locality. I was struck with the number of admissions from Market-street; most of the cases coming from that locality became quickly typhoid, and made slow recoveries. This is a narrow back street; it is almost overhung by a steep hill, rising immediately behind it; it contains the lowest description of houses, built closely together, the access to the dwellings being through filthy closes. The front entrance is generally the only outlet. Numerous food

* Vide the evidence of Mr. Dark and Mr. Treble, Appendix.

for the production of miasma lies concealed in this street. I think I could point out one in each close.

In one part of the street there is a dunghill,—yet it is too large to be called a dunghill. I do not mistate its size when I say it contains a hundred cubic yards of impure filth, collected from all parts of the town. It is never removed; it is the stock-in-trade of a person who deals in dung; he retails it by cartfuls. To please his customers, he always keeps a nucleus, as the older the filth is the higher is the price. The proprietor has an extensive privy attached to the concern. This collection is fronting the public street; it is enclosed in front by a wall; the height of the wall is about 12 feet, and the dung overtops it; the malarious moisture oozes through the wall, and runs over the pavement. The effluvia all round about this place in summer is horrible. There is a land of houses adjoining, four stories in height, and in the summer each house swarms with myriads of flies; every article of food and drink must be covered, otherwise, if left exposed for a minute, the flies immediately attack it, and it is rendered unfit for use, from the strong taste of the dunghill left by the flies. But there is a still more extensive dunghill in this street; at least, if not so high, it covers double the extent of surface. What the depth is I cannot say. It is attached to the slaughter-house, and belongs, I believe, to the town authorities. It is not only the receptacle for the dung and offal from the slaughter-house, but the sweepings of the streets are also conveyed and deposited there; it has likewise a public privy attached. In the slaughter-house itself, which is adjoining the street, the blood and offal is allowed to lie a long time, and the smell in summer is highly offensive. In two of the narrow closes opposite the market, there is in each a small space not built upon, and that space, being the only spare ground in the close, is occupied by a dunghill; these two closes are notorious as nurseries for fever. I believe it to be a rare occurrence when fever is not to be found in them during any time of the year. Market-street is certainly one of the most filthy and unhealthy streets in Greenock; it is needless to say that many places here and there throughout the town are as bad, indeed, I may state that from the best to the worst locality in the town there is not a street but requires to be subjected to some rigid system for removing away regularly the rubbish and impurities which are constantly exhaling forth so much, and which is indirectly the cause of the yearly increase of so much destitution."

Mr. Baker, in his report, gives another instance of the ignorance and carelessness under which the health of the population suffers.

"The contractor for the street sweepings, who is the treator with the Commissioners of Public Nuisances in Leeds, last year rented a plot of vacant land in the centre of the North-east ward, the largest ward in point of population in the township of Leeds, and containing the greatest number of poor, and this year rents, in the East ward, another plot of land, as a depôt for the sweepings from the streets and markets, both vegetable and general, for the purpose of exsiccating and accumulating till they could be sold as manure and carried away. So noisome were these exhalations, that the inhabitants complained of their utter inability to ventilate their sleeping-rooms during the day time, and of the insufferable stench to which both by night and day they were thus subjected."

The comparatively recent mode of cleansing adopted in the wealthy and newly-built districts by the use of water-closets, and the discharge of all refuse at once from the house through the drain into the sewers, saves the delay and the previous accumulation, and it also saves the expense of the old means of removal. It is most applicable to the poorer districts, because really the most economical, when they are properly sewered and supplied with water. The cost of cheap and appropriate apparatus, and of water for cleansing, it will be proved is a reduction of the mere cost of cleansing in the old method, independently of the cost incurred by the decay of woodwork and deterioration of the tenement which commonly takes place on premises in the condition of those described by Mr. Howell. The chief objection to the extension of this system is the pollution of the water of the river into which the sewers are discharged. Admitting the expediency of avoiding the pollution, it is nevertheless proved to be an evil of almost inappreciable magnitude in comparison with the ill health occasioned by the constant retention of several hundred thousand accumulations of pollution in the most densely-peopled districts.

There is much evidence, however, to prove that it is possible to remove the refuse in such a mode as to avoid the pollution of the river, and at the same time avoid the culpable waste of the most important manure.

A practical example of the money value which lies in the refuse of a town, when removed in the cheapest manner, and applied in the form best adapted to production, viz., by a system of cleansing by water, is afforded in connexion with the city of Edinburgh. In the course of the sanitary inquiry in that city the particular attention of Dr. Arnott and myself was directed to the effects of some offensive irrigation of the land which had taken place in the immediate vicinity of that city. It appears that the contents of a large proportion of the sinks, drains, and privies of that city are conveyed in covered sewers to the eastern suburb of the town, where they are emptied into a stream called the Foul Burn, which passes ultimately into the sea. The stream is thus made into a large uncovered sewer or drain. Several years ago some of the occupiers of the land in the immediate vicinity of this stream diverted parts of it, and collected the soil which it contained in tanks for use as manure. After this practice had been adopted for a long period, the farmers in the vicinity gradually found that the most beneficial mode of applying the manure was in the liquid form, and they conducted the stream over their meadows by irrigation. Others, perceiving the extraordinary fertility thus obtained, followed the example, and by degrees about 300 acres of meadow, chiefly in the eastern parts of that city, but all in its immediate vicinity, and the greater part of it in the neighbourhood of the palace of Holyrood, have been systematically irrigated with the contents of this common sewer. From

some of this land so irrigated, four or five crops a-year have been obtained; land once worth from 40*s.* to 50*s.* per acre now lets for very high sums. It is stated by a writer cited as an authority, on behalf of the parties interested,—

"That the rent for which some of these meadows are let in small portions to cow-feeders varies on an average from 20*l.* to 30*l.* per acre. Some of the richest meadows were let in 1835 at 38*l.* per acre; and in that season of scarce forage, 1826, 57*l.* per acre were obtained for the same meadows. * * * The waste land called Figget Whins, containing 30 acres, and 10 acres of poor sandy soil adjoining them, were formed into water meadows in 1821, at an expense of 1000*l.* The pasture of the Figget Whins used to be let for 40*l.* a-year, and that of the 10 acres at 60*l.* Now the same ground as meadows lets for 15*l.* or 20*l.* an acre a-year, and will probably let for more, as the land becomes more and more enriched."

This use of irrigation followed so gradually, that the time of its commencement seems not accurately ascertained, but is known to have been usual near the beginning of the present century. The tanks are still to a certain extent used. The irrigation proceeds from the beginning of April to the middle of September, and it is supposed that the deposits in the tanks are in the interval increased by the quantity of soil not employed in irrigations.

The practice is strongly objected to by the inhabitants as an offensive and injurious nuisance. To Dr. Arnott, who surveyed the district, the process appeared to be, like most offensive processes, unfitted for the vicinity of a town. The miasma from the preparation of the large accumulations of manure in open receptacles near places of public resort or crowded habitations would probably affect the public health injuriously to a greater or less degree. In particular states of the weather it could scarcely fail to engender disease. In the decomposition of substances for manure, deleterious gasses will be evolved, which in particular states of the atmosphere will act with powerful effects on animal life within their reach. But it is at the same time stated, the process of applying manure by irrigation, that is, separated and diluted with water, is considered to be productive of less deleterious gas, of less injurious effects, than by spreading it over fields in a solid form, and allowing it to remain until it is decomposed and separated by the atmosphere and conveyed into the soil by rain. Liebig, the greatest living authority on agricultural chemistry, states that night-soil loses in drying half its valuable products, that is, half its "nitrogen," for the "ammonia" escapes into the atmosphere. By irrigation, by the diffusion and conveyance of the manure to the plant in the medium of water the escape of the valuable substance as a noxious and injurious gas is diminished.* Whatever extent of loss there is from manures by decomposition when placed

* Mr. Smith, of Deanston, is of opinion that it would be practicable to distribute such refuse by irrigation without exposure of the surface of the fluid in which it is held in suspension.

on the land in a solid form, and when exposed to the action of the atmosphere, it is stated that there is proportionate gain by holding the material in suspension in water. The simple offensiveness, it may be assumed, is a sufficient ground of exclusion of any process from amidst the habitations of a town population. But at a reasonable distance the use of dung or any other manure would not be forbidden; and the process which is the least injurious, the irrigative, is entitled therefore to a preference. Effective drainage must make way for the conveyance of diluted manures, and consequently for effective irrigation.

The continuance of the practice in Edinburgh of the use of the common sewer for irrigation is defended by the occupiers and owners, on the ground that from the time of its commencement, when it was unopposed, and, as it appears to us, escaped any notice, a legal right has been acquired by them in the manure of the city contained in the Burn, and the present claimants of the right contend that they are entitled to compensation under the Scotch law for any diversion of the stream or of the manure which it contains. The irrigation which has surrounded the palace of Holyrood having, as it is considered, rendered it prejudicial to health, Her Majesty's government, for the protection of this palace as a royal residence, have directed legal process for the trial of the right claimed to the irrigation. The defendants vindicate the measure on the ground of its utility as an agricultural operation, and treat the proposal to divert the contents of the sewers as being in fact a proposal to deprive the city of the milk and butter yielded by more than 3000 milch cows, and the markets of the meat from their carcases; that, in fact, "the grass, which in virtue of irrigation these meadows produce, supports in Edinburgh 3300 cows, and in Leith 600 cows, during the season."* We were informed that

* Professor Liebig in his work on the "Chemistry of Agriculture," refers to various authorities on the practical value of such refuse, who state that "human urine is, if possible, more husbanded by the Chinese than night-soil for manure; every farm or patch of land for cultivation has a tank, where all substances convertible into manure are carefully deposited, the whole made liquid by adding urine in the proportion required, and invariably applied in that state." This is exactly the process followed in the Netherlands.—See "Outlines of Flemish Husbandry, p. 22. "The business of collecting urine and night-soil employs an immense number of persons, who deposit tubs in every house in the cities for the reception of the urine of the inmates, which vessels are removed daily with as much care as our farmers remove their honey from the hives. When we consider the immense value of night-soil as a manure, it is quite astounding that so little attention is paid to preserve it. The quantity is immense which is carried down by the drains in London to the river Thames, serving no other purpose than to pollute its waters. A substance which by its putrefaction generates miasmata may, by artificial means, be rendered totally inoffensive, inodorous, and transportable, and yet prejudice prevents these means being resorted to. If," says the professor, "we admit that the liquid and solid excrements of man amount on an average to 1½ lb. daily (¾ lb. of urine and ¼ lb. fæces), and that both together contain 3 per cent. of nitrogen; then in one year they will amount to 547 lbs., which contain 16·41 lbs. of nitrogen, a quantity sufficient to yield the nitrogen of 800 lbs. of wheat, rye, oats, or of 900 lbs. of barley."—(Boussingault.) "This is much more than is necessary to add to an acre of land in order to obtain, with the assistance of the nitrogen absorbed from the atmosphere, the richest possible crop every year. Every town and farm might thus supply itself with the manure which, besides containing the most nitrogen, contains also the most phosphates, and if rotation of the crops were adopted, they would be most abundant."—Edited by Dr. Lyon Playfair.

the parties interested in the lands estimate the compensation that would induce them to discontinue the practice at 150,000*l.*; and a pamphlet written at their instance, in 1840, states this as the sum which the proprietors of the meadows to the west of the city would be legally entitled to (independently of the claims of those in the east) were the practice abolished by legislative authority. The proprietors have had, on several occasions, sufficient influence to frustrate the efforts of the city authorities, to obtain legislative sanction for the removal of the nuisance, and for a more salubrious disposal of it for the advantage of the inhabitants themselves.

The public refuse of cities by the usual course of legislation in local Acts, and by custom, and on all principles which govern the application of the proceeds of such produce belongs to the public, and it may be submitted that, whatever may be the decision in the case of Edinburgh, means should be taken to prevent for the future the acquisition of new rights at the expense of the health and of the conveniences of such large classes of the population. And it may here be observed that it will probably be found, under the circumstances of the increasing population of the towns, and the increasing necessity of keeping open spaces within and around the towns, and of exercising a general control for the beneficial arrangement of new buildings for the public health and convenience, and of securing convenient public walks and places of temperate and healthful recreation for the population—that it is most desirable for all these objects that means should be taken to redeem to the crown the fee, or otherwise obtain as early as practicable, and on the terms of proper compensation, lands within and in the immediate vicinity of towns for public use.

If then, in Edinburgh, the contents of the cesspools were carried by adequate supplies of water in drains from the houses into covered sewers, and thence in covered instead of open sewers to the lands at proper distances where it might be distributed as manure by irrigation, it would be a mode of irrigation considered by Mr. Smith of Deanston, and other authorities on drainage and irrigation, whom I consulted, the best that is now apparently practicable, *i. e.*, the best means for removing quickly, and constantly, and the least injuriously, the matters which can only remain for removal by any other process at the expense of the public health; they concur in opinion that it would also be the most productive mode of distributing the manure.

On the scale of the value set upon that portion of the refuse of Edinburgh that has been appropriated for irrigation by the occupiers of the land in the vicinity of the city, the value of the whole of the soil of the city (not one-third of which finds its way into

the irrigated meadows), if it were made completely available by an appropriate system of town drainage, would be double or treble the amount, producing an income of 15,000*l.* to 20,000*l.* per annum for public purposes. On the same scale of value it would appear that, in the metropolis, refuse to the value of nearly double what is now paid for the water of the metropolis is thrown away, partly from the districts which are sewered into the Thames, and partly from the poor districts which are unsewered, where it accumulates and remains a nuisance until it is removed at a great expense. It is allowed by Captain Vetch, an experienced engineer, and by other authorities, to be the most eligible plan in respect to economy as well as efficiency, wherever the levels were not convenient, or it were desirable to send the refuse over heights for distribution, that the contents of the sewers should be lifted by steam power, as water is lifted in the drainage of the fens, and that it might be sent for distribution, wherever it is required for use, in iron pipes, in the same mode as that in which water is conveyed into towns by the water companies. The estimated expense of this mode of cleansing and removal is about the same as the conveyance of water into towns, *i. e.*, not a tithe of the expense of cartage, as will subsequently be shown.

The comparative economy of conveyance of fluid in pipes has been but little observed, and has only recently perhaps been applied for the purpose of cleansing. The following is an instance of the application of the principle:—A contract was about to be entered into by the West Middlesex Water Company for hauling out from their reservoir at Kensington the deposit of eight or ten years' silt, which had accumulated to the depth of three or four feet. The contractor offered to remove this quantity, which covered nearly an acre of surface, for the sum of 400*l.*, in three or four weeks. The reservoir was emptied in order to be inspected by the engineer and directors before the contract was accepted. It occurred to one of the officers that the cleansing might be accomplished more readily by merely stirring up the silt, to mix it with the water; and then if a cut or outlet were made in the main-pipe used for conveying the water to London, that it might be washed out. He accordingly got thirty or forty men to work in stirring up the deposit, and accomplished the work at the cost of 40*l.* or 50*l.* and three or four days' labour, instead of so many weeks; when the directors went to see the basin, to decide upon the contract, the reservoir was as free from any deposit as a house-floor. Since the discovery thus made, the silt has been regularly cleansed out into the common sewers. It is to be observed, in respect to the relative cheapness of the two modes, that the contractor would only have removed the silt to the nearest convenient place of deposit in the immediate vicinity of the reservoir, whereas, in the fluid state, it might be carried at the actual cost of conveying water, as far as it is at present conveyed, and sold with a profit, 12 or 14 miles, and raised to heights of 150 feet, at 2½*d.* per ton.

By the application of capital and machinery, the cost of conveyance of substances in suspension in a fluid, even at the water companies' prices, may be rendered thirty and even more than forty times as cheap as collection by hand labour and removal by cartage. In the metropolis, where the persons who water the roads may obtain water gratuitously from pumps, the water supplied by stand-pipes by some of the water companies at 1*l.* per 100 tons, is found to be twice as cheap as the mere labour of pumping the water into the cart. By proper hydraulic arrangements heavy solid substances may be swept away through the iron pipes.

These means which science gives of cheapening the cost of the conveyance of refuse from houses, will be available also in extending and completing the cleansing of the towns, of removing the filth which oppresses the poorer districts, and rendering the whole of it available, in the best form, for future use as manure.

The expense of cleansing the streets of the *township* of Manchester is 5,000*l.* per annum. For this sum the first class of streets, namely, the most opulent and the large thoroughfares, are cleansed once a-week, the second class once a-fortnight, and the third class once a-month. But this provision leaves untouched, or leaves in the condition described in Dr. Baron Howard's report, the courts, alleys, and places where the poorest classes live, and where the cleansing should be daily. There are abundance of recommendations to the effect, "Let it be ordered that the streets be properly cleansed;" but in this instance the cost of cleansing the whole of what is properly the same town, Salford, and the out-townships, would be 8,000*l.* or 10,000*l.* per annum; and such a recommendation, under the existing modes of management, is equivalent to saying, let 20,000*l.* or 30,000*l.* of additional rates be expended, and 40,000 or 60,000 additional loads of refuse be removed. In other large towns, the service and the expense is on a similar scale. At the rate of expense of one large parish, the present cost of cleansing in the metropolis may be estimated at about 40,000*l.* per annum. This expense, however, is generally repaid by the sale of the coal-ashes, which are used in the manufacture of bricks.

Though the refuse of the poorer districts is often taken and sold, the immediate objection to the extension of the services of the scavenger to them is the increase of the immediate expense, which it is practically necessary to consider in detail, although if there were no compensation by the sale of any coal-ashes or house refuse, and if the occupants were required to pay for the cleansing at the rate of one of the opulent parishes in the metropolis, that is at the rate of 4*s.* per house per annum, which would be less than a penny per tenement for the weekly street cleansing;

or in the poorer districts, where there are mostly two families to a tenement, a charge of less than one halfpenny per week for cleansing, would be found to be good economy, as one means of diminishing the existing heavy charge of sickness, not to speak of the wear and tear of clothes.

Two-thirds of the usual expense of street cleansing is the expense of cartage, which, with a proper adaptation of the sewers, is wholly unnecessary. The exclusive use of hand-labour in street-sweeping is pronounced by competent judges to be a mere barbarism, and several machines have been invented which demonstrate that by mechanical power, moved by horses, the cleansing may be effected in a far shorter time. Some of these scrape the mud in ridges to the sides, where it remains until it can be lifted and carted away. But this is objected to as inconvenient by the shopkeepers, and the scavengers object that it is no convenience to them, inasmuch as raking it in heaps prevents the evaporation of the liquid, and increases the cartage; and, moreover, that the process of sweeping by hand is as quick as the carts can return for its removal. A machine has been used at Manchester which rapidly and cleanly sweeps the level surfaces of the streets into a cart; but there is still the encumberance of the labour, and cost and delay of carting the refuse to a place of deposit, which may be several miles distant, and returning to reload. The value of a process of street-cleansing is proportioned to the rapidity with which it is performed, but at present it is usually delayed until the sun or the air has done a large portion of the work by the evaporation of the moisture, commonly however to the deterioration of the air of the town and the health, and also to the deterioration of the value of the refuse.

On examining these obstructions to the cleanliness and salubrity of our towns, it became apparent that the expensive and slow process of the removal of the surface refuse of the streets by cartage might be dispensed with, and the whole at once carried away by the mode which is proved, in the case of the refuse of houses, to be the most rapid, cheap, and convenient, namely, by sweeping it at once into the sewers, and discharging it by water.

The sewerage of the metropolis, though it is a frequent subject of boast to those who have not examined its operations or effects, will be found to be a vast monument of defective administration, of lavish expenditure, and extremely defective execution. The general defect of these works is, that they are so constructed as to accumulate deposits within them; that the accumulations remain for years, and are at last only removed at a great expense, and in an offensive manner, by hand-labour and cartage. The effect is to generate and retain in large quantities before the houses the gases which it is the object of cleansing to remove. In the course of the present inquiry instances have been frequently presented of fevers and deaths occasioned by the escapes of gas from the sewers into the

streets and houses. In the evidence given before the Committee of the House of Commons, which received evidence on the subject in 1834, one medical witness stated; that of all cases of severe typhus that he had seen, eight-tenths were either in houses of which the drains from the sewers were untrapped, or which, being trapped, were situated opposite gully-holes; and he mentioned instances where servants sleeping in the lower rooms of houses were invariably attacked with fever. It was proposed as a remedy to prevent the escape of the noxious effluvia by trapping them, but this was refused on the ground of the danger to the men, who must enter the sewers to clean them, from the confined gas. In one of the circulars the reason assigned for allowing the escape of the gas into the streets is that if it were confined in the sewers it might impede the flow of the water. It was then proposed to allow the escape of the noxious gases through chimneys constructed at certain distances. But this was decided to be an experiment, and the Committee did not feel themselves authorized to make experiments. Instances were adduced where it had been found necessary either to trap or to remove gully-holes in the vicinity of butchers' shops, to avoid the injurious effects of the effluvium upon the meat. Similarly mischievous effects of the defective construction and management of the sewers are commonly displayed in the medical reports from the provincial towns, and they have been incidentally noticed in the passages already cited.

It may be mentioned as another instance of the absence of appropriate knowledge that has governed these structural arrangements, that a large proportion of the most expensive sewers are constructed with flat bottoms. In proportion as the water is spread the flow is impeded, and the deposit of matter it may hold in suspension increased. Mr. Roe, a civil engineer, who, much to the honour of the Holborn and Finsbury district of sewers, has been appointed to the care of their sewers, and is perhaps the only officer having the experience and qualifications of a civil engineer, states, that as compared with sewers or drains with bottoms of a semicircular form, those with flat bottoms invariably occasion a larger amount of deposit; and with the same flow of water, the difference of construction occasions a difference of more than one-half in the deposit which is left. By the common and most expensive form, the drains are apt to be choked up with noxious accumulations; by being built with flat sides (instead of with curved sides, which give the strength of an arch) they are apt in clayey and slippery ground to be forced in. The expense of the improved form is nearly one-fourth less than those in general use. *Mr. Roe,* whose evidence, which is corroborated by the evidence of other engineers, is given in the Appendix, was asked,—

In respect to the levels, how have you found the sewers?—They appear to have been entirely constructed with reference to the locality, to

drain to the nearest outlet, and not on an extended view for the whole district, or with any view to sewerage on a large scale. In the Holborn and Finsbury divisions the Commissioners now adopt a series of levels suited from the lowest outlets to the surrounding districts.

Have you heard of any alterations made in the surrounding districts on the same principle?—I have heard of none as adopted generally. The City have lowered several of their outlets; and the chairman of the Westminster Commission has had the subject under consideration for some time.

What are the chief effects of the piecemeal town drainage without reference to extended levels?—Chiefly that when new lines of houses are built and require new sewers, either the old sewers must be taken up and re-constructed at a great expense, to adjust them to a new and effective sewerage, or the new sewers, if they are adjusted to the old ones, are deficient in fall, and they have greater deposits.

Does the existing form or system of sewerage answer fully and at the least expense the chief objects of sewerage in house and street cleansing, and the removal of noxious substances?—No, it does not, except where the outlets have been lowered, and the sewers continued at a proper level; great accumulations of deposit are occasioned in the sewers, and from their containing the refuse that was at one time deposited in the cesspools, the deposit is more noxious than formerly; the gas is more considerable, it escapes more extensively into streets and into the houses, where the drains are not well trapped. My opinion is that the general health of the men who work and have been accustomed to the sewers, has become still worse; they are more pale and thin, and lower in general health than formerly. The effect of the noxious gases upon men working in these places is to lower the general health. Since I have had the superintendence of the sewers, the men have encountered about half a dozen accidents by explosions of gas.

But is the health of these men who work in the sewers to be taken as a criterion of the health of persons who are not accustomed to such places?—I have had no means of forming a comparison, though I am of opinion that gases which they encounter without any immediate injury would be very injurious to the health of susceptible persons, or of any persons not habituated to it.

The first prejudicial effect of the defective system, then, is to occasion these noxious accumulations; how are they removed?—Formerly, in the Holborn and Finsbury sewers, and at present, I believe, in all other sewers, the streets were opened at a great expense and obstruction (they are so now, I believe, elsewhere); men descend, scoop up the deposit into pails, which are raised by a windlass to the surface, and laid there until the carts come; it is laid there until it is carted away, sometimes for several hours, to the public annoyance and prejudice. The contract price for removal from the old sewers without man-holes was 11*s.* per cubic yard of slop removed; where they have man-holes it was 6*s.* 10*d.* per cubic yard. This practice also involves injury and expense as respects the pavement; a street may be well paved when it is broken up for the cleansing of the sewers, but the portions of pavements so disturbed are never so well put down again; neither can accidents be effectually guarded against.

By what means may these effects be obviated?—In the Holborn and Finsbury divisions I suggested a plan of flushing the sewers, and of carrying off all the refuse by water. This plan has been adopted, and it is now in operation. The breaking up of the streets is avoided by the formation of side entrances; cast-iron flushing gates are fixed in the sewers; the ordinary flow of water in the sewers accumulates at these gates; the gates are opened, and the force of the water is sufficient to sweep off the deposit; and the system may be further extended.

What is the comparative difference in the expense of construction?—The cost of side entrances and flood-gates, as compared with the cost of man-holes, is from 6*d.* to 1*s.* less per foot lineal of the length of new sewers.

What other expense is attendant on this improved practice?—The main expense is the attendance of a man to shut and open the flood-gates.

The structural expense being lower, is the ultimate expense of cleansing lower also?—Yes; the expense of cleansing the sewers is about 50 per cent. less than the prevalent mode. Our expense of cleansing the sewers was about 1,200*l.* per annum; we save 600*l.* of that, and expect to save more; but to this must be added the saving to the public of the cleansing of the private drains, formerly choked by the accumulations in the sewers. This saving, on a moderate calculation, is found to be upwards of 300*l.* per annum. There is also the diminution of the escapes of gas from the old and continued accumulations.

During what intervals are deposits allowed to remain on the old mode?—The average is in one set of sewers about five years, and in another about ten years.

During which time the public are subjected to all the escapes of gas from the decomposing accumulation?—Exactly so. It could not, however go on so long but for heavy falls of rain or snow, which occasion partial clearances.

What is the effect of these accumulations upon the private drainage?—That the drains to the private houses are stopped: the first intimation of the foul state of the main sewer arises from complaints of individuals whose drains are affected; the accumulations in the private drains also occasions an expense to the individuals and much annoyance. By flushing the sewers this expense might be, and in Holborn and Finsbury division it is, avoided.

Are there any other defects you have, as an engineer, noticed in the prevalent mode of constructing the sewers?—Yes, the prevalent practice is to join sewers at angles, frequently at right angles; this occasions eddies and deposits of sediment that would otherwise pass off with the water; it injures the capacity of the main sewers by obstructing the current of water along them: I ascertained by experiment that the time occupied in the passage of an equal quantity of water, along similar lengths of sewer with equal falls, was—

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

The Commissioners of the Holborn and Finsbury divisions agreed to require that the curves in sewers, passing from one street to another,

shall be formed with a radius of not less than 20 feet; it is also required that the inclination or fall shall be increased at the junction, in order to preserve an equal capacity for the passage of water, and of effect in sweeping away the deposit.

When by heavy falls of snow or otherwise the refuse of the streets is carried into such sewers, is there any difficulty in sweeping it away?—None whatsoever.

In what number of years would the saving in cleansing sewers by flushing repay the expense of applying the apparatus to the existing sewers in the Holborn and Finsbury divisions?—In seven years.

Have you any doubt of the practicability of carrying all the surface cleansing of the streets into the sewers, and removing it by conveyance in water, instead of by hand labour and cartage?—I entertain no doubt whatever that it might be done, where there is a good sewer and proper gully-holes and shoots; with a good supply of water these would carry away rapidly all the surface refuse; the experience of the sewerage in the Holborn and Finsbury divisions prove it.

How does it prove it?—At every opportunity the street-sweepers sweep all they can into the gully-holes, and it is swept away without inconvenience.

One practical witness states that the expense of the cartage alone of the refuse from a Macadamised street of half a mile, in the winter time in the metropolis, is 5*l.* weekly. What would be the comparative expense of carrying it away by the sewers?—It would save the whole expense of the cartage; it would be less than the present expense of sweeping and filling into the carts, and if there were a sufficient supply of water on the surface, the work might be conducted with great rapidity.

You are aware that one inconvenience of the existing mode of street cleansing, independently of the great expense, is the length of time during which the wet refuse remains to the public annoyance on the surface, until removed by the slow process of sweeping and cartage?—Yes; and the men would appear to delay for the purpose of the dirt being removed, by being washed by rain into the sewers.

Do you conceive that all the business of street cleansing and house draining might be consolidated advantageously to the public?—Yes, clearly so, and with great economy.

In the evidence of Mr. Oldfield, an experienced builder in the wealthy districts of the metropolis, will be found exemplifications of the mischiefs resulting from the defective modes of opening sub-drains or communications, even from houses of the first class, into the main drains.* The state of sewerage and drainage in the larger towns, as described in the medical reports, in its effects of frequent disease and death,—is much worse in the provincial towns. But every step in improvement is an advance in reduction of existing burdens; drainage, *per se*, will be found to be a reduction of an existing charge for the expenses of sickness and mortality; *science*, applied to the improvement of drainage, not only gives it efficiency, but reduces greatly the expense.

* See *post*.

The streets in the larger towns commonly display, from the want of science in their construction, similar waste, and equally admit of an improved and scientific arrangement, which will conduce to economy and to improved public health.

The bad condition of the streets in many of the towns is very generally ascribable to pavement being commonly regarded as requisite solely for cart or carriage conveyance, and not as a means of cleanliness. The pavement has therefore been usually confined to the chief streets in which the carriage traffic is considerable. Some of the principal streets even in the metropolis almost justify the description of being "streams of mud and filth in winter," and "seas of dust" in summer. But attention has of late been directed to the cleansing of the road as a means of removing damp and dirt or dust, which are each found to be injurious. So far as various experiments have yet proceeded in the metropolis, they are stated to be highly favourable to the use of wood as a substance for paving the streets, though perhaps in forms different from those at present in use, with improvements which further experience will suggest. Wood, when pinned together and laid on a firm substratum, appears to be less retentive of wet than most forms of stone pavement, and to possess very considerable advantages over the Macadamised roads for crowded thoroughfares. If it be brought into general use it will have an advantage in removing the granite dust, which medical authorities believe to be much more prejudicial to health, in exciting or aggravating lung diseases, than the public have been aware of. Where there is much dust in the working of close quarries, the effects of it are almost as destructive to the lungs of the operatives as the knife-grinding to the operatives of Sheffield who do not guard against the steel-dust. "It is scarcely conceivable," Dr. Arnott states, "that the immense quantities of granite-dust pounded by one or two hundred thousand pairs of wheels working on Macadamised streets, should not greatly injure the public health. In houses bordering such streets or roads, it is found that, notwithstanding the practice of watering, the furniture is often covered with dust even more than once in the day, so that writing on it with the finger becomes legible, and the lungs and air-tubes of the inhabitants, with a moist lining to detain the dust, are constantly pumping the same atmosphere. The passengers by a stage-coach in dry weather, when the wind is moving with them so as to keep them enveloped in the cloud of dust raised by the horses' feet and the wheels of the coach, have their clothes soon saturated to whiteness with the dust, and their lungs of course are charged in a corresponding degree. A gentleman who rode only 20 miles in this way, had afterwards to cough and expectorate for 10 days to clear his chest again." The imperfection of road cleansing in paved streets at the same time deteriorates the salubrity of the towns, the value of the refuse for production, and the streets themselves. The farmers

find that the refuse of the streets, of which horse-dung and other excrementitious substances form so important a part, is valuable in proportion as it is "fresh." On a proposition to sweep the streets of a town district oftener, it was stated by some farmers that they would, in that case, give more for the refuse. It is with this description of refuse, as stated with respect to the night-soil, in proportion as it is allowed to remain in the streets to dry, it loses the gas which gives it value; and the gas which is lost frequently gives to streets the offensive smell perceptible to strangers who have not been familiarised to it, and makes a deleterious addition to the compounds by which the health of the town population is injured. The complete and rapid cleansing of the roads has also its effects on the draught. It is proved experimentally that, "calling the draught on a broken-stone road 5, that on the same road covered with dust is 8, and that on the same road wet and muddy is 10."* A road should be cleansed "from time to time, so as never to have half an inch of mud upon it. This is particularly necessary to be attended to where the materials are weak, for if the surface is not kept clean, so as to admit of its becoming dry in the intervals between showers of rain, it will be rapidly worn away." With the even surface obtainable from the use of wood as a pavement, it is stated that the streets which are now kept wet and dirty whilst the process of cleansing is slowly carried on by the hand, may be rapidly and cheaply swept by sweeping-machines drawn by horses. With the advantage of such a system of sewerage as that described by Mr. Roe, the surface refuse, which continues exposed during a whole week, may be removed every morning before the hours of traffic from all the principal thoroughfares. In the main streets of the towns of considerable traffic, a smooth and firm surface for the carriage-way would ensure the advantages of a railroad, in addition to those to the public health from cleanliness. The experience on several portions of smooth road shows that single horses with lighter and less expensive vehicles would suffice where two horses are now required on the common roads; where strong stone pavements are required to resist the shock of heavy vehicles, and heavy vehicles propelled with double power to resist the battering of strong pavements, and the grinding and wear and tear of heavy and dirty roads.

Captain Vetch, the engineer, who is extensively acquainted with the structural economy of towns, observes in a communication on the subject, that—

"The other mode of avoiding the formation of mud is the substitution of wooden pavements; of the success of these I have little doubt, though for the present many failures have occurred, either from the foundation not having been truly and firmly laid, or from the blocks of

* Treatise on Road Formation and Cleansing.

wood not being massive enough. The greatest objection to wood pavements at present is the slipping of the horses, but this I believe might be obviated. The question, however, at present is to get rid of the street dirt, such as it is; and for that purpose I concur in opinion it would only be necessary in wet weather during rains that the street-cleaner should sweep the dirt into the kennels, and aid the water by stirring the mud, to carry off the material in a state of diffusion; in dry weather, the opening of pipes with hose attached would serve the same purpose as the rains, and at the same time aid the sewerage at the time most required. After a short but heavy fall of rain, the cleansing effect of the water is fully perceived: and if any means could be devised of saving the rain-water that falls on the houses and in the streets, so as to apply it in considerable quantities at intervals, it is probable that the rain-water would be amply sufficient for all the purposes in question."

Mr. Roe states, that arrangements were made with the water companies for supplies of water for the cleansing of the sewers in the Holborn and Finsbury district, but it was found that the ordinary supplies to the sewers sufficed, and those from the company were not used.

The cleansing of the streets and the removal of the impurities from the habitations appears to have been the subject of considerable attention at Paris of late years. An individual proposed to the administration of that city a mode of cleansing the streets and pavement, by sweeping all the refuse into the sewers which are discharged into the Seine, that had hitherto been daily gathered into heaps and carted away beyond the precincts. The minister of police thought it advisable to take the opinion of the Institute on the proposal. The superiority of the proposed mode of street cleansing was admitted, but the members of the Institute, to whom the subject was referred, having ascertained the quantity of rubbish which was daily collected in Paris, and also the quantity of water which flowed in the Seine during the summer-time, they found that this volume of water was 9600 times greater than the greatest quantity of filth and rubbish collected in the same length of time from the streets of Paris; and they reported as their conclusion, "that the quantity of dirt which would be thrown into the Seine, compared with the volume of water in the river, would be found to be so extremely small as to be absolutely inappreciable; that it was not from the consideration therefore of insalubrity that the project for cleaning the streets as proposed should be negatived, but solely because by that means there would be lost a quantity of most valuable manure, which was quite indispensable to the agriculture around Paris, and consequently to Paris itself."*

Mr. Roe has furnished me with a calculation made from the flow of water in the Thames, at a neap tide: taking the ebb, and comparing it with the quantity of deposit in the water running from the sewers from the whole of the metropolis (assuming that

* See in the Appendix the form of calculation.

the sewerage bears the same proportion as the Holborn and Finsbury division), that the proportion of impurities to the volume of water of the Thames is as 1 to 10,100. If the surface cleansing of the streets were added to the ordinary mass of impurity, he calculates that the proportion held in suspension would then be about 1 to 5069. To this must be added the impurities from land-floods, and those from vessels in the river. The amount of impurity discharged from the sewers was calculated from the amount of deposit known to have been formed in several of them. The amount of impurity in the Thames would therefore be, at the least, double the amount of that calculated for the Seine.*

If the evils of the pollution of such a stream were much greater, they would still be found inconsiderable as compared with the perpetual pollution of the air by the retention of ordures and refuse amidst large masses of the population. What has been stated as to the practicability of extending threefold the cleansing of towns, by dispensing with cartage, and using the sewers for the removal of the refuse of the streets, is stated as an advantage, even on the supposition that no use is made of the refuse, and that it is entirely thrown away. But it were a reproach to stop at the advance to this far lesser evil, and to add to the pollution of the streams of the towns, which throughout the country form the chief common sewers, by throwing into them everything that is vile in the towns, *i. e.* everything that is most valuable for increasing the surrounding fertility.

On a full examination of the evidence adduced and of the evidence indicated, it will, I trust, be found to be satisfactorily established; that the houses of towns may be constantly and rapidly cleansed of noxious refuse by adaptation of drains and public sewers; and that with such an adaptation, for one street or one district cleansed at the present expense three may be cleansed by the proposed mode; that the natural streams flowing near towns may be preserved from the pollution caused by the influx of the contents of the public sewers, by the conveyance of all refuse through covered pipes, and that the existing cost of conveyance, by which its use for production is restricted, may

* In Paris the greater proportion of the private houses are even now supplied with water only by water-carriers, and the means of the immediate conveyance of refuse, by a system of water-closets communicating through drains to sewers to receptacles for use, could not have been presented to the consideration of the men of science to whom the subject was referred. It appears that in the first class of houses in that city the cesspools were formerly only emptied once in four or five years, and that it is now considered a great improvement that they are emptied twice or thrice a-year. But the offensiveness and the frequent injurious effects from emptying and removing the contents, has led to the proposal of a plan of closed receptacles or removable tanks, in which the soil may be carted away to the place of deposit for use as manure. The retention, however, of accumulations, which can only be constantly removed by means of water, and the want of proper supplies of water laid on in the houses very seriously disparages the salubrity and habits of the population of that city, as well as of the towns in this country where the same practice prevails.

be reduced to less than one-fortieth or fiftieth of the present expense of removal by hand labour and cartage;* that these bounties on cleanliness and salubrity on the one hand, and beneficial production on the other, are dependent on skilful and appropriate administrative arrangements. But for the attainment of these objects, and the relief of the worst-conditioned districts, another provision appears to be requisite, namely, appropriate

Supplies of Water.

Besides those reports from towns in which a large proportion of their salubrity is attributed to a natural drainage, from the porosity of the soil, or from the undulations of the surface being favourable to the discharge of moisture, as at Birmingham, other reports ascribe a large proportion of the comparative health of the population to advantageous circumstances, in respect to the supplies of water. From such information as that already cited, it will be manifest that for an efficient system of house cleansing and sewerage, it is indispensable that proper supplies of pure water should be provided, and be laid on in the houses in towns of every size, and, it might be added, in all considerable rural villages. No previous investigations had led me to conceive the great extent to which the labouring classes are subjected to privations, not only of water for the purpose of ablution, house cleansing, and sewerage, but of wholesome water for drinking, and culinary purposes.

Mr. John Liddle, one of the medical officers of the Whitechapel union, after describing the deplorable condition of the

* Mr. John Martin, the artist, has endeavoured to direct public attention to the sewerage of the metropolis, and proposed the erection of a grand cloaca maxima, and various architectural works along the Thames, with the meritorious objects of preventing the pollution of the river, and saving the refuse. His plan was to form a canal on each bank parallel to the river, so as to intercept the whole of the sewerage, and convey it to large reservoirs or places of deposit at a distance. His plan for the north bank was a canal, constructed of iron, costing 60,000*l.* per mile, extending from Westminster to the mouth of the Regent's Canal, "where the grand receptacle should be from which the soil should be conveyed to barges, and transmitted by canals to various parts of the country."—*Committee on Sewers' Report*, p. 169. The primary objection to this plan is that it would send the refuse still further out of the reach of large districts, where it is wanted as manure, to a place where it would only be available to the places for which canal conveyance would be convenient; that it would leave untouched the great obstacle to the use of manure, namely, the cost of removal and application by cartage and hand labour. The construction of the canal would also involve the disturbance of the whole of the wharf property; as originally proposed, it involved their entire re-construction, and the erection of a grand colonnade along the banks of the river. For the removal of the refuse, engineers of practical experience agree that the most eligible plan was by various small conduits, not larger, where iron pipes might be necessary, than the pipes used by the water companies in bringing water into the metropolis, at a cost not a fifth, perhaps, of one large canal, and without any disturbance of property. For the application of the refuse as manure, practical experience at Edinburgh, and of irrigation elsewhere, shows that the most effectual mode of distribution for use is by water-meadows or drainage and irrigation combined; forming an unseen, unostentatious, self-acting system of excretory ducts, altogether superseding cartage or hand labour, and conveying the refuse in closed streams, acting constantly and rapidly until they distribute the refuse into the field of production.

dwellings of the labouring population in that part of London, states, that—

"In connexion with this state of things is the deficiency of water which is not laid on in any of their houses.

"How do they get such water as they use?—They get it for the most part from a plug in the courts. I cannot say whether it is the actual scarcity of water, or their reluctance to fetch it, but the effect is a scarcity of water. When I have occasion to visit their rooms, I find they have only a very scanty supply of water in their tubs. When they are washing, the smell of the dirt mixed with the soap is the most offensive of all the smells I have to encounter. They merely pass dirty linen through very dirty water. The smell of the linen itself, when so washed, is very offensive, and must have an injurious effect on the health of the occupants. The filth of their dwellings is excessive, so is their personal filth. When they attend my surgery, I am always obliged to have the door open. When I am coming down stairs from the parlour, I know at the distance of a flight of stairs whether there are any poor patients in the surgery. Any one who attends on the relief days of the out-door relief may satisfy himself as to the personal condition of these parties.

"Are the courts in which the labouring classes reside, in your district, paved or cleansed?—They are not flagged, they have a sort of pebbles; they are always wet and dirty. The people, having no convenience in their houses for getting rid of waste water, throw it down at the doors. If I cast my eye over the whole district at this moment, I do not think that one house for the working classes will be found in which there is such a thing as a sink for getting rid of the water.

"Then there is not such a thing as a house with the water laid on?—Not one in the poorer places. There is also the want of cesspools; there is only one or two places for a whole court, and soil lies about the places which are in a most offensive condition.

"What is the number of cases which you visit for the administration of medical relief during the year?—During the last year the number of cases was 1560, all of them out-patients.

"Has not a large sewer been recently formed through your district?—Yes, through Rosemary-lane.

"What has been its effect?—Very little as respects the inhabitants of the courts; the landlords are not compelled, and do not go to the expense of making any communication from the courts to the sewer; the courts are in as wet and dirty and in as bad a condition as ever.

"What are the rents paid for these descriptions of tenements?—I am informed, very high rents. I am informed that this description of property pays a better per centage than any other description of property.—My impression is that it pays as much as 20 per cent. in many instances."

This evidence exhibits the common condition of large masses of habitations, even in the metropolis, where there are so many competing companies.

Mr. Mott states that, in Manchester,—

"There are numerous pumps and a plentiful supply of water within a few feet of the surface, to say nothing of the various tanks and cisterns in factories and private dwellings, which in this proverbially rainy district are always abundantly supplied; but, from the nature of the atmosphere, the rain-water is frequently like ink. The Irwell and Medlock rivers run through the town of Manchester; but being receptacles for all kinds of filth and refuse, the water is too impure for general use. In the suburbs of Manchester the water is generally procured through the medium of rain-water cisterns, or from very shallow wells by pumps. In the better class of houses it is generally filtered, but the poorer classes use it without any preparation. The custom is for owners of small cottage property to erect a pump for the use of a given number of houses; this pump is frequently rented by one of the tenants, who keeps it locked, and each of the other tenants are taxed a certain sum per month for the use of it. One poor woman told me she paid 1*s.* per month. The water company give a plentiful supply to small houses at 6*s.* per year, or about half what this woman paid for a precarious supply from the subscription pump. The Stockport Local Act empowers the commissioners of that town to *compel* the cottage owners to provide a good supply of water to their tenants."

Mr. John Moyle, medical officer of the Truro union, states—

"But few houses are properly supplied with water. In very dry seasons, they have to fetch water from a distance varying from a quarter to 1½ mile."

This is at present the condition of a large proportion of the houses in Hampstead, Highgate, and Hendon, where water is purchased by the pailful.

Mr. Daniel Antrobus, medical officer of the Audley district, Newcastle union, Staffordshire, says—

"They have seldom a good supply of water, are without *pumps*, and the occupants are obliged to obtain it from stagnant reservoirs or impure springs, situate often at a considerable distance."

Mr. Henry Cribb, the medical officer of the Dunmow union reports, as a circumstance which is highly injurious to the health,—

"The want of good and wholesome spring-water: there being scarcely any pumps for the use of the poor, they are compelled to use water collected from ditches; and I have known it frequently to be not only very impure, but almost in a putrid state."

The medical officer of the Bishop's Stortford union, states—

"I am of opinion that, in this and most of the rural parishes, complaints often arise from the want of good and wholesome spring-water, there being very few pumps, or even wells, and the poor being compelled to use water collected from ditches and other impure sources; this circumstance, connected with the very imperfect drainage, I think requires strict investigation."

Mr. Whilpels, the medical officer of the Lexden and Winstree union, states—

"There is a point I deem most worthy of notice, I allude to the deficiency of spring-water. The inhabitants of Salcot Virley and Great Wigborough are compelled to drink pond-water, which is impure, brackish, and most injurious to the constitution. The few who have

the means, send for water a distance of four miles; to obviate this evil would be a blessing conferred upon the great mass of the population residing in these parishes."

Mr. William Blower, surgeon of Bedford, states,—

"At Wootton (near Bedford) the labourers are very numerous, and before the passing the Poor Law Amendment Act the greater part of them were dependent for support upon the poor-rates. The land was enclosed and undrained, employment was scanty, and wages were very low; the water was very bad, the inhabitants being principally supplied from pits dug near their houses, and filled by rain in the winter, which in the summer, and particularly in dry seasons, were almost emptied by use and evaporation, leaving only a muddy fluid covered with a green scum, and loaded with aquatic animals and plants. Sporadic typhus prevailed extensively in the summer and autumn, and ague in the winter and spring.

"Since the introduction of the New Poor Law and the enclosure of the land, considerable draining has been effected, employment has been more plentiful, and the wages higher, and many of the labourers have allotments of ground. Typhus has been rapidly diminishing, and this year (1839) there was no case until November, and then only two. This must principally be attributed to the improved state of the parish, and partly, perhaps, this year, to the wetness of the season, by which the water-pits have been kept nearly full, so that the conditions favourable to the generation of malaria have not existed.

"A few wells have been dug lately, and good water has been obtained, and there is every probability if the water-pits were filled up, and more wells dug, and the draining completed, that sporadic typhus and ague, which have so long infested this village, and occasioned so much distress and expense, might be entirely eradicated. A respectable farmer informed me that, in the neighbouring parish of Houghton, a few years ago, his was the only family that used well-water, and almost the only one that escaped ague."

The state of the supplies of water to the labouring classes in Scotland appears to be similar to that prevalent in the towns and the rural districts of England.

Mr. William Tait, surgeon, of Edinburgh, states, in regard to the houses in the High-street, Cowgate, and Canongate:—

"The dwellings of the poor are remarkable for their generally uncomfortable appearance, and I attribute this in most instances to a deficient supply of water, necessaries, and such like conveniences. There are no receptacles for filth of any description, and it is either accumulated in the stairs or dwellings themselves, and the stairs are scarcely ever washed. And how can it be otherwise, seeing that the poor have to travel for a considerable distance for water, and afterwards carry it up five, six, or seven stories?"

The Return from Glasgow states that the—

"Sewers or drains are left uncovered, and with no diluting water except the refuse of families and rain-water."

That—

"There is no scarcity of water if carried into the poorer houses."

Dr. Alexander Cuddie, of Aberdeen, states that the—

"Water is plentiful; but it would be proper to bring it into the houses of the poor as well as the rich."

Mr. Forrest, in his report on the sanitary condition of the population of Stirling, states that in that town—

"The supply of water is often very deficient. There is no water-company, and the water is not conveyed into the houses even of the wealthy inhabitants. In times of scarcity it is no uncommon occurrence to see from 80 to 100 persons waiting at each public well for water; and the scarcity of it is often made an excuse by servants for the neglect of domestic duties. I may therefore with propriety say, that the poor of Stirling are often not properly supplied with water for the purposes stated in the query."

The *Rev. George Lewis,* the minister of St. David's parish, Dundee, in speaking of drainage, says that—

"Everything in this way is done very imperfectly; drains and sewers are insufficient, and run into the mill-pond."

That there is—

"No water, except what is purchased or taken out of the filthy mill-pond."

Another informant states—

"The west and south-west suburbs are destitute of water, and have no sewers; the north and east suburbs are also badly supplied with water, and have no drains. Indeed there are only two drains in the town that I know of, and I should think them rather hurtful than otherwise, as there is not water enough to scour them out."

In answer to the question, whether the residences of the population amidst which contagious febrile diseases arise are properly supplied with water for the purposes of cleanliness of the houses, person, and clothing? *Dr. John Macintyre,* of Greenock, states that—

"Their proprietors or landlords, with a few exceptions, have not properly supplied them with water, although an ample supply of that necessary aid to cleanliness can be cheaply obtained by means of pipes from the Shaws' Water Company."

Dr. James Sym states that—

"There are few wells of good water in Ayr. The water in general is strongly impregnated with lime, and the supply is defective. Strangers find it unpleasant, and I believe horses which have not been used with it are apt to suffer when it is given them to drink."

Mr. A. Cochrane and *Mr. W. J. Thomson,* surgeons, of Arbroath, state—

"That the town is well supplied with *hard* water, but that an abundant supply of soft water might be brought into the town with very little expense from a spring in the neighbourhood."

The Return from Renfrew states that—

"A plentiful supply of water may be had from the street wells, and also from a burn which runs close to the town."

Dr. Henry Douglas, of Dunfermline, says—

"They are *very inadequately* supplied with water for these purposes."

The return from Kirkwall, states—

"That water is supplied at public wells: there is no scarcity of water, but it is somewhat hard."

Dr. W. B. Ross, of Tain, in reply to the question whether the town is properly supplied with water? says—

"By no means; the water is very hard, and unfit for most domestic purposes."

Dr. S. Scott Alison, in his Report on the sanatory condition of the town of Tranent, furnishes an exemplification of the condition of many of the smaller towns:—

"I do not believe there is a house in Tranent into which water is conducted by pipes. There existed great difficulty on many occasions in getting water at all. During the seven years I lived there, the village was, on the whole, extremely ill supplied with water: it was usual for it to be occasionally absent from Tranent altogether. Last summer the supply of water was stopped for several months. The inhabitants suffered the greatest inconvenience from this cause; they could not get sufficient water to maintain cleanliness of person and clothes; it was even difficult for labouring people to get enough to cook their victuals; and I know that many of the poor were, in consequence, reduced to the practice of using impure and unwholesome water. On these occasions water was carried from a considerable distance from the village. Some went the distance of a mile; some used barrels drawn on carriages; some employed children to bring it in small vessels; and, I doubt not, many went without it, when it was highly necessary, from inability or infirmity to go themselves, and from want of funds to employ another for the purpose. Since the above was written I have learned from a lady, previously resident in Tranent, that, when cholera prevailed in that district, some of the patients suffered very much indeed from want of water, and that so great was the privation, that on that calamitous occasion people went into the ploughed fields and gathered the rain water which collected in depressions in the ground, and actually in the prints made by horses' feet. Tranent was formerly well supplied with water of excellent quality by a spring above the village, which flows through a sand-bed. The water flows into Tranent at its head, or highest quarter, and is received into about 10 wells, distributed throughout the village. The people supply themselves at these wells when they contain water. When the supply is small, the water pours in a very small stream only; and it happens, in consequence, that on these occasions of scarcity great crowds of women and children assemble at these places, waiting their 'turn,' as it is termed. I have seen women fighting for water. The wells are sometimes frequented throughout the whole night. It was generally believed by the population that this stoppage of the water was owing to its stream being diverted into a coal-pit which was sunk in the sand-bed above Tranent. That pit has been lined with sheets of iron, and the water has lately returned to Tranent in great abundance."

The observations made by *Mr. Burton,* in his Report, appear to be deserving of attentive consideration. He states—

"I have reason to believe that in many parts of Scotland the want of a good supply of water is one of the most material impediments to the furtherance of cleanly habits among the working people. Besides the immediate evils of a narrow supply, much time is wasted, and many bad habits are acquired by those who have to wait their turn at the wells in a time of drought. Dundee, Stirling, Dunfermline, Lanark, and Arbroath, are all, I believe, imperfectly supplied. The community of Dundee have spent about 30,000*l.* in a contest between the supporters of two contending water-bills; and I understand that an Act which was passed about three years ago has been found incapable of being put in operation. The evil is rendered more serious by the demand for cooling water for the numerous steam-engines, and the article is so precious that it is for these purposes repeatedly re-cooled by exposure and evaporation after it has been heated. I believe that in many of the colliery and manufacturing districts there is inconvenience, amounting to suffering, from want of water. Where there is a positive deficiency of the element on the spot, the means of procuring a supply from another place are so various and so dependent on local circumstances, that nothing but some arbitrary authority, possessed of sufficient funds, could ensure its being obtained in every instance."

On these and various reports from the medical officers and others in England, as well as from Scotland, in which it is stated in terms similar to the return from Renfrew, "that a plentiful supply of water *may be* had from the street wells, and also from a burn which runs close to the town," it is to be observed, that the economy of a town, or of any considerable collection of habitations, appears to be essentially defective, insofar as it leaves a large proportion of the inhabitants dependent on such a mode of supply.

Supplies of water obtained from wells by the labour of fetching and carrying it in buckets or vessels do not answer the purpose of regular supplies of water brought into the house without such labour, and kept ready in cisterns for the various purposes of cleanliness. The interposition of the labour of going out and bringing home water from a distance acts as an obstacle to the formation of better habits; and I deem it an important principle to be borne in mind, that in the actual condition of the lower classes, conveniences of this description must precede and form the habits. It is in vain to expect of the great majority of them that the disposition, still less the habits, will precede or anticipate and create the conveniences. Even with persons of a higher condition, the habits are greatly dependent on the conveniences, and it is observed, that when the supplies of water into the houses of persons of the middle class are cut off

by the pipes being frozen, and when it is necessary to send for water to a distance, the house-cleansings and washings are diminished by the inconvenience; and every presumption is afforded that if it were at all times requisite for them to send to a distance for water, and in all weathers, their habits of household cleanliness would be deteriorated. In Paris and other towns where the middle classes have not the advantage of supplies of water brought into the houses, the general habits of household and personal cleanliness are inferior to those of the inhabitants of towns who do enjoy the advantage. The whole family of the labouring man in the manufacturing towns rise early, before daylight in winter time, to go to their work; they toil hard, and they return to their homes late at night. It is a serious inconvenience, as well as discomfort to them to have to fetch water at a distance out of doors from the pump or the river on every occasion that it may be wanted, whether it may be in cold, in rain, or in snow. The minor comforts of cleanliness are of course forgone, to avoid the immediate and greater discomforts of having to fetch the water. In general it has appeared in the course of the present inquiry that the state of the conveniences gives, at the same time, a very fair indication of the state of the habits of the population, in respect to household, and even personal cleanliness. The *Rev. Whitwell Elwin,* the chaplain of the Bath union, gives the following illustration of the habits of many of the working population even in that city, which is well supplied with water:—

"A man had to fetch water from one of the public pumps in Bath, the distance from his house being about a quarter of a mile,—'It is as valuable,' he said, 'as strong beer. We can't use it for cooking, or anything of that sort, but only for drinking and tea.' 'Then where do you get water for cooking and washing?'—'Why, from the river. But it is muddy, and often stinks bad, because all the filth is carried there.' 'Do you then prefer to cook your victuals in water which is muddy and stinks to walking a quarter of a mile to fetch it from the pump?'—'We can't help ourselves, you know. We could not go all that way for it.' There are many gentlemen's houses in the same district in which the water is not fit for cooking; and I know that much privation and inconvenience is undergone to avoid the expense of water-carriage. I have often wondered to see the shifts which have been endured rather than be at the cost of an extra pail of water, of which the price was three halfpence. With the poor, far less obstacles are an absolute barrier, because no privation is felt by them so little as that of cleanliness. The propensity to dirt is so strong, the steps so few and easy, that nothing but the utmost facilities for water can act as a counterpoise; and such is the love of uncleanliness, when once contracted, that no habit, not even drunkenness, is so difficult to eradicate."

In most towns, and certainly in the larger manufacturing towns, those members of a family who are of strength to fetch water are usually of strength to be employed in profitable industry, and the mere value of their time expended in the labour of fetching water,

is almost always much higher than the cost of regular supplies of water even at the charge made by the water companies. In Glasgow the charge for supplying a labourer's tenement is 5*s.* per annum; in Manchester 6*s.* In London the usual charge is 10*s.* for a tenement containing two families, for which sum two tons and a half of water per week may be obtained if needed. For 5*s.* per annum, then, as a water-rate (on which from 10 to 20 per cent. is paid to the owner for collection), each labourer's family may be supplied in the metropolis with one ton and a quarter of water weekly, if they find it necessary to use so much. The ton is 216 gallons, equal to 108 pails full, at two gallons the pail. Thus for less than one penny farthing, 135 pails full of water are taken into the house without the labour of fetching, without spilling or disturbance, and placed in constant readiness for use. Under any circumstances, if the labourer or his wife or child would otherwise be employed, even in the lowest-paid labour or in knitting stockings, the cost of fetching water by hand is extravagantly high as compared with the highest cost of water lifted by steam and conducted through iron pipes at a large expenditure of capital (the lowest in London is about 200,000*l.*) and by an expensive management. In illustration of the difference in economy of the two modes of conveyance, I may mention that the usual cost of filtered water carried into the houses at Paris by the water-carriers, is two sous the pailful, being at the rate of 9*s.* per ton; whilst the highest charge of any of the companies in London for sending the same quantity of water to any place within the range of their pipes, and delivering it at an average level of 100 feet, at the highest charge, is 6*d.* per ton.

At the highest of the water companies' charges it would be good economy for the health of the labourer's family to pay for water being laid on in the house, to reduce the expense of medicines and loss of work in the family, as indicated by any of the tables of sickness. The cost of laying on the water in a labourer's tenement, and providing a butt or receptacle to hold it, may be stated to be on an average 40*s.*, which will last twenty years.

The experience of the water companies tends to show that the distribution of water directly into the houses where it is wanted, would be good economy of the water. When the supply of water into the houses is stopped by frost, and cocks are, on that occasion, opened in the streets, the supply of water required is one-third greater than usual; as great, indeed, as it is in the heat of summer, when there is a large additional consumption for watering gardens and roads. I would here suggest that it is essential that the water should be charged on the owners of all the smaller weekly tenements, because, where the owner finds it necessary to collect the rent weekly, the smaller collection of rates for longer periods would often be impracticable, and the expense

of the collection alone of such small rates weekly (1¼*d.* per week) would be more than the amount collected.

The mode of supplying water by private companies for the sake of a profit is not however available for the supply of a population, where the numbers are too small to defray the expense of obtaining a private Act of parliament, or the expense of management by a board of directors, or to produce profits to shareholders; it is, therefore, a mode not available to the population of the country who do not reside in the chief towns. The Poor Law Commissioners have been urgently requested to allow the expense for procuring supplies for villages to be defrayed out of the poor's rates in England, but they could only express their regret that the law gave them no power to allow such a mode of obtaining the benefit sought. The mode of supply by private companies is, however, the subject of complaint in the populous towns, where it is the only mode.

Although there is little probability that regular supplies of water would ever have been obtained without the inducement of salaries to the managers and of returns of interest to the capitalists; although the cost of most of the supplies at the highest is much lower than the labour of fetching water from a pump close to the house, and no valid objection appears against compulsory provisions for water being laid on (*i. e.* for existing charges of labour being reduced) in the tenements of the labouring classes in towns, at the common charge of the water companies: still the appearance of a profit and of dividends on the supply of a natural commodity does, in the new districts at least, furnish pretexts for the objection of the poorer owners and ignorant occupiers to the supposed expense of the improvement which consists in an immediate outlay. Apart from such objections, however, it is a mode of obtaining supplies attended with great inconveniences, which it is desirable to have considered with respect to new improvements. The payment of a dividend for an improved supply of such a commodity will be found as imperfect a measure, even of its pecuniary value, as it would be of the pecuniary value of a good and abundant supply of air and of the light of day. There are numerous indirect effects of the use of such a commodity, of which a pecuniary estimate cannot conveniently be made, as against an immediate outlay. For example, there is little ground left for doubt that the effect of street and house cleansing by means of the supplies of water needed in the worst districts, would occasion considerable reductions in the pecuniary charge of sickness on the poor's rates, but it would be extremely difficult to obtain these results in money to make up, with any pretence to accuracy, a profit and loss account as an undertaking for the outlay. The evidence afforded by the creation and success of a private company proves only that a certain class of persons so far appreciate the advantages of the supply as to be willing to incur such an immediate expense as will

cover the cost, and yield a profit to the undertakers; it proves nothing as to the intrinsic value of the service or the commodity, which may be immense to the bulk of the community, and yet not one be found ready to volunteer to defray a portion of the expense. But the expense of the machinery of water companies, as already stated, is disproportioned to the means of the smaller towns and to a large part of the country; and generations may pass away amidst filth and pestilence before the scientific means and the economy of prevention can be appreciated by them. And there are further objections made in towns to the mode of supply itself. One is, that it creates strong interest against all improvements in the quality or the supplies of water; for every considerable improvement creates expense, which is felt in diminution of the dividends of the private shareholders; and so long as a majority of the rate-payers are content with bad water, or deem it hopeless to seek to obtain water of a superior quality, so long as any public clamour will not endanger the dividends, it appears that no amendment entailing considerable expense can be expected. Even where there are convenient unappropriated streams, and a wide field is afforded for competition by a very populous district, the competition of different companies does not necessarily furnish to the individual consumer any choice or amendment of the supplies.

The competition frequently absorbs the profit on the funds that might be available to the competing parties (supposing them disposed to carry out any plans other than those which have for their object the cheapest supply that can be procured), and does not reduce the charge of the supply of water to the public. At one time there were three sets of water-pipes belonging to three different companies passing through the same streets of a large proportion of the metropolis. This wasteful competition of three immense capitals sunk in the supply of one district, for which the expenditure of one capital and one establishment would have sufficed, ended in an agreement between the competing companies to confine themselves to particular districts. The dividends at present obtained by the shareholders of the chief companies in the metropolis on the capital now employed, appears, however, to be only 4, 5, or 6 per cent., but this is on several expensive establishments and sets of officers, which appear to admit of consolidation. The committee of the House of Commons which investigated the subject of the supplies of water in 1821, concluded by recommending a consolidation of the several trusts, but excepting that the competition between them has abated, the expense and waste of separate establishments is still continued, and beyond this the expense of the fixed capital and establishment, charged upon perhaps one-third the proper supply of water.

The private companies are also complained of as being practically irresponsible and arbitrary, and unaccommodating towards individuals. It is a further subject of complaint, as respects supplies by such companies, that they are directed almost exclu-

sively to the supplies of such private houses as can pay water-rates; that they are not arranged for the important objects of cleansing of the streets or drains, or of supplying of water in case of fire. I have not been able to observe the extent of foundation for these complaints. Whilst no strong motive for aggressive proceedings by the companies against individuals appears, the existing force of the following statement made by the Committee referred to, which sat in 1821, will be admitted:—

"The public is at present without any protection, even against a further indefinite extension of demand. In cases of dispute, there is no tribunal but the boards of the companies themselves to which individuals can appeal; there are no regulations but such as the companies may have voluntarily imposed upon themselves, and may therefore revoke at any time, for the continuance of the supply in its present state, or for defining the cases in which it may be withdrawn from the householder. All these points, and others of the same nature, indispensably require legislative regulation, where the subject matter is an article of the first necessity, and the supply has, from peculiar circumstances, got into such a course that it is not under the operation of those principles which govern supply and demand in other cases."

Since the period of that report, there has been no legislation on the subject other than that in new Acts, or on the renewal of old ones, clauses have been introduced empowering any individual rate-payer to demand a supply of water.

In some instances legislative permissions have been given to the local authorities to obtain supplies for the use of towns, but the permissions have not been accompanied with the requisite powers to make them available.

Bath, however, is supplied with water under the authority of the local Act of the 6 Geo. III. (c. 70), for paving, &c. which, after reciting that there was a scarcity of water within the city and precincts, and that there were in the neighbourhood of the said city several springs of water belonging to the corporation, enacts that the corporation shall have full power to cause water to be conveyed to the said city from such springs, and gives them authority to enter upon and break up the soil of any public highway, or common, or waste ground, and the soil of any private grounds within two miles of the city, and the soil or pavement of any street within the city, in order to drain and collect the water of the springs, and to make reservoirs sufficient for keeping such water, and to erect conduits, water-houses, and engines necessary for distributing it, and to lay under ground aqueducts and pipes most convenient for the same purpose. The Act vests the right and property of all water-courses leading from the said springs to the city, and also of all reservoirs, conduits, water-houses, and engines, erected or used for the purpose, in the mayor, aldermen, and citizens of Bath. The following extract from a communication from the *Rev. Whitwell Elwin*, who has closely investigated the economy of the poorest classes in that city, thus describes the present state of the supply:—

"Bath is surrounded by hills which pour down a vast quantity of water into reservoirs. Pipes are laid from these reservoirs to every part of Bath, and as the springs from which the water originally rises are as high up on the hills as the roofs of the houses, water can be carried into the attics without the application of a forcing pump: thus no machinery is employed. The only water-works are the pipes which convey the water.

"These reservoirs are the property of different persons, and there are five distinct parties by which particular districts in Bath are supplied. They are the Bath Corporation, the Freemen's Company, the Circus Company, the Duke of Cleveland, and Captain Gunning. There can scarcely be said to be any competition, because the possession of a spring in a particular locality gives a monopoly of the surrounding neighbourhood. But wherever there is room for selection, the supply of the corporation is always preferred. It is often resorted to even where the distance is much greater than to other springs; the supply being more regular, more abundant, and cheaper than the rest, with the exception of that of the Duke of Cleveland, who only provides his own tenants. The corporation supplies more than three parts of the town. There are at present 2184 persons paying water-rates, but the number of houses furnished with water is considerably greater, because courts and rows of cottages have frequently a common cistern. Where this is the case each cottage making use of the cistern pays a rent of 10*s.* a-year, and where the house has a cistern of its own, 20*s.* a-year. The charge for the water is in proportion to the rent of the house. The quantity of water supplied is about a hogshead a-day. In summer, when the springs are low, the quantity is not so great. The laying down and repair of the feather, that is the pipe which branches from the main pipe, is at the cost of the tenant.

"In addition to these private supplies the corporation provides five public pumps, which are open to all the inhabitants free of expense.

"The greater part of the cottages in the town itself, but not in the suburbs, make use of the water-works. There is generally a pump in addition, which yields water too hard and bad for domestic purposes.

"The water rents of the corporation for the last year were 3,233*l.* 2*s.*, the expenses (including salaries, rent for springs, repairs of pipes) 449*l.* 3*s.* 3*d.*, thus leaving a profit of 2,783*l.* 18*s.* 9*d.* This sum is applied to the reduction of the borough rate.

"The advantages of this system over private companies appear to me great and incontestable. Here are no expenses for solicitors, or litigation between rival concerns; no collusion between coalescing companies to raise the charges to the utmost amount that the inhabitants will bear; no exorbitant salaries to the variety of officers, which every separate establishment demands. A few watermen, whose united salaries are only 114*l.* 8*s.* per annum, is the sole addition to the ordinary corporation machinery. When to this we add that all the profits are for the benefit of the town and not for individuals—that the sum paid in water-rate is thus pretty nearly deducted from the borough rate—we can

hardly hesitate to strike the balance. The corporation management, here at least, gives unlimited satisfaction. They are under the direct control of the rate-payers, properly desirous to conciliate their opinion, and are sure to hear of any incivility, which, as they have no interest in protecting it, they are always ready to redress."

In this instance, however, it is to be observed that the real cost of the water to the corporation is not more than one-seventh their charge to the consumer; consequently, the charge for a supply out of the house may be said to be less than 1*s.* 6*d.* per annum; and it will admit of little doubt that if the water were lifted by steam power and carried into every tenement, as it might be, the actual expense need not be doubled; six-sevenths then of the charge, which is about the same as the ordinary charges of water companies, is to be considered as a borough rate, levied in the shape of a water rate, applied doubtless to some other proper public services.

An example is presented in Manchester of the practicability of obtaining supplies for the common benefit of a town without the agency of private companies. In that town gas has for some years past been supplied from works erected and conducted not by the municipality but by a body appointed under a local Act by an elected committee of the ratepayers. This mode of supplying the town was, it appears, violently opposed by private interests; but I am informed that the supplies of gas are of as good or even of a better quality, and cheaper than those obtained from private companies in adjacent towns; that improvements in the manufacture of the gas are more speedily adopted than in private associations, and the profits are reserved as a public fund for the improvement of the town. Out of this fund a fine Town Hall has been erected, whole streets have been widened, and various large improvements have been made; and the income now available for the further improvement of the town exceeds 10,000*l.* per annum, after providing for the expense of management and the interest of the sinking fund on the money borrowed. There are now in the same districts in the metropolis no less than three immense capitals sunk in competition,—three sets of gas-pipes passing through the same streets, three expensive sets of principal and subordinate officers where one would suffice, comparatively high charges for gas to the consumers, and low dividends to the shareholders of the companies in competition. Where a scientific and trustworthy agency can be obtained for the public, manifest opportunities present themselves for considerable economy on such modes of obtaining supplies. A proposal was made in Manchester to obtain supplies of water for the town in the same manner as the supplies of gas, but the owners of the private pumps, who, it is stated, have the monopoly of the convenient springs, and exact double the charge for which even private companies are ready to convey supplies into the houses, made a compact and effectual opposition to the proposal, contending that the supplies of rain-water (which are sometimes absolutely black with the soot held in suspension), together with that from the springs was sufficient, and the proposal was defeated. These petty interests could not, however, avail against the more powerful interest of a joint-stock company, which was established to procure supplies for the middle and wealthier classes of the town.

There appears to be no reason to doubt that the mode of supplying water to Bath and gas to the town of Manchester might be generally adopted in supplying water to the population. Powers would be required to enter into the lands adjacent to the towns on a reasonable compensation to the owners to obtain supplies of water; and, as the management of water-works requires appropriate skill, it would be necessary to appoint an officer with special qualifications for their superintendence. Ordinary service may be obtained for the public, if recourse be had to the ordinary motives by which such service is engaged in private companies. It is not mentioned invidiously, but as a matter of fact, that the majority, not to say the whole, of such undertakings by joint stock companies, are, in the first instance, moved by a solicitor, or engineer, or other person, for the sake of the office of manager of the works, and that the directors and shareholders, and the inducement of profit to them, through the benefit undoubtedly to the public, are only the machinery to the attainment of the object for which the undertaking is primarily moved. If competent officers be appointed and adequately remunerated for the service, there can be little doubt that the public may, as at Bath and Manchester, be saved the expense of the management by the occasional attendance of unskilled directors, and that they may save the expense of dividends, or apply the profits to public improvements, as at Manchester, and moreover avoid the inconveniences and obstructions undoubtedly belonging to the supply of a commodity so essential to the public health, comfort, and economy, by a private monopoly. Bad supplies of water would, I apprehend, generally be less tolerated by the influential inhabitants of all parties from a public municipal agency than from a private company.

Another ground for the recommendation that supplies of water for the labouring classes should be brought under some public authority, is that some care may be taken to prevent the use of unwholesome supplies.

The queries transmitted to the medical officers were directed to ascertain the sufficiency of the supplies for the purpose of cleansing, but the returns frequently advert to the bad effect of inferior supplies upon the health of the population; and it is scarcely conceivable to what filthy water custom reconciles the people. Yet water containing animal matter, which is the most feared, appears to be less frequently injurious than that which is the clearest, namely, spring-water, from the latter being oftener

impregnated with mineral substances; but there are instances of ill health produced by both descriptions of water. The beneficial effects derived from care as to the qualities of the water is now proved in the navy, where fatal dysentery formerly prevailed to an immense extent, in consequence of the impure and putrid state of the supplies; and care is now generally exercised on the subject by the medical officers of the army. In the Dublin Hospital Reports, for example, we have the following statement, which is still more important, as showing the extent to which the nature of the water influences health:—

"Dr. M. Barry affirms that the troops were frequently liable to dysentery, while they occupied the old barracks at Cork; but he has heard that it has been of rare occurrence in the new barracks. Several years ago, when the disease raged violently in the old barracks, (now the depôt for convicts,) the care of the sick was, in the absence of the regimental surgeon, entrusted to the late Mr. Bell, surgeon, in Cork. At the period in question the troops were supplied with water from the river Lee, which, in passing through the city, is rendered unfit for drinking by the influx of the contents of the sewers from the houses, and likewise is brackish from the tide, which ascends into their channels. Mr. Bell, suspecting that the water might have caused the dysentery, upon assuming the care of the sick, had a number of water-carts engaged to bring water for the troops from a spring called the Lady's Well, at the same time that they were no longer permitted to drink the water from the river. From this simple, but judicious arrangement, the dysentery very shortly disappeared among the troops."—*Dublin Hospital Reports*, vol. iii. 11. Paper by Dr. Cheyne "On Dysentery."

Parent du Chatelet, the most industrious and able of modern investigators into questions of public health, gives the following instance, which in like manner demonstrates the amount of disease generated solely by the use of bad water, as well as the difficulty of detecting the specific effects produced by it:—

"When I visited last year the prisons of Paris with my friend Villermé, who was interested in prisons generally, I was extremely surprised at the proportion of sick in the hospital of St. Lazarus, relatively to the whole population of the prisons. The prison, uniting all the conditions necessary to health as regards its position, construction, the dress and food of the prisoners, who were constantly kept at work, how explain the much greater proportion of sick to what we remark in other prisons of a bad condition, and in which are found united all the apparent causes of unhealthiness?—This, I must confess, has baffled all calculation, and has driven every one to say that there must be a cause for the peculiarity, but that it could not be discovered. I do not despair to have hit upon that cause, and I believe it is to be recognised in the nature of the water drunk by the prisoners. Having tasted it in the wooden reservoir behind the house, which was in bad order, and full of plants of the genus confervæ, I found it had a detestable and truly repulsive taste, a circumstance which does not appear to have been hitherto remarked. Might not the cause, then, be detected in the chemical nature of the water of Belleville and of the neighbourhood of St. Gervais, of which the prisoners drink exclusively? What proves it is the striking resemblance which exists in this respect between the water of Belleville and that in the wells of the entrance-court of the hospital of the Salpêtriere, which both contain a very great proportion of sulphate of lime, and other purgative salts. Now the venerable Professor Pinel and his pupil Schwilgué have remarked for more than 20 years the influence that the water of the wells of which I speak has upon the portion of the population of the hospital who make use of it, and they believe that certain affections connected evidently with locality cannot be attributed to any other cause, and particularly the disposition to chronic diarrhœa which is so often observed in this hospital. It turns out upon examination *that the greater part of the sick who fill the infirmary of the prison of St. Lazarus are brought there for illnesses of the same identical nature.* In the prison they are obliged to have recourse to the water of the Seine to cook the vegetables and other food, an evident proof of the truth, or at least the probability, of all I have just advanced."

In the metropolis the public owes the analysis of the supplies of water and some improvement of supplies not in their nature essentially bad, chiefly to the stirring of speculators in rival companies. But the population of the rural districts, and of the smaller towns, afford no means for the payment of companies, still less any field for pecuniary competition. As in the cases cited, it is to be feared that the knowledge gained for the safety of the health of the soldiers and the prisoners was not proclaimed for the protection of the bulk of the poorest population, who, under existing arrangements, only receive care in the shape of alleviations, when the suffering from disease is attended by the destitution which establishes the claim to relief. The middle classes are exposed to the like inconveniences, and put up with very inferior water, whilst supplies of a salubrious quality might be obtained by extended public arrangements for the common benefit.

It will not be deemed necessary to attempt to develope all the considerations applicable to the subject; and I confine myself to the representation of the fact,—That there is wide foundation for the complaint that proper supplies of water to large portions of the community are extensively wanting—that those obtained are frequently of inferior quality—that they are commonly obtained at the greatest expense when obtained by hand labour—that the supplies by private companies, though cheaper and better, are defective, and chiefly restricted to the use of the higher and middle classes, unless in such inconvenient modes (*i. e.* by cocks in courts), as seriously to impede the growth of habits of cleanliness amongst the working classes. To which I venture to add, as the expression of an opinion founded on communications from all parts of the kingdom, that as a highly important sanitary measure connected with any general building regulations, whether for villages or for any class of towns, arrangements should be made for all houses to be supplied with good water, and should be pre-

scribed as being as essential to cleanliness and health as the possession of a roof or of due space; that for this purpose, and in places where the supplies are not at present satisfactory, power should be vested in the most eligible local administrative body, which will generally be found to be that having charge of cleansing and structural arrangements, to procure proper supplies for the cleansing of the streets, for sewerage, for protection against fires, as well as for domestic use.

Sanitary Effect of Land Drainage.

In considering the circumstances external to the residence which affect the sanitary condition of the population, the importance of a general land drainage is developed by the inquiries as to the causes of the prevalent diseases, to be of a magnitude of which no conception had been formed at the commencement of the investigation: its importance is manifested by the severe consequences of its neglect in every part of the country, as well as by its advantages in the increasing salubrity and productiveness wherever the drainage has been skilful and effectual. The following instance is presented in a report from *Mr. John Marshall, Jun.*, the clerk to the union in the Isle of Ely:—

"It has been shown that the Isle of Ely was at one period in a desolate state, being frequently inundated by the upland waters, and destitute of adequate means of drainage; the lower parts became a wilderness of stagnant pools, the exhalations from which loaded the air with pestiferous vapours and fogs; now, by the improvements which have from time to time been made, and particularly within the last fifty years, an alteration has taken place which may appear to be the effect of magic. By the labour, industry, and spirit of the inhabitants, a forlorn waste has been converted into pleasant and fertile pastures, and they themselves have been rewarded by bounteous harvests. Drainage, embankments, engines, and enclosures have given stability to the soil (which in its nature is as rich as the Delta of Egypt) as well as salubrity to the air. These very considerable improvements, though carried on at a great expense, have at last turned to a double account, both in reclaiming much ground and improving the rest, and in contributing to the healthiness of the inhabitants. Works of modern refinement have given a totally different face and character to this once neglected spot; much has been performed, much yet remains to be accomplished by the rising generation. The demand for labour produced by drainage is incalculable, but when it is stated that where sedge and rushes but a few years since we now have fields of waving oats and even wheat, it must be evident that it is very great.

"On reference to a very perfect account of the baptisms, marriages, and burials, in Wisbech, from 1558 to 1826, I find that in the decennial periods, of which 1801, 1811, and 1821, were the middle years, the baptisms and burials were as under:—

	Baptisms.	Burials.	Population in 1801.
1796 to 1805	1,627	1,535	4,710
1806 to 1815	1,654	1,313	5,209
1816 to 1825	2,165	1,390	6,515

"In the first of the three periods the mortality was 1 in 31; in the second, 1 in 40; in the third, 1 in 47; the latter being less than the exact mean mortality of the kingdom for the last two years. (*See Registrar-general's Second Report, p. 4, folio edition.*) These figures clearly show that the mortality has wonderfully diminished in the last half century, and who can doubt but that the increased salubrity of the fens produced by drainage is a chief cause of the improvement."

Mr. R. Turner, medical officer of the Newhaven union, states,—

"The district which has been under my care comprises five parishes, three of which, viz., Kingston, Iford, and Rodmell, are (more especially the two latter) situate in close proximity to marshes, which were formerly for a considerable portion of the year inundated; of late very extensive improvements have taken place in the drainage of these levels, and in consequence of that change, the diseases constantly engendered by marsh miasmata, viz., typhus and intermittent fevers, are not more common than in other districts which present to the eye a fairer prospect of health."

Mr. G. R. Rowe, medical officer of the Ongar union, observes,—

"It is worthy of remark, that in the districts surrounding Chigwell no malignant, infectious, or contagious disease has appeared during my experience of thirty years' occasional residence, and even during the prevalence of cholera not one case occurred. The land is well drained, the situation elevated, and the cleanly habits of the poor, with the benevolence of its residents, have tended much to the prevention of disease, and its amelioration when occurring."

Mr. W. Sanders, medical officer of the Gravesend and Milton union, states,—

"I beg leave to suggest how extreme are the beneficial effects of a proper drainage, which shall prevent stagnant water, and its deleterious consequences, accumulating in crowded neighbourhoods. This is exemplified in this town, and also in Tilbury Fort opposite, which is built on a marsh, and where, during the cholera period, then under my care, not a single case occurred."

Mr. Emerson, one of the medical officers of the Eastry union, states,—

"There is, I believe, no locality which has been for some years so exempt from fevers of a malignant and contagious character as the eastern coast of Kent. Accordingly, idiopathic fever, under the form of synochus and typhus, very rarely occurs, and when it does appear, is generally of an isolated kind. Intermittents, also, which fifteen or twenty years since were so generally prevalent in this district, have become comparatively of rare occurrence, and indeed have almost disappeared from the catalogue of our local endemics. This exemption from ague and other febrile epidemics of an infectious nature may be justly imputed to the total absence of malaria, and of all those causes which

usually generate an unwholesome and contaminating atmosphere, viz., from the whole district being secured from inundations by the most complete and effectual system of drainage and sewerage. Also, from the exposed state of the country favouring a free and rapid evaporation from the surface of the soil."

Mr. George Elgar, another of the medical officers of the Eastry union, observes that,—

"The parishes forming the fifth district of the Eastry union, are, with one or two exceptions, close to marshes separating the Isle of Thanet from this portion of East Kent, and consequently, during the spring and autumn, the inhabitants are exposed to the malaria therefrom; but for these last few years, owing to the excellent plan of draining, very few diseases have occurred (in my opinion) that can be said to be produced by malaria. There is very little ague, scarcely any continued fevers; and a case of typhus, I believe, has not been known along the borders of the marshes for these last three or four years. Some years back, a great portion of the parishes adjoining these marshes was under water from the end of autumn to the early part of the following spring; then, agues and fevers of all characters prevailed to a very great extent. Although the malaria does not produce diseases of any *decided character*, yet, during a wet spring or autumn, there are always cases of inflammation of the lungs or bowels, and rheumatism, both in acute and chronic forms. The houses in general are good, well drained and well ventilated, having one or two sitting-rooms, as many bed-rooms, sometimes more, scullery, &c., and convenient receptacles for refuse and fuel. The cottages generally are *extremely cleanly;* of course there must be some exceptions, where the occupiers would not be clean and careful under any circumstances."

Mr. Spurgin, the medical officer of the Dunmow union, states—

"In this district great attention is paid to the cultivation of land, under drainage being much attended to, on which account partly we are not exposed to malaria, neither does ague prevail to any extent. A few cases have occurred, and when they have it has been for the most part in individuals whose systems have been impaired by irregular habits, and consequently the more readily affected by external impressions, as atmospheric vicissitudes."

Mr. D. R. M'Nab, the medical officer of the Epping union, states that—

"The health of the inhabitants of these two parishes is on the whole highly satisfactory, as will appear by this return, but I would observe that the sanitary condition of two localities would be greatly improved by a little attention on the part of the public surveyors and others to the drains and ditches immediately abutting on the dwellings of the poor inhabitants. I refer more especially to that part of Epping which is denominated the Back-street, and the greater part of which is in the parish of Coopersall. In very wet weather the drains and ditches are flooded; in very dry, on the contrary, they are by the evaporation of the fluids rendered very offensive, and thus almost all our cases of malignant fever are situated amongst those dwellings; if the neighbourhood had been crowded with inhabitants the mischief would have been much greater;

and even as it now is, it has been the cause of much fatality among the able-bodied men and women. The same observations are applicable to Duck-lane in the parish of Weald, and also at the Gullett, but in the latter case it is principally owing to the carelessness and filth of one or two families, who have thrown all sorts of excrementitious substances around their dwellings, and in the course of putrefaction it has occasionally become pestiferous.

"I may also venture to add the following observation, after twenty-six years' practice in this neighbourhood, that I have scarcely ever had a case of typhus fever in a malignant form without discovering some stagnant drain or overcharged cesspool, or some other manifest cause of malaria in the immediate residence of the patient."

In the reports given from the parish ministers in the statistical accounts of Scotland, the effects of drainage upon the general health of the population are strongly marked in almost every county, expressed in notes made from an examination of the returns. Sutherland—parish of *Rogart,* "healthy, and a good deal of draining." *Farr,* "subject to no particular disease; a deal of draining." Ross and Cromarty—*Alness,* dry and healthy, "climate improved by drainage." It is to be understood that drainage appears to form the essential part of agricultural improvement, which is connected with the improvement of health. Thus the notes from another parish in the same county, *Kilmuir Wester* and *Suddy,* states it as "healthy; great improvement; scarcely an acre in its original state." *Rosemarkie,* "healthy; agriculture much improved." Elgin—*New Spynie,* "healthy, much waste reclaimed, much draining." *Alves,* "dry and healthy, well cultivated, wood sometimes used for drains." Banff—*Deckford,* healthy, and people long lived, much draining." Kincardine—*Fordoun,* "so much draining that now no swamps: formerly, agues common, now quite unknown." Angus—*Carmylie,* "health improved from draining." Kinross—*Kinross,* "agues prevalent sixty years ago in consequence of marshes, now never met with." *Oswell,* "ague prevailed formerly, but not since the land was drained." Perth—*Methven,* "the north much improved by draining." *Redgorton,* "healthy; no prevailing disease; ague was frequent formerly, but not since the land has been drained and planted." *Moneydie,* "healthy; an immense improvement by draining." *Abernyte,* "since the land was drained, scrofula rare and ague unknown." *Monzie,* "healthy; a good deal of land reclaimed." *Auchterarder,* "much draining, and waste land reclaimed—climate good." *Muckhart,* "great improvement in agriculture; ague formerly prevalent—not so now." *Muthill,* "healthy, much draining and cultivation extended." And similar statements are made from the rural districts in all parts of the country.

In the course of inquiries as to what have been the effects of land drainage upon health, one frequent piece of information received has been that the rural population had not observed the effects on their own health, but they had marked the effects of drainage on the

health and improvement of the stock. Thus the less frequent losses of stock from epidemics are beginning to be perceived as accompanying the benefits of drainage in addition to those of increased vegetable production.

Dr. Edward Harrison, in a paper in which he points out the connexion between the rot in sheep and other animals, and some important disorders in the human constitution, observes:—

"The connexion between humidity and the rot is universally admitted by experienced graziers; and it is a matter of observation, that since the brooks and rivulets in the county of Lincoln have been better managed, and the system of laying ground dry, by open ditches and under-draining, has been more judiciously practised, the rot is become far less prevalent. Sir John Pringle informs us, that persons have maintained themselves in good health, during sickly seasons, by inhabiting the upper stories of their houses; and I have reason to believe that, merely by confining sheep on high grounds through the night, they have escaped the rot."

Dr. Harrison makes some observations on the effects of imperfect drainage in aggravating the evils intended to be remedied, of which frequent instances are presented in the course of this inquiry:—

"A grazier of my acquaintance has, for many years, occupied a large portion of an unenclosed fen, in which was a shallow piece of water that covered about an acre and a half of land. To recover it for pasturage, he cut in it several open ditches to let off the water, and obtained an imperfect drainage. His sheep immediately afterwards became liable to the rot, and in most years he lost some of them. In 1792 the drains failed so entirely, from the wetness of the season, that he got another pond of living water, and sustained, in that season, no loss of his flock. For a few succeeding years, he was generally visited with the rot; but having satisfied himself by experience, that whenever the pit was, from the weather, either completely dry or completely under water, his flock was free from the disorder, he attempted a more perfect drainage, and succeeded in making the land dry at all times. Since that period he has lost no sheep from the rot, though, till within the last two years, he continued to occupy the fen. * * *

"Mr. Harrison, of Fisherton, near Lincoln, has by judicious management laid the greatest part of his farm completely dry, and is now little troubled with the rot, unless when he wishes to give it to some particular animals. His neighbours, who have been less provident, are still severe sufferers by it, nor are their misfortunes confined to sheep alone. Pigs, cows, asses, horses, poultry, hares, and rabbits, become rotten in this lordship, and have flukes in their livers. * * * *

"The late Mr. Bakewell was of opinion, that after May-Day, he could communicate the rot at pleasure, by flooding, and afterwards stocking his closes, while they were drenched and saturated with moisture. In summer, rivers and brooks are often suddenly swollen by thunder-storms, so as to pass over their banks, and cover the adjacent low lands. In this state, no injury is sustained during the inundation; but when the water returns to its former channel, copious exhalations are produced from the

swamps and low lands, which are exceedingly dangerous to the human constitution, and to several other animals, as well as sheep. * *

"A medical gentleman of great experience at Boston, in Lincolnshire, and who is considerably advanced in life, has frequently observed to me, that intermittents are so much diminished in his circuit, that an ounce of the cinchona goes further at this time in the treatment of agues than a pound of it did within his own recollection. During his father's practice at Boston, they were still more obstinate and severe. For my own part, I have declared, for several years, in various companies, that marsh miasmata are the cause of both agues and the rot. And as miasmata are admitted, by the concurring testimonies of medical practitioners in every part of the globe, to be produced by the action of the sun upon low, swampy grounds, I hope this interesting subject will be fully investigated, and effectual plans carried into execution, for the preservation of man, and of the animals which are so useful to him."

I may here mention a circumstance which occurred at the Poor Law Commission Office, and which with succeeding information tended to direct our attention to the subject of sanitary measures of prevention for the protection of the rates. A medical officer of one of the Unions who came to town for the transaction of some business before the Board, begged to be favoured by the immediate despatch of his business, inasmuch as, from a change of weather which had taken place since his departure, he was certain that he should have a number of cases waiting for him. On being asked to explain the circumstances from which he inferred the occurrence of disease with so much certainty, he stated that within his district there was a reservoir to feed a canal: that they had let out the water as they were accustomed to do in spring time for the purpose of cleansing it; and that whenever such weather occurred as then prevailed during the process, he was sure to have a great number of fever cases amongst the labourers in the village which immediately adjoined the reservoir. It appeared to be, in fact, a case in which the rot was propagated amongst the labourers in the village under circumstances similar to those before cited in which it was propagated amongst the sheep.

The following portions of evidence afford instances of the condition in which a larger proportion of the country remains, from the neglect of general land drainage, than would be conceived from any *à priori* estimate of the amount of prevalent intelligence and enterprize.

Mr. R. W. Martyr, one of the medical officers of the Langport union, thus describes the condition of a large proportion of his district:—

"The parishes of Kingsbury and Long Sutton being the district No. 1 B of the Langford union, the population of which amounts to above 3,000; Kingsbury, containing 2,000; and Long Sutton 1,000, or thereabouts. Both these parishes are partly surrounded by low meadow land, and are liable to frequent inundations, often covering many

thousand acres, and sometimes to a great depth; the level of much of this land being below the bed of the main river or drains, makes it very difficult (when once inundated) in very wet seasons to drain or carry off the immense body of water they often contain.

"These inundations are caused by the banks of the main rivers not being sufficiently strong or elevated, and from the bridges not being capacious enough to carry the immense body of water brought down from the neighbouring hills and country higher up, which, in heavy rains, sometimes takes place so rapidly as to completely overflow the banks in twenty-four hours; but besides the casual or accidental giving way of the banks of the rivers, it is sometimes done by interested persons for the purpose of warding off the mischief from themselves by throwing it on their neighbours.

"When these floods occur in the winter season, and there is but little herbage, or early in the spring, and are followed by dry weather, the surface of the ground becomes dry and healthy, and they are then highly beneficial to the land, and but little prejudicial to the health of the surrounding inhabitants; but when, as is sometimes the case, these floods take place late in April, May and June, and cover hundreds of acres of hay, some cut and some uncut, and which must of course rot on the ground, the affluvia and stench is then often unbearable, and highly prejudicial to the health of the neighbouring villages, and it is sometimes years before the land recovers its healthy state, producing nothing but rank herbage, and causing agues, fevers, dysentery, and numerous other diseases. Many of these evils may, I think, be remedied if the owners of large estates in this neighbourhood would interest themselves in the matter: I am persuaded the increased value of their property would amply repay the outlay necessary for the purpose. When the land is in this unhealthy state, it appears to be equally prejudicial to the animal as the human subject, producing numerous diseases among cattle, particularly among sheep, many farmers losing the whole of their flocks.

"Although much remains to be done to remedy the mischief complained of, yet a considerable improvement has taken place within the last twenty years by enclosing many of the large commons, and by that means partially draining them; and also by enlarging the back drains which carry the water to a lower level into the main river, by which means it is carried off much sooner, and less mischief is done, than if it remained longer on the surface of the land.

"It is stated in a very old history of Somerset, that about 300 years ago, nearly the whole of the inhabitants of Kingsbury, Muchelney, and Long Load, were carried off by a pestilence (without doubt meaning a malignant fever); and that for many years afterwards it was considered so unhealthy that it was inhabited solely by outlaws, and persons of the worst character, a clear proof the country is in a much healthier state now than it was in former times.

"In addition to the more general causes of disease arising from the flat state of the country, and its liability to inundations, are many others of a more local character, and much easier of removal, in the village of Kingsbury; and in many others there are numerous pits or ponds in the winter season filled with muddy water, and, in summer, mud alone: these are often situated in the front or at the back of the cottages, and are receptacles for all manner of filth, and in certain seasons are productive of very serious diseases, and at all times highly injurious to health. Besides the mud pits above mentioned, there is scarcely a cottage that is not surrounded with all manner of filth, oftentimes close to the doors of the inhabitants, very few of the cottages being provided with privies, or if there be any, they only add to the general nuisance from being open and without drains."

Mr. Oldham, the medical officer of the Chesterfield union, gives the following account of his district:—

"Wessington is situated upon an elevation, but the houses are arranged around a green or unenclosed common, upon the surface of which are a great number of small pools, which, for the most part, are stagnant. In the winter season they overflow, and at this season the neighbourhood appears less infected with fever. In the summer months, and greater part of the spring and autumn, they are stagnant, and undoubtedly a fruitful source of malaria; indeed the neighbourhood of Wessington is scarcely ever free from fever at these seasons of the year.

"It perhaps may not be amiss to mention, I have attended a number of persons in the neighbourhood of this common who have been attacked with fever, who were at the same time well fed, and lived in comfortable and tolerably well-ventilated houses."

He then adduces instances, and proceeds—

"From the facts before mentioned, I am led to conclude that the decomposition constantly going on in these small pools is the source of the malaria, and that the malaria so engendered propagates fever. 1st. Because there are cases of fever in this locality nearly all the year. 2d. Because paupers, and persons who are better fed, and live in more comfortable and better ventilated houses in the neighbourhood of this green or common, are attacked with the disease, and, I may say, almost indiscriminately. 3d. Because during the years I have attended the paupers of the district, there has scarcely been a case of fever in the winter season when the pools are overflowed, and the atmosphere is colder, and consequently unfavourable to fermentation and decomposition. In my opinion the only method to remedy this evil would be to drain the common, which is small, and its situation being elevated, would greatly facilitate its drainage. The condition of a few of the smaller and more confined of the tenements might be greatly improved."

Mr. L. Reynolds, one of the medical officers of the Dore union, thus describes in his report the district where some fever cases occurred:—

"Of those cases the six first have occurred on Colston Common, a small marshy spot, never drained, and containing several pools extremely unhealthy, from decaying vegetables that never are removed. This year the same families have been again attacked, and shall be so every year till that nuisance be removed. In a medical point of view, such commons are injurious, and they are extremely expensive to the unions, for they cause fever, asthma, and rhumatism, from their incipient moisture, thus injuring the labouring classes, and heavily taxing the parish.

"The four next have occurred at a place called Toad Ditch: it well deserves the name; it is a collection of badly-built houses, rendered unhealthy from the large ditch, into which every kind of refuse is poured; the removal of that nuisance is imperatively called for. All these houses have one privy in common, but the ditch is the place generally used.

"This district would be much served by enclosing and draining Colston Commons, by keeping the sewers at Kingston clean, and by draining the ditch at Toad Ditch. These are the only removable nuisances of which I have any knowledge."

Mr. Blick, medical officer of the Bicester union, describes the prevalence of typhus:—

"This disease has been very prevalent in this district during the past year, indeed we are never free from it. I think its origin may be traced, in most instances, to a constant exposure to an atmosphere loaded with malaria, and propagated, in the second place, by contagion, so little attention being paid to prevent its diffusion.

"The malaria alluded to arises from the decomposition of vegetable matter left upon Otmoor (a marsh of about 4000 acres), by the previous winter's flood, and acted upon by the sun, &c., during the summer."

Mr. J. Holt, the medical officer of the Leighton Buzzard union, reports:—

"I have had only 34 cases of remittent and intermittent fevers during the last year, which is a small number in comparison to the amount usually occurring in hot summers. The great prevalence of these fevers at such times is attributable principally to the number of stagnant ponds and ditches which are situated in the very midst of many of the towns and villages of this union, and which, in hot weather, become quite putrid and offensive from the quantity of decaying animal and vegetable matter. I have generally observed that the greater number of these fevers occur in houses situated in the immediate vicinity of these ponds, and have no doubt is the chief cause of nearly all the fevers of this description. The villages to which I more particularly refer are Egginton, Eddlesbon, Cheddington, &c."

The sanitary effects of road cleansing, to which house drainage and road drainage is auxiliary, it appears is not confined to the streets in towns and the roads in villages, but extends over the roads at a distance from habitations on which there is traffic. Dr. Harrison, whose testimony has been cited on the subject of the analogy of the diseases of animals to those which affect the human constitution, in treating of the prevention of fever or the rot amongst sheep, warns the shepherd that, if after providing drained pasture and avoiding "rotting-places" in the fields, all his care may be frustrated if he do not avoid, with equal care, leading the sheep over wet and miry roads with stagnant ditches, which are as pernicious as the places in the fields designated as "rotting-places." He is solicitous to impress the fact that the rot, *i. e.* the typhus fever, has been contracted in ten minutes, that sheep can at "any time be tainted in a quarter of an hour, while the land

retains its moisture and the weather is hot and sultry." He gives the following instance, amongst others, of the danger of traversing badly drained roads. "A gentleman removed 90 sheep from a considerable distance to his own residence. On coming near to a bridge, which is thrown over the Barling's river, one of the drove fell into a ditch and fractured its leg. The shepherd immediately took it in his arms to a neighbouring house, and set the limb. During this time, which did not occupy more than one hour, the remainder were left to graze in the ditches and lane. The flock were then driven home, and a month afterwards the other sheep joined its companions. The shepherd soon discovered that all had contracted the rot, except the lame sheep; and as they were never separated on any other occasion, it is reasonable to conclude that the disorder was acquired by feeding in the road and ditch bottoms." The precautions applicable to the sheep and cattle will be deemed equally applicable to the labouring population who traverse such roads.

Such instances as the following, on the prejudicial effects of undrained and neglected roads, might be multiplied. *Mr. E. P. Turner,* the medical officer of Foleshill union, in accounting for some cases of fever, states:—

"These cases of typhus all occurred in the same neighbourhood, where the road is bad and a dirty ditch of stagnant water on each side of it; the road is generally overflowed in the winter. The disease broke out in the month of October; other cases occurred in the same neighbourhood at the time."

The nature of the more common impediments which stand in the way of the removal of the causes of disease and obstacles to production described in the preceding, are noticed in the instances following. Others will be adduced when the subject of the legislative means of prevention are stated.

Dr. Traves, on the sanitary condition of the poor in the Malton union, states,—

"The whole of the low district above alluded to, and extending into the Pickering union, (known by the name of the Marishes, or Marshes,) has at different times within the last few years been the seat of typhus and other fevers.

"Attempts were made by some of the landed proprietors a few years ago to effect a system of drainage and embankments likely to prevent the inundations of these rivers in wet seasons, but the attempt was abandoned in consequence of the reluctance of certain townships to bear their portion of the necessary outlay, and any partial system of embankment is positively injurious, inasmuch as the water that is let in upon the land at a higher point of the river is prevented returning into the stream again by an embankment at a lower point, so that this water, containing vegetable matters in a state of decomposition, must remain stagnant until evaporated by the sun's rays, or dissipated by the wind; cases of fever occurring under these circumstances have repeatedly come under my observation, as well as that of other medical men familiar with

the district, and this fruitful source of disease (in seasons like 1839 more especially) will probably now remain in full force until an Act of the legislature shall effect a change."

Mr. Thomas Marjoribanks, the minister of Lochmaben,—

"No means of any consequence, so far as I am aware, have yet been tried to remedy the evil, the removal of such substances as generate malaria. There are no scavengers appointed for the removal of nuisances. One great mean of preventing the generation of malaria (in my opinion) would be the lowering of the bed of the river Annan, which would to a great extent free the surrounding lands of stagnant water, give greater facilities for draining, improve the system of farming, lessen the risk of damage, and increase the quantity as well as improve the quality of the food which the low lands produce, and in every way conduce to the comfort and cleanliness of the inhabitants. It is computed that in consequence of the flooding of the Annan, damage during the last four years has been done to the amount of 6,000*l.*, and this along only about three miles of its course. The property is very much subdivided, and, in consequence, poverty and want has increased to a great extent among the small proprietors."

In closing this exposition of the state of the chief external evils that affect the sanitary condition of the labouring population, it may be observed that the experience, on which the conclusions rest as to the principles of prevention is neither recent nor confined to this country. That which is new, is the advantages we possess beyond other times, and perhaps beyond all other countries, in capital and practical science for its application. The experience of the advantage of public sewers to the health of a town population is nearly as old as Rome itself. I may refer with M. Du Châtelet to the experience of that city, to illustrate the consequences of neglects, such as are manifest amidst large masses of the community throughout the country, and are partially displayed in the mortuary registers first cited. He gives the details from the treatise *De Adventitiis Romani Cœli Qualitatibus,* by the celebrated Italian physician Lancisi, who deeply studied the sanitary condition of Rome, and wrote several admirable works on the subject, which had the happy effect of inducing the pope to cleanse and drain the city:—

"The barbarians of every tribe having several times pillaged and sacked the city of Rome, the acqueducts were destroyed, and the water, spreading into the surrounding plains, formed marshes, which contributed greatly to render uninhabitable the surrounding country.

"The aqueducts existing no longer, the sewers and privies were alike neglected, and produced serious and frequent sicknesses, which were more effectual in destroying the population than the arms of the barbarians. All the historians of these remote times, and particularly St. Gregory, in his Homilies, and the deacon John, in the Life of that saint, give a frightful picture of the city of Rome. The air became so vitiated that plagues and fevers of a malignant character continually carried on their ravages to such a point that Peter Damien, writing in the eleventh century to Pope Nicholas II., to intreat him to accept his

resignation, alleged as the pretext the danger he ran every instant of losing his life by remaining in the town.

"It was principally during the abode of the popes at Avignon that all which regards health was neglected at Rome, and some historians have not hesitated to attribute to this negligence the depopulation of the town, which was reduced in a little time to 30,000 inhabitants.

"Things remained in this state to the end of the fourteenth century, an epoch at which the popes, resuming the ancient labours, restored things to their proper condition; a new title to glory of Leo X., who of all the popes was the one who occupied himself with this important object in the most especial manner.

"It is, in part, to these precautions that we are to attribute the rapid increase of the population of Rome, which, from 30,000 souls, reached in a short time to 80,000; and it is a thing worthy of our attention that after the death of this pontiff the population quickly fell to the number of 32,000, because, according to the contemporary authors, everything having been neglected, the first calamities were renewed.

"Happily for Rome this state of things did not continue long, because all successive popes, instructed, it appears, by the experience of ancient times, having carried on immense labours, and constructed fresh sewers, have given to the air of this city the necessary purity."

Italy presents instances, though comparatively modern, of the removal of disease by land drainage:—

"At Vareggio," observes M. Villermé, "in the principality of Lucca, the inhabitants, few in number, barbarous, and miserable, were annually, from time immemorial, attacked about the same period with agues; but in 1741 floodgates were constructed, which permitted the escape into the sea of the waters from the marshes, preventing at the same time the ingress of the ocean to these marshes both from tides and storms. This contrivance, which permanently suppressed the marsh, also expelled the fevers. In short, the canton of Vareggio is at the present day one of the healthiest, most industrious, and richest on the coast of Tuscany; and a part of those families whose boorish ancestors sunk under the epidemics of the *aria cativa*, without knowledge to protect themselves, enjoy a health, a vigour, a longevity, and a moral character unknown to their ancestors."

The histories of other cities, and particularly of Paris, afford illustrations of the effects of the neglect of public cleansing, which begin in the ignorance and carelessness of the superior officers, and continue in the predominance of ignorance and obscure interests of a multitude in the present day:—

"For several years the suppression of an enormous cesspool at Paris near the Barrière des Fourneaux was implored by the inhabitants. Placed under the predominant winds, it was a permanent cause of annoyance to the quarters of St. Germain and St. Jacques. But all petitions were in vain. A singular occurrence brought about the event for which the people had prayed more than 50 years. In a hunting party, the Prince of Conde was carried by a fiery horse towards this same cesspool; finding it impossible to turn the animal, the prince had the presence of mind to throw himself on the ground, but the horse darted

forward into the cesspool and disappeared. The next day an order was issued from Versailles, enjoining M. Lenoir, the lieutenant of police, to fill up the cesspool, which was accordingly done."

A particular evil had attracted the attention of an able minister, who had recourse to the expedient which we have seen recently re-discovered and introduced into practice into one section of the sewerage of London:—

"The great sewer of Montmartre being uncovered, and the fall exceedingly small, it was easily choked, and spread infection through all the neighbourhood. Turgot thought that the best method to obtain a ready flow for the muddy waters it received was to wash it by frequent currents. A vast reservoir, capable of containing about 22,000 measures of water, was in consequence established at the opening of the sewer, opposite the Rue des Filles-du-Calvaire. The waters of Belleville were conducted there, together with those of two wells dug in the vicinity. This volume of water was, on certain days, let into the main sewer by means of flood-gates, which could be opened at pleasure. The scouring of the sewer by a current of living water attracted the public attention, and produced the most happy results. Shortly the people could dwell on the confines of this ancient ditch without fear of dangerous exhalations. The quarters of the Faubourg Montmartre, of the Chaussée-d'Antin, of the Ville-l'Evêque, and of the Faubourg St. Honoré, became populated. At length the land was so valuable in these different quarters that the possessors of the banks of the sewer demanded and obtained the permission to cover it over at their own expense."

The mode of cleansing had, however, been before proposed by another minister:—

"In the conferences which were held in 1666 and 1667 at the house of the Chancellor Seguier respecting the grand police of the kingdom, a thorough examination was made of the sewers of Paris, which began to multiply. The minutes of these sittings still exist. We see there the opinions given on the subject by each of the members of the commission, and particularly by Colbert, who in the sitting of the 13th of January, proposed, as the best method of cleansing the sewers, to establish several fountains in the quarters where they were necessary, and at the side of each of them a reservoir of 15 measures, which should be let out all at once. Nothing, assuredly, could be better than this proposition. But one thing was wanting to the minister—the water could not be procured."

But the water, though abundant in the vicinity of Paris, is still wanted, and the cause of the want is thus noticed by M. Du Châtelet:—

"Paris possesses an immense mass of water, which can be distributed into every quarter and every house. Does the demand multiply with the pipes? Assuredly not, and one might well be surprised to see the negligence and apathy of proprietors in this respect. Some persons adduce the fact to prove that seven litres* of water are sufficient for the inhabitants of Paris, whilst sixty are necessary for

* A litre is one pint and a twentieth.

London, and still more for Edinburgh. But if we look closer to the conduct of the proprietors, we shall find that it proceeds from calculations well understood. It is the certainty that they will have sooner to empty the cesspools which scares them. This operation, and the expense it often brings with it, influences the venal propensities of the proprietors. Is it likely that they will pay for water of which the inevitable result will be to multiply the number of operations they dread the most, and which increase the expense in an enormous proportion? Thus the actual state of our cesspools, and the mode of emptying them now in use, are, in our opinion, the principal causes which prevent individuals from taking the water, and which retard the period in which the city will receive the interest of the enormous sums that it has devoted, and still devotes daily, to the supply of water."

It is to be hoped, however, that the legislature will give the powers and direct the means requisite in this country, to furnish to every city in Europe a practical demonstration that by the art of the engineer, the obstacle to improvement, formed by the great expense and annoyance of removing the refuse of houses and streets may be rendered inconsiderable. In Paris the interests of turbulent bodies of men, the water-carriers, and another class of men called the chiffonniers, who live by raking for what they can find amongst the refuse cast into the streets, are opposed to any change which will reduce the charge of imperfect cleansing, and the disease promoted by filth. The general practice in that metropolis is to cast all the rubbish of the house into the street on the overnight, or before seven o'clock in the morning, when men attend with carts to sweep it up and remove it. In the night-time, however, the chiffonnier comes with a lantern and rakes amongst the refuse, and picks from it bones, rags, or whatever may have been thrown away by accident, or the carelessness of the servants. The offensive filth of their persons and their occupation, makes them outcasts from other classes of workmen; they sleep amidst their collections of refuse, and they are idle during the day; they are like all men who live under such circumstances, prone to indulgence in ardent spirits; being degraded and savage, they are ready to throw away their wretched lives on every occasion. There are nearly 2000 of the chiffonniers alone in Paris, and they and the water-carriers were conspicuous actors in the revolution of 1830. During the administration of Casimir Perrier the householders had complained of the inconvenient mode of cleansing the streets by large heavy carts drawn by three horses, which, during their slow progress throughout the day, obstruct the public thoroughfares and occasion great inconveniences, especially in the narrow streets.

In the beginning of the year 1834, when the cholera broke out, the attention of the authorities was directed to sanitary measures, and the municipality decided that the cleansing of the streets should be done by contract, by a quick relay of carts of a smaller

and more convenient shape, drawn by single horses; and in order to diminish the inconvenience of the presence of these improved vehicles, the contractor was allowed to collect one load for each of his carts on the over-night, which would have led to a practice similar to that of London, where the dust-carts take the refuse direct from the house without any deposit in the streets. But in this arrangement an important interest had been overlooked; the chiffoniers, who were said to have been aided and directed by the owners and men belonging to the superseded vehicles, rose in revolt, attacked and drove away the conductors, broke to pieces the new carts, threw the fragments into the river, or made bonfires with them. Unfortunately at that time the cholera had broken out at Paris. The mobs of chiffonniers which collected on the following day were swollen by other crowds of ignorant, terrified, and savage people, who were persuaded that the deaths from the strange plague were occasioned by poison. "My agents," says the then prefet of police, in an account of this revolt, "could not be at all points at once, to oppose the fury of those crowds of men with naked arms and haggard figures, and sinister looks, who are never seen in ordinary times, and who seemed on this day to have arisen out of the earth. Wishing to judge myself of the foundation for the alarming reports that were brought to me, I went out alone and on foot. I had great difficulty in getting through these dense masses, scarcely covered with filthy rags; no description could convey their hideous aspect, or the sensation of terror which the hoarse and ferocious cries created. Although I am not easily moved, I at one time feared for the safety of Paris —of honest people and their property." In fact the riot was one of the most dangerous that had been witnessed in that city, and it was not suppressed without great exertions and some loss of life. The anxieties which it occasioned to the minister, Casimir Perrier, and his disgust at the political use made of it, were considered to have contributed to his death. He was himself attacked with the cholera, and died a few days after. Shortly before his death, when expressing his disgust, he said to the prefet, "My friend, we are harnessed to a vile carriage." "Truly so," replied the prefet, "and the ways are dreadfully dirty." The material ways of the city continued as they were, the prefet seeing that the introduction of the new carts became "a motive to discontent and collision," took upon himself to set aside the contract with the contractor, who, he states, received no other compensation for his losses than a permission which he could not use to collect the refuse during the day, and the chiffonniers continue to the present time in the exercise of their wretched vocation at the expense of the public health and cleanliness.

The course of the present inquiry shows how strongly circumstances that are governable govern the habits of the population, and in some instances appear almost to breed the species of the

population. Conceiving it probable that the amount of filth left by defective cleansing had its corresponding description of persons, I made inquiries of the Commissioners of Metropolitan Police. From returns which they obtained from their superintendents, it appears that of the class of bone-pickers, mud-rakers, people living on the produce of dung-heaps in mews, courts, yards, and bye lanes insufficient cleansed, 598 are known to the police. From an observation of the proportion of filthy children and adults who appear amidst refuse whenever there are new buildings and an unusual quantity of rubbish, and from other circumstances, I believe that, were the refuse of houses daily cast into the streets in London in the same manner as at Paris, London would soon have as large and as dangerous a population of the chiffonnier class. I am informed by Sir Charles Shaw, the chief commissioner of police at Manchester, that there are 302 of them known within the police jurisdiction of that town also. He complains that they have heretofore been licensed in their occupation; that the children are pilferers, and occupy the attention of the police, and furnish a large quota to the stock of juvenile delinquents and the population of the prisons. I am informed that in Bath there are about 100 of them known; and in other towns and places I have little doubt that they would be found in like proportions, which approach the proportions of the stated numbers of chiffonniers to the population of Paris. These degraded creatures are also found amongst the inmates of the workhouses, and the close identity of their habits with those of the chiffonniers of Paris afford a striking proof of the similarity of the population produced by similarity of circumstances. They are thus described to me by an eye-witness:—

"The bone-pickers are the dirtiest of all the inmates of our workhouse; I have seen them take a bone from a dung-heap, and gnaw it while reeking hot with the fermentation of decay. Bones, from which the meat had been cut raw, and which had still thin strips of flesh adhering to them, they scraped carefully with their knives, and put the bits, no matter how befouled with dirt, into a wallet or pocket appropriated to the purpose. They have told me, that whether in broth or grilled, they were the most savoury dish that could be imagined. I have not observed that these creatures were savage, but they were thoroughly debased. Often hardly human in appearance, they had neither human tastes nor sympathies, nor even human sensations, for they revelled in the filth which is grateful to dogs, and other lower animals, and which to our apprehension is redolent only of nausea and abomination."

The following report from one of the superintendents to the Commissioners of the Metropolitan Police describes the manner in which they appear to the police, their moral character, and the efficacy of the means of prevention:—

"With reference to the question of the Commissioners as to the means of subsistence of that portion of the population which at present exists by picking bones in the bye-lanes, &c., in the event of those places being properly cleansed, I am of opinion that they would be compelled to adopt

some more laborious and useful means of obtaining a livelihood, such as field labour, &c. They are at present an idle, dissolute class, prowling about the stables, yards, backs of premises, and lanes, willing to commit petty felony wherever opportunity presents itself. While it would remove them, on the other hand, the instant removal of filth from the metropolis must prove beneficial to the health of the inhabitants."

It will then be found to be an ultimately beneficial effect of the removal of the circumstances by the adoption of such modes of cleansing as diminish the prevalent amount of filth or filthy processes, that it will force a change to other occupations of a less degrading character, and diminish the number of persons "brought up" to them. Any provision of the nature of a poor law may be said to be badly constructed which does not allow the exercise of a discretionary authority to alleviate any severe inconveniences to the poorest classes from such changes. For the sake of preventing the growth of the like misery, it would probably be found a good civic economy to maintain the whole of the existing class in idleness, if idleness were not in itself a curse to them. I mention this, because the parish officers frequently oppose improved modes of paving and efficient cleansing, (as they generally opposed the new police on the ground that it diminished the means of subsistence of decrepit old men as watchmen,) for the avowed reason that it is expedient to keep the streets in their present state of filth in order to keep up the means of employing indigent persons as street-sweepers and sweepers of crossings in removing it.

It is found in the metropolis to be a beneficial result of the increase of the practice of removing night-soil by the self-acting process of water-closets communicating with the sewers, that it prevents the increase of the number of nightmen formerly requisite for the performance of that offensive and dangerous labour, and is in the metropolis diminishing the number.

Yet it should be borne in mind, that until more complete measures are adopted, even the services of such agents are an improvement, and in crowded cities are only neglected at the expense of the degradation of the whole mass of the labouring population. An example is to be found in the state of some districts mentioned by *Dr. Speer*, who in his account of the diseases of the lower orders in Dublin, given in the Dublin Hospital Reports, noticed the fact that the fever cases always came from the filthy districts; and he observes,

"We cannot wonder at the rapidity with which contagion often spreads. Both in and out of doors, it seems facilitated in every way; within doors every article of furniture and wearing apparel is disfigured with filth; every spot seems encrusted with its layers, and the foulest odours abound everywhere. Out of doors, at least in warm seasons, our churchyards, slaughter-houses, and the masses of filth and offal with which our streets and lanes are disgraced, contribute no less to the propagation of contagion. In the larger and better streets, the cleansing

is very well attended to, but in the narrow and crowded ones, where the necessity of its removal is infinitely greater, the heaps of filth are truly disgraceful. In some of my visits I have been obliged to wade through masses of filth enough to sicken the stoutest and strongest—masses which have remained undisturbed for months, perhaps for years, and thus generating the most putrid effluvia. We know that vegetables are very dear in our markets. Why? Because our gardens are not sufficiently manured; this manure lies in our lanes and alleys, and only wants collecting; but what would this be compared with the benefits from the purification of our atmosphere which its removal would produce?"

The condition of large rural districts in the immediate vicinity of the towns, and of the poorest districts of the towns themselves, presents a singular contrast in the nature of the agencies by which the health of the inhabitants is impaired. 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. The impediments arising from the existing state of the law and of its local administration, form a subject for separate representation.

Before stating the cost in life and money attributable to the noxious causes external to the dwelling, it is desirable to notice other noxious causes, within the recognised province of legislative interference, that appear to be similarly under control, namely, the overcrowding of places where large numbers are assembled together, such as the overcrowding of places of work.