

**Papers relating to the fetid irrigations around the city of Edinburgh. 1839 /  
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October 22, 1839.

# PAPERS

RELATING TO THE

## FETID IRRIGATIONS

AROUND THE

### CITY OF EDINBURGH.

1839.

*(Published by authority of a Committee of the Commissioners of Police.)*

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PRINTED BY THOMAS ALLAN & CO.  
265 HIGH STREET, EDINBURGH.

1839.

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PAPERS

RELATIVE TO THE

PETIT IRRIGATION

SECOND THE

CITY OF EDINBURGH

1839

PRINTED BY THOMAS ALLEN & CO.  
10, N. B. STREET, EDINBURGH.

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## INTRODUCTORY NOTE.

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EDINBURGH has long been famed for its salubrity as well as for its beauty. The elevated situation of the City itself has made it capable of the most effectual sewerage and drainage; and the purity of the air amid the fine scenery and noble walks of its immediate neighbourhood rendered it, in the words of Arnot, 'the most healthful of any town of equal bulk in Great Britain.'

The inhabitants have now, however, much cause to complain that these advantages, so bountifully bestowed on them by nature, are nearly lost, owing to the cupidity of several individuals, proprietors of lands lying around the Town.

The refuse and impurities of the City are carried away by means of streams of water flowing from it in several directions, to the sea, and into a small river called the Water of Leith. The chief of these streams, which is named emphatically 'the Foul Burn,' has, for time immemorial, conveyed to the sea the refuse of the whole of the Old Town and part of the New. It passes through part of the royal demesne, close to the Palace of Holyrood, enters the lands of the Earl of Moray, passes the cavalry barracks at Piershill, and runs through the lands of Craigentenny, belonging to Mr Miller, where it enters the sea at a point named the Figget Whins.

The other chief stream conveys away the impurities of parts of the northern and western districts of the City, and, passing through the lands of Dalry, it enters the Water of Leith at Coltbridge.

These excrementitious streams, so long as their nauseous contents were permitted to remain in their channels, quietly deposited them into the river or the sea, without creating annoyance of any kind.

But, many years ago, a tenant of Lord Moray, near the village of Dalry, perceiving the advantage which might result to him from the Foul Burn, proceeded to collect part of its contents in pits for manure, and to use other parts of it in the irrigation of his fields.



As these operations, however, were of a limited extent, and the irrigated fields consisted only of a few acres, they attracted no general observation. A neighbouring proprietor, Mr Duncan, indeed, who had purchased a villa in the neighbourhood, complained of the pits as a nuisance; and, about the year 1809, brought an action against Lord Moray to have them discontinued; but he was unsuccessful, on the double ground that he himself used similar pits, and that *he* had 'come to the nuisance.'

Since the year 1809, the system of irrigation commenced by Lord Moray's tenant at Restalrig has been adopted by most of the owners of grounds through which these polluted streams flow, and has gradually increased from a few acres (not exceeding twenty) to many hundreds on the east, west, south, and north of the City. The system consists of damming up the water, and leading it by means of sluices into innumerable smaller streams, whereby the field is thoroughly soaked or drenched with the excrementitious mixture. Vegetation quickly follows, and many successive crops of grass are thus produced, yielding immense profits to the proprietor, but creating a succession of fetid stagnant marshes, which exhale an odour so foul and nauseous that no language can describe. These rank and fetid exhalations poison the air for miles round. They are insufferable to passengers, and to those living in their neighbourhood. They are carried by the winds into the City,—into the palace,—and into the barracks; and after being condensed in the atmosphere by the evening's cold, they fall down in the form of damps, bringing with them sickness and disease.

Extensive as these irrigated fields have already become, the commanding situation of the City renders it practicable to extend them much farther. If the proprietors of the lands of Lochend, Craigen-tinny, and Dalry, have a right to commit this nuisance, so have the whole proprietors round the City through whose lands any of the polluted streams run. It may be possible to saturate every acre round Edinburgh with their contents, except Arthur Seat alone; and unless this great evil be now suppressed, many parts of Edinburgh, like corresponding parts of Rome, will become unfit for the habitation of man.

A nuisance such as this, which now surrounds Edinburgh, would not be tolerated in the neighbourhood of London for an hour. The Court or Parliament would forbid it; and in England the remedy by *indictment* is effectual for its instant abatement. But Edinburgh has now

neither a resident Court, nor a Parliament, within her walls, and the remedy of indictment has no place in the law of Scotland.

A remedy, no doubt, is open by means of an action of declarator or interdict before the Court of Session, which may be brought by *any individual aggrieved*. But who shall be found willing to enter into protracted and expensive litigation with such proprietors as the Earl of Moray or Mr Miller, who are enriched by these operations to the extent of many thousands a year? The rich man, too, has it in his power to escape from the horrors of these nauseous exhalations during the months in which they are most obnoxious, by retiring to his seat in the country. But the poor artisan and his family, and the greater part of the middle classes, are compelled by dire necessity to spend their whole lives in the town; and it is hard indeed, not only that the air of their habitation is to be thus contaminated, but that the pure air of the country is also denied them for their evening walk and recreation.

The Commissioners of Police have long had the anxious wish to abate this nuisance. In 1832 they introduced into the Police Bill when in Parliament, clauses which had for their object to obtain that desirable end. But they were vehemently opposed; and as a mode had been proposed of doing so by means of altering the direction of the Foul Burn, and carrying it into the sea by a covered drain, the opposers of the bill had sufficient interest to obtain the insertion of a proviso, 'that in making any main drain, or sewer, or conducting See 2 Wil. IV. c. 87, sect. 60. drain, the water at present carried into any existing outlet shall not be diverted therefrom.' This clause forms part of the Edinburgh Police Act, and hence any plan of carrying the impurities of Edinburgh to the river or the sea by any channel different from the present is now rendered impossible, except by a repeal of the statute.

The nauseous exhalations arising from these fetid marshes, always most offensive, have of late attracted particular attention, owing to the remarkable unhealthiness which of late years has been gradually increasing in the City. The Report of the Edinburgh Fever Board, published in January 1839, gave to the inhabitants the appalling information, that the ravages of Fever have been gradually increasing of late years; that 'they have been recently much extended, and that its malignity has very greatly increased; that the epidemic which has prevailed in Edinburgh during the last two years must have affected at least ten thousand of the population of the city; and

‘ that while such has been the history of Epidemic Fever in Edinburgh during the last twenty years, it is to be observed, on the other hand, that *in almost every great town in England it has been gradually decreasing ; in none of them has it been during that time a formidable epidemic, and in several of them it is almost unknown.*’

Individuals of wealth and respectability who have taken up their residence in Edinburgh for the education of their families, have become alarmed at this state of things ; and some have even intimated their determination to reside elsewhere, unless the nuisance created by the fetid irrigation be put down. The subject became a matter of public discussion, and at meetings of the Magistrates and Town Council, burgh of Canongate, and southern districts, the practice was unanimously condemned, and resolutions were passed that it ought to be suppressed by such means as Counsel might suggest.

Accordingly, the opinion of two eminent counsel, Messrs Duncan M'Neil and Patrick Shaw, advocates, have been obtained, the substance of which is, *first*, that although the inhabitants of Edinburgh have, on the principles of the common law, a right to divert the course of the polluted streams, in so far as they consist of the rain-water which descends within the bounds of the city, and of the water brought into the city by the Water Company, yet that they cannot do so, in so far as the streams are supplied from natural springs, and that they are barred from making any alteration whatever in their course by the clause in the Police Act already quoted. They are of opinion, *secondly*, that the whole refuse and impurities of the city belong by the Police Act to the Commissioners of Police, and, that were it practicable (which it is not) to separate them from the water, they might be conveyed away in different channels, or disposed of as the Commissioners think proper. They are of opinion, *thirdly*, that assuming, in point of fact, that the operations complained of are a nuisance, it is not competent for the Commissioners of Police, in their representative capacity, to bring any action for putting a stop to them : ‘ but that such action could be maintained at the instance only of those who individually are the sufferers ; and even such parties may be precluded from insisting, if they had either come to the nuisance, or had submitted to it so long as to amount to acquiescence.’

The opinion concludes as follows :—‘ Under all the circumstances, we think that it would not be expedient to attempt to abate the

‘ nuisance by an action at law. The evil, as represented in the Memorial, is of a nature so great, and so deeply affects the public health and the welfare of the city, as to bring it under the principles of General Police Legislation; and we are therefore of opinion, that the most effectual and the most expeditious course would be to apply to Parliament for authority, by means of drains or otherwise, to abate the nuisance. This course is the more necessary, as the clause in the Police Act sanctioning the present course of the water, and prohibiting it from being diverted, would be a formidable obstacle in attempting to obtain relief, either by an application for interdict, or other proceeding, in a Court of Law.’

The course of proceeding being thus pointed out, the only question remaining is, as to the proper parties to bring in the Bill. The inhabitants of the city, it is believed, would be ready to submit to additional burdens in order to carry a measure so important as this. But they have great doubts, from the experience they have had, and the opposition to which they know they would be exposed, how far a Bill, in their hands, would pass both Houses of Parliament; and they feel hopeless of ever obtaining redress if the measure be thrown upon them. On the other hand, this is obviously a matter of *general sanitary police*, and the Bill ought, on that account, to be a *public act*, brought in and carried through by the Officers of the Crown. And it is particularly to be observed, that the Officers of the Crown have a direct interest, as administrators for the Palace of Holyrood, as well as being interested in the Cavalry Barracks and Queensberry House, to obtain the removal of a nuisance which is so prejudicial to the Crown property. A perusal of the documents appended will prove this; and should the Officers of the Crown have any doubt as to the accuracy of any statements now made, they may easily satisfy themselves by the appointment of a qualified person, who will examine the effects of the nuisance complained of on the Palace and other Crown property, and report his opinion thereon.

The Commissioners of Police have resolved, in the mean time, with the view of explaining to the Commissioners of Woods and Forests,—the Crown Counsel,—the Board of Ordnance,—and other influential persons, the nature, extent, and effects of the system of irrigation now pursued around the city of Edinburgh,—to print various documents connected with that practice, as it affects the city of Edinburgh in general, and the Crown property in particular, including medical opi-

nions, with analogous cases recently collected by the Commissioners of the Poor-Laws of England. It has been controverted how far these fetid exhalations are exciting or aggravating causes of fever; but this is a point on which the Commissioners of Police do not presume to judge. He must be a bold dogmatist, however, who, after perusing attentively the documents now printed, will venture to say positively that they are *not*. But at all events, it is sufficiently manifest, that the fetid exhalations in question, covering so large an extent of surface, and daily increasing, in the close and immediate neighbourhood of a large and densely peopled city, must be highly prejudicial to health, since they doubtlessly deteriorate the air to a greater or less extent, and, in the opinion of many eminent medical men, thereby heighten and increase, if they do not directly produce, different forms of sickness, prolong bad health, and impede and prevent recovery.

The disgust and nausea created by breathing them is admitted by all, and is not a matter of any controversy.

The Commissioners beg only to add, that, in their opinion, the objects of the legislative enactment ought to be,

*1st*, To empower the Commissioners of Police, or other public authorities in towns, to cover over the polluted streams, and all other open or stagnant ditches within their jurisdiction, and until they reach a specified distance from it; and to purchase the necessary ground for the formation of such sewers or drains as may be required for this purpose.

*2d*, To prohibit the occupiers of grounds through which sewers or drains flow, under heavy penalties, from irrigating their lands with their contents, or to use them in any other way which shall cause a nuisance to the neighbourhood.

*3d*, That summary action for breach of the statute shall be competent, at the instance of the Superintendents of Police, Procurators Fiscal, or other public functionaries of the towns or districts which may be exposed to such nuisances.

W. DRYSDALE,

*Chairman of the Committee.*

*Edinburgh, October 1839.*

## DEFINITION, NATURE, AND EFFECTS OF MARSH- EFFLUVIA OR MIASMA,

AS UNDERSTOOD BY MEDICAL MEN.

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WE have thought it proper to preface the medical opinions and remarks contained in the following pages, by a definition of the character and effects of Marsh-effluvia, in order to facilitate the comprehension of some of the medical expressions which we have been obliged to use, and to give more precision to the whole question under our consideration. For this purpose we have turned to the two latest, and what medical men look upon as the two most standard works on medicine published in Britain, viz. "The Cyclopaedia of Practical Medicine" of Drs Forbes, Conolly, and Tweedie (London, 1834), and the "Dictionary of Practical Medicine" of Dr Copland, now in the course of publication. We extract from them, without any comment, the following definitions, &c. given of the cause of disease which is believed to exist in emanations from marshes, and vegetable and animal putrefaction.

"*Malaria and Miasma.*—The first of these words, and that which is now generally employed to designate a certain effluvia or emanation from *marshy* ground, we have adopted from the Italian (*malaria*, bad air). Miasma is a Greek word, signifying originally contagion or pollution, but now, with the occasional adjunct, marshy, not unfrequently applied to the same effluvia or emanation. We infer the *existence* of the matter designated by one or other of these terms, as we do that of contagion from *certain* effects on the animal economy; and we trace its origin to marshes, from its having been observed, for a series of ages, that such effects are produced *only* in the vicinity of marshes.... The observation of centuries having rendered us well acquainted with (these) certain effects of malaria, we now reason conversely; and when we perceive the more familiar of them, particularly intermittent and remittent fevers, we infer its existence, and endeavour to discover its sources.... We should

take but an imperfect view of malaria, did we consider intermittent and remittent fevers its sole results. Besides these its more familiar effects, *organic affections of the spleen, liver, and mesenteric glands; similar affections of the stomach and intestines; dropsy, apoplexy, palsy, and idiocy*, as manifested in the marshy districts of Tuscany, and in the cretinism of the valleys of Switzerland, are the effects of its long-continued application. *Cholera, dysentery, and diarrhœa*, are by many writers referred to its more brief agency, and, there is reason to think, occasionally with justice; *intermittent neuralgia* (tic doloieux), there seems little doubt, is one of its effects; and to this formidable list some are disposed to add *rheumatism*, but the propriety of this seems doubtful."—*Cyclopedia of Practical Medicine*, article Miasma, vol. iii. p. 60, &c.

Dr COPLAND, in the last-published part of his learned Dictionary of Medicine, gives a table of infectious agents. In this table he sets down

"*Miasms* from decayed vegetable matter, aided by moisture in temperate ranges of atmospheric heat," as causing "*catarrhal fevers, rheumatic attacks, intermittents, enlargements of the spleen, and torpid states of the liver.*"

"*Exhalations* from absorbent, or deep, exuberant, and marshy soils, suspended in atmospheric humidity at temperate grades of warmth," as producing "*intermittents, remittents, simple dysentery, simple cholera, bilious fevers, obstructions and other diseases of the liver and glandular organs.*"

"*Miasms, or vapours* from decayed vegetable matter, or from marshes, and rich, deep, and humid soils, at high ranges of temperature," as generating "*inflammatory, bilious, and gastric fevers, of both a remittent and continued type, and diseases chiefly of the abdominal viscera.*"

"*Effluvia* from animal matter, or from vegeto-animal matters, during decomposition, aided by humidity," as the cause of "*adynamic or pernicious remittents, continued fevers, adynamic dysentery, cholera, gastric, mucous, or enteric fevers.*"

"*Animal matters* in a state of putridity or decomposition," as producing "*diffusive or disorganizing inflammation of cellular parts, inflammation of lymphatics and of veins, &c.*"

"The effects," he observes, "or the diseases produced by infection, vary with the sources and modes of infection, with the concentration or intensity of the infectious agents, and with the predisposition or susceptibility of the persons exposed to them. It has been supposed that the terrestrial miasms, or mephitic vapours, emitted by marshes and other sources of malaria, produce only intermittent and remittent fevers. Some writers, however, have contended that true yellow fever, and even plague, also spring from these sources, aided by the influence of high ranges of temperature, and an epidemic state of the air. That terrestrial miasms are capable of producing, under these circumstances, pernicious or malignant forms of

fever, which assume either a remittent or a continued type, according to concurring causes and the state of the patient, I will readily admit; but that they occasion either true yellow fever or plague, is an assumption founded on preconceived and fallacious views, which every circumstance connected with the origin and pathological relations of these maladies fully disproves. That malaria, however, produces a wider range of diseased action than has been long supposed, I will allow; for I agree with much that has been advanced by Dr Macculloch on this subject, and believe that the less concentrated states of terrestrial exhalations, particularly in low grades of atmospheric temperature, will give rise to several diseases usually imputed to other causes,—as to *catarrhs* or *catarrhal fevers*, *rheumatism*, *neuralgic affections*, *sciatica*, *obstruction of glandular organs*, and *premature decay*. When terrestrial exhalations are concentrated, or rendered more active by a warm and humid air, *bilious inflammatory remittents*, *gastric*, or *mucous fevers*, *cholera*, *dysentery*, and *visceral diseases*, will frequently result, according to the existing disposition or states of those exposed to them.”—(Part v. p. 352.) “There are various circumstances connected with the production and diffusion of exhalations given out from the soil, that require attention from the medical practitioner. It seems fully established, that *dead animal matter* and *exuviae* in situations producing these exhalations contribute most remarkably to their noxious effects. The circumstances which render vegetation *quick* and *luxuriant* generate immense swarms of insects and reptiles, the exuvial and dead bodies of which mingle with vegetable matter in a state of decay, and give rise to miasms, particularly during moist states of the air, *much more noxious* than those resulting from vegetable matter *alone*.”—(Part iii. p. 758.) The fevers of locality originating from such causes “are modified, from the more simple form of ague to the most malignant remittent or continued type, by the particular circumstances in which they originate, as the miasms become more concentrated, or consist more of the effluvia of decayed animal substances,—by the warmth of the season and climate,—by the humidity and dryness of the air,—and by the constitution and predisposition of the patient.”—(P. 759.)





## A SERIES OF LETTERS

*Published in the Caledonian Mercury,*

DESCRIPTIVE OF THE FETID IRRIGATIONS ROUND THIS CITY, AND  
THEIR EFFECTS ON THE HEALTH OF THE INHABITANTS.

WE reprint these letters here, as containing a concise general summary of the noxious effects of marsh-air,—and particularly of that which arises from the irrigated lands around our city—upon the health of its resident inhabitants. The letters were originally published during the course of the last summer, under the signature of “Al Hakim,” and addressed to the Editor of the above Newspaper.

### LETTER I.

SIR,—The influence of marshes on health has been observed in every age,—the diseases resulting from their proximity have been familiar among all nations, and the removal or correction of their effluvia the object of the solicitude of every government.

As early as 600 years B. C. the magistrates of Agrigentum sent for the philosopher Empedocles to consult with him on the best method of protecting their city against the noxious effects of marshes in its vicinity.

The cloacæ or sewers of Rome, erected in the infancy of the monarchy, and famous in every age, still exist after a lapse of twenty-four centuries, an apparently imperishable monument of that people's care for the health of its citizens, and for the removal of every thing noxious to public salubrity.

It would be useless to multiply examples of a similar character, to be found in every succeeding period, down to the present time. It was reserved for another age to witness a departure from these established principles of ancient wisdom, and to see, not an unwholesome atmosphere more effectually purified by modern science, but a pre-eminently healthy city converted into a pestilential swamp; and that age the nineteenth century, that city the modern Athens.

The creation and continuance of artificial marshes round the city of Edinburgh would be sufficient, *a priori*, to convince us of an increased unhealthiness and mortality among its population,—an inference confirmed by facts; while, on the other hand, the nature and extent of this unhealthiness might induce us, likewise *a priori*, to in-

fer the recent establishment of these artificial marshes, or some similar source of disease.

This is a subject of deep interest to every inhabitant of Edinburgh,—one in which their health and life are at stake. It is, then, one which ought to be discussed with the same seriousness with which shipwrecked seamen or a beleagured garrison hold council on their fate,—one to be approached with earnestness, composure, and a comprehensive knowledge of the case, free alike from all incredulous levity or blind alarm.

It will, then, in the first place, be proper to ascertain the general effects of marshes on health. Secondly, in what manner Edinburgh can be affected by such influences. Thirdly, the means of removing them.

When dead organic matter is exposed to air, warmth, and moisture, it undergoes a decomposition more or less rapid, whose result is an evolution of gases all more or less noxious to human beings. Among these, one of the most common, as well as most fatal, is sulphuretted hydrogen, an air so poisonous that nature seemed under the necessity of associating with it an intolerable stench, in order to warn animals of its proximity, lest they, unconscious of its presence, should perish without any chance of escape.

But besides these ponderable gases, the results prove that there emanate from such putrefying remains, particles too minute for the senses of the body to appreciate, too subtle for its coverings to exclude, and too mortal for the constitution to resist. These are divided into two kinds,—animal and vegetable effluvia; the former often termed fomites, the latter miasmata. Their fatal importance to mankind may be estimated (invisible and imponderable though they be) by physicians considering them as the principal, if not the only origin of fevers; while these last are the cause of death to a great proportion of the human race.

We shall examine, first, the influence on the health, of vegetable decomposition; secondly, that of decomposed animal matter; and, thirdly, both combined.

It is evident that vegetable substances, macerated in the shallow stagnant water of marshes, exposed to the sun and air without the possibility of drying, are in the precise state most favourable to putrefaction, while the stagnation of the water prevents their removal, and its shallowness allows of their noxious particles being diffused through the atmosphere. These are known, by uniform experience, to give rise, especially in summer and autumn (for the causes of their production, heat and moisture, are then most active), to agues or intermittent fevers. The power of vegetable decomposition to produce these effects is well illustrated by the influence of flax and hemp steeping, and the cultivation of rice. For this latter purpose inundations are necessary, but with such fatal results, that the government of Russia has prohibited that branch of industry throughout its dominions. The inhabitants of marshy districts are found to be almost universally subject to these diseases, which attack, likewise, occasional visitors of such localities; and it is not only the marshes themselves which are subjected to such a scourge, but also whatever districts

(however healthy in other respects) lie in the direction of the prevalent winds, to the leeward of the marshes, especially valleys, which serve as funnels to confine, guide, and concentrate these winds, and whatever noxious vapours they may be loaded with. It may be proper to give a slight sketch of the nature and effects of such fevers as have been mentioned, in order to show how fatal must be the influence of marshes on public salubrity.

Intermittent fevers are chiefly of three kinds (differing rather in degree than in their nature or consequences), viz. quartan, tertian, and quotidian, returning respectively every seventy-two, forty-eight, and twenty-four hours. Each fit consists of a cold, a hot, and a sweating stage. The cold stage comes on with excessive languor, lassitude, yawning, sighing, shortness of breath, and aversion to food. The face becomes pale and shrunk, the whole skin constricted, as if from cold water thrown upon it; the bulk of the entire body is lessened. Now intense cold is felt creeping on, till it invade the whole frame; violent shiverings ensue; the teeth chatter, the limbs tremble, the whole trunk is agitated, even sometimes the very bed shakes under the patient; severe pains accompanying the shivering, spread from limb to limb, while nausea and vomiting supervene. The head swims, the eyes grow dim, the pulse small and irregular, confusion of thought occurs, and in some instances a stupor resembling apoplexy.

At length a re-action takes place—the heat of the body begins to return, and soon rises to excess; the skin becomes red, the face swollen and flushed; the blood rushing to the head, the temples throb, the head aches. There is burning thirst, the breathing is rapid, the pulse hard and strong, and sometimes it ends in delirium.

At length a profuse perspiration bursts out, saturating all the clothes; the thirst and heat abate by degrees, and the fit is at an end; but leaving after it a listlessness, languor, and debility, more dreaded by the patient than the invasion itself, which however returns after its regular interval of one, two, or three days.

Yet the effects of intermittent fever are not limited to the disease itself, but it too often lays the foundation of chronic diseases, which carry off the patient slowly, but not less surely, giving him sad and lingering experience of a living death. Among these, we see chronic inflammation and swelling of different internal organs, especially of the liver, spleen, and mesenteric glands, with the consequent diseases of partial or general dropsy, jaundice, loss of appetite, and gradual wasting away.

But these chronic diseases are produced by the influence of marshes, independently of intermittent fever; and palsy, apoplexy, and idiotcy are unusually frequent in such districts. Not only the inhabitants appear sallow, weak, and listless, but the term of natural life is shortened. On the banks of the Lower Loire, fifty years is the extreme of life, at which age men seem to be past eighty. In the Delta of Egypt, in the American Georgia, and Virginia, many districts have a population whose life is extinguished at forty; and at Petersburg, in the latter State, no native inhabitant has been known to pass the age of twenty-eight.

Such are the effects of simple vegetable decomposition, and the influence of marshes on public health.

## LETTER II.

SIR,—We glanced in our last at the noxious effects of vegetable decomposition on the health. We now proceed to examine the influence resulting from the decay of animal matter. This latter decomposition differs from the former in the greater facility of its production, and in the evolution of ammoniacal gases. As the decomposed substance is, in this case, more nearly akin, in constitution, to the animal economy, it exercises over it a more powerful influence. Thus we see the diseases generated by it (various kinds of continued fevers) more formidable in their symptoms, more rapid in their progress, and more fatal in their termination, than even those formerly described. But they differ in a still more important particular, that while vegetable decomposition exercises its influence only in the vicinity of marshes, animal effluvia, and the diseases sprung from that source, may be carried to any distance in all their malignity. (Among the number of such disorders it is sufficient, for example, to mention the typhus fever and the plague.) Let us take, by chance, an illustration of this fact. In August 1743, according to Sir J. Pringle, the British army (previously in good health) encamped at Hanau, where, owing to damp and heat combined with decayed animal remains not properly removed, a fever and dysentery broke out, which in a few weeks attacked half the army. A detachment, free from the disease while separate from the rest, were seized as soon as they joined the main body. The hospitals in the village of Feckenham, still more crowded and exposed to animal effluvia, suffered in proportion; more than half the patients died, almost all the medical staff were carried off, and the entire native population of the village was swept away. Of the soldiers, the survivors were embarked in boats on the Mayne and Rhine, but so virulent did the disease become, pent up in those close and noisome barges, that the silence of the night was broken by the corpses plunging into the stream, and nearly all the sick perished before they reached the Low Countries. We have now witnessed the effects of animal and vegetable exhalations taken separately; let us now see their power when combined.

It has been remarked, that as yellow fever, and others of the same class, all seemingly arising from marshes, differ from ague, there must be a variety of marsh poison. Admitting this as probable, the reason of the variety seems to be plain enough. Ague prevails only in circumstances where simple vegetable decomposition takes place; while *remittents* seem only to be developed where a powerful sun acting on a moist and rich soil, not alone produces a luxuriant vegetation, but fosters and calls forth such a pullulation of animal life as exceeds all imagination. The whole swamp is crawling with vitality, and the sky overcast with living clouds. But the life of these insects and reptiles is as transient as their numbers are without number, and they start into existence only to perish. In such conditions, the quantity of dead animal matter perhaps equals the amount of vegetable decay.

It appears, then, in this state, that every cause noxious to life is concentrated on the very spot where vitality enjoys the highest ener-

gy, lest, as it were, without such an antidote, it should o'erpeople the earth.

What wonder, then, that diseases originating in such circumstances should combine the malignity of those emanating both from animal and vegetable decay (since both the one and the other are present), uniting the all-consuming tediousness of the one with the fiery virulence of the other—the languor of the ague with the fury of the plague.

This is what actually occurs, and in the whole round of human ills there are none so formidable as the various forms of remittent fever, the offspring, probably, of the double decomposition of vegetable and animal life, producing a redoubled mortality and inevitable death. The names alone of this dismal train, *Jungle Fever*, *Bulam Fever*, *Yellow Fever*, *Bilious-remittent*, are a sufficient commentary.

Thus have we seen that marshes and other scenes of vegetable decay produce intermittent fever and its bad consequences; that animal decomposition gives rise to continued fever with its mortal energy; and that a combination of both generate remittent fevers more malignant and fatal than either of the other two. Having thus come to the end of the first part of our proposition, we shall next attempt to show, that both the conditions alluded to (animal and vegetable disorganization) are found united in the artificial marshes in the neighbourhood of Edinburgh, and must give rise, in part, to the consequences we have described.

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### LETTER III.

SIR,—In our last we considered the injury inflicted on health by the decomposition of organic remains. We shall now examine in what manner Edinburgh is affected by this cause of disease. *First*, let us attend to the topography of Edinburgh, including the extent of the low grounds from which the exhalations arise, and the direction given by the hills and *plateaux* to the prevalent winds. *Secondly*, the amount of animal and vegetable matter daily poured out from the sewers of the city. *Thirdly*, the quantity of vapour and gases evolved or evaporated from the meadows irrigated from such impure sources.

The roots of the Pentland Hills, shooting into the plains of Lothian, stretch by Slateford and Morningside towards the Castle Rock, where the high ground branching from Arthur's Seat, by St Leonard's and Lauriston, sinks down and joins them about the Canal Basin; and the united ridge sweeping round the Castle rock constitutes in the New Town a *plateau*, which descends towards the sea in the direction of Leith. By this means the drainage of Edinburgh, following the declivity of the ground, belongs to two different systems. First, the Water of Leith; second, that small brook which flows past Holyrood towards Restalrig, and empties itself into the Frith at Seafield, between Leith and Portobello.

The Easter Road from Leith, the Calton Hill, George Street, Lothian Road, and the line running by Bread Street and Lauriston to

St Leonard's, form the boundary of these two systems. Hence it follows, that almost all the New Town is drained naturally by the Water of Leith, as well as the southern part of the town; while the Old Town is drained in the direction of Restalrig. It follows, likewise, that there are two systems of meadows—the one extending from Dalry and Coltbridge toward Slateford and Corstorphine; the other from the neighbourhood of Holyrood towards Restalrig and Seafield. The one system lies to the west of Edinburgh, the other to the east. This leads us to inquire into the direction of the winds passing over these meadows. The winds blow at Edinburgh mostly from the east or the west. About 230 days westerly, and 135 easterly. It follows that, with the rare exceptions of winds due north or due south, no wind can prevail at Edinburgh without passing over the Corstorphine or the Restalrig meadows, blowing about five days over the former to three over the latter. The configuration of the ground and the direction of the valleys, scooped out of the "*plateaux*," modifies the action of the currents of air; for the Calton Hill on the one side, and Arthur's Seat on the other, concentrate the east wind as in a funnel, and direct it in mass, loaded with vapours, on Holyrood, the South Back of the Canongate, and the Cowgate, on one hand; and on the other on the North Back of the Canongate, the Low Calton, and under the North Bridge and the Regent's Bridge, into the New Town; thus turning the position of the Calton Hill, no longer available for repelling the enemy. A third column of wind likewise runs up between Salisbury Crags and the Pleasance, turning Arthur's Seat, and penetrating to the southern part of the town. Thus no part of the city is free from the east wind, against which two hills are reared in vain; for in Hygiene, as in tactics, detached redoubts are easily turned. As for the west wind, collecting all the noxious exhalations, "*échellonnés*," on the Glasgow road, it divides into four columns, and pours into the city by the Bruntsfield Links, by the West Port, by the Prince's Street gardens, and by the pleasant village of Water of Leith—sweeping round Moray Place to Stockbridge, Royal Circus, and Great King Street. The Castle is no security against it, and everything is open to its attack. Thus every part of the city is exposed to the east and to the west wind. Let us now endeavour to ascertain the extent of the meadows which engage our attention. Without affecting precision, we may say, that the meadows to the west extend two miles in length by one in breadth, and contain about two square miles—while those to the east of the city may be about two miles long, by half a mile broad, and contain perhaps one square mile. The sum total is three square miles—that is, 1920, or about 2000 acres, equivalent to 87,120,000 square feet of poisonous swamp.

This, then, is the surface covered with the drainage of the city, where it is spread out in small currents, which sink into the ground till it be completely saturated, like a sponge. The sun, acting on the ground so prepared, decomposes the animal and vegetable matter there deposited, and gives rise to all those effects formerly enumerated; while, whatever wind may blow, the exhalations are wafted from one or the other system of drainage to every part of the town.

We now come to consider the quantity of "*debris*" daily carried

away by the sewers of the city. These proceed from various sources, of which the principal are, private dwelling-houses, stables and cow-houses, slaughter-houses, manufactories, and drainage of the streets. Besides what is carried away by the sewers, a quantity of "*debris*" are removed in a dry state by the dust-carts; but being used as manure in the neighbourhood of the town, it equally at last undergoes decomposition, and must therefore be taken into account. It is manifestly impossible to arrive at precision in such a calculation, at least we can only attempt an approximation. If we suppose the average specific gravity of the organic matter consumed by the inhabitants of Edinburgh to be the same as that of water, we shall probably not be far from the mark, especially when we consider the great proportion in which water enters into their composition. For the same reasons, it is likely that when converted into a gaseous form, they occupy about the same space as watery vapour, that is, about 696 times their volume in the solid or liquid form. For, while carbonic acid gas, azote, &c. are more dense than aqueous vapour, hydrogen is more rarefied, so that gaseous water may be taken as a medium density.

It only remains, then, to approximate to the bulk of organic "*debris*" daily poured out of the city, in order to come at the volume of gas evolved from the marshes of which we are treating. When we consider that the population of Edinburgh is about 140,000, and when we reflect on the multitude of horses, dogs, &c. likewise fed in the town—and that, perhaps, not half the raw materials of nutrition can be made available for the purpose of serving as food, it will appear very probable that each individual requires daily, on an average, equivalent to 3 lbs. of organic matter, and (as we before supposed that its specific gravity is the same as that of water), it follows that each individual

requires  $\frac{6}{125}$  of a cubic foot of such organic matter. (The specific gravity of water being  $63\frac{1}{2}$  lbs. to the cubic foot); and that 140,000 requires  $\frac{6 \times 140,000}{125}$  cubic feet, or 6720 daily. If this quantity of

solid matter, previously dissolved, in great part, were resolved into gas or vapour, it would occupy (according to our supposition of these having the average of density of aqueous vapour) 11,397,120 cubic feet. This, then, is the quantity of gas daily evolved from the "*debris*" of organic matter consumed in Edinburgh, or eighty-one cubic feet daily for each individual. If we inquire into the nature of these gases, we shall find that their constituent elements are oxygen, hydrogen, carbon, and azote—except the first, all irrespirable, and when combined together or with other substances still more noxious, in the form of ammoniacal gases, or those of carburetted or sulphuretted hydrogen. This last is so poisonous, that atmospheric air contaminated

with  $\frac{1}{400}$  of its volume of this gas is fatal to horses!

It is unnecessary to repeat here what has been already said relative to the more subtle animal or vegetable poisons generated in such circumstances, since we have no means of calculating their volume, though certain of their production.



It may be said, that much of the organic remains carried out of Edinburgh is conveyed to the sea, or is converted into fresh vegetable life in the meadows themselves.

Making every allowance for this modification, enough remains of the eighty-one cubic feet of poison for every one's share. It may be likewise objected, that only half the exhalations of the marshes reach the city, since whatever wind blows one half to it, blows the other half away from it. Make what allowance we will, there is still a superfluity of death impregnating the atmosphere; for as the superficies of these meadows is about 87,120,000 square feet, and the evolution of gas perhaps 11,397,120 cubic feet, it follows, that if not mingled with the atmosphere, it would lie  $1\frac{1}{2}$  inch deep over the whole surface. Besides, we have not reckoned the drainage of manufactories, stables, slaughter-houses, or markets. Moreover, we have taken the average of the whole year, whereas the causes which give activity to the decomposition are much above the average in summer, owing to the heat and consequent evaporation. It may be objected, also, that places raised a considerable height above marshes are free from their influence, and that situations removed a certain distance are likewise free. But the experience of the Maremmas of Italy shows that no place is secure under the elevation of 1600 *feet*; for Camaldoli, at that height, is attacked by ague. And as for distance, it is known that at Jamaica, a barrack near Kingston was rendered uninhabitable (all those entering it dying) by a swamp *four miles off*.

As, then, the elements of the fatal diseases mentioned formerly are in full operation in our neighbourhood, and every situation, high or low, east or west, old or new, is alike exposed to their attacks, which are made with redoubled virulence in this hot season, it behoves every inhabitant of Edinburgh to unite in arresting such a scourge, which threatens not only the health of the population, but the commercial and social prosperity, and even existence, of the town itself.

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#### LETTER IV.

SIR,—In our letters Nos. I. and II. we examined the nature and effects of organic decomposition, the products of such disorganization, and their effects upon health; and we found among these latter, intermittent, remittent, and typhus fever.

In our last letter we found that Edinburgh was subjected to these influences on account of the defective state of its drainage. We shall now show from documents that this is the fact, and that such influences have produced their legitimate consequences, and that the health of the city has declined in proportion to the rise of the noxious exhalations.

Of all the methods of ascertaining the healthiness or mortality of a town, none is more exact than the registers of an infirmary, since it is recruited from the ranks of the poor, who are subjected to the

prevailing influences of the atmosphere, without any counteracting causes, which exist in the case of the middle or upper classes of society; and for this reason these registers give a more accurate view of the topographical causes of disease than the general registers of mortality.

We shall therefore limit ourselves to the state of sickness at the Royal Infirmary for the last three years, as exhibited in the reports of the Managers.

*From the Report for 1838.*—Patients remaining in the house on the 1st October 1837, 335; admitted from the 1st of October 1837 to 1st October 1838, 4568; total, 4903; of whom 598 died. Thus it appears that 4903 persons have received the benefit of the institution during the past year, of whom 2244 were fever patients.

The return of the previous year showed a corresponding number of 4164, so that there has been an increase of patients admitted into the house during the last year of 739. In their last report the Managers stated, that there had been an increase of patients during the year 1837 of 701, and that the number admitted into the house during that year was greater than in any former year in the history of the Royal Infirmary, and exceeded the average of the previous thirteen years by no less than 912. And they have shown that, during the year 1838, there has been an increase, even above the numbers admitted in 1837, of 739; *i. e.* above the average of thirteen years preceding 1837, of no less than 651.

The whole number of patients who came from a distance was about 350, and thus it appears that about 4000 inhabitants of Edinburgh and Leith, or nearly 1 in 32 of the whole population of these towns (and no less than 1 in 20 of the whole adult population), have sought refuge in the Infirmary during the last year. And that they have not done so on account of slighter ailments than formerly (as some might have suspected), appears undeniably from this fact, that whereas thirty years ago the mortality in the Infirmary seldom exceeded 1 in 20 of the whole patients admitted, it has gradually risen, until in the last year it amounted to nearly 1 in 8. This mortality certainly cannot be attributed to the want of the best medical treatment.

These are facts indicating, it is to be feared, a gradual deterioration of the condition of the poor in this city and neighbourhood, which ought to fix the attention of all ranks of the community.

The Managers stated, in their report for last year, that the cause of the great increase of patients was the unusual prevalence of typhus fever.

The epidemic continued so prevalent throughout the whole year, that they were never able to shut up at any one time more than two of the spare wards (up to that time set apart exclusively for the reception of convalescents), the whole of which had been opened for the admission of fever patients.

The Managers regret to state, that fever, after declining somewhat during the summer, has prevailed again since 1st October last to as great a degree as during last year, and that they have opened every ward in the house, and even *the garrets* for the reception of patients. The number of fever patients admitted from 1st October

1837 to 1st October 1838 has been 2244, and the number from 1st October 1838 to 31st December has been 597.

They are sorry to have to add, that many instances have occurred this winter, for the first time, in which patients in fever have applied at the Infirmary without obtaining admission. This did not proceed from the applicant being unprovided with any suitable recommendation for admission; but it happened only when every bed in the house which could possibly be appropriated to such patients was already occupied. All the exertions that have been made to procure sufficient hospital accommodation for fever patients have been insufficient to prevent its holding its ground in the city, and extending, in many instances of late, to the highest ranks of society..... And it may be feared that this evil will continue to increase. So far the report:—let us make a few remarks.

The numbers admitted in 1836 were 3463; in 1837, 4164—increase 701, or twenty per cent. In 1838, admitted 4903—increase 739, or seventeen per cent. on the preceding year; and on 1836 an increase of 1440, or forty-one per cent! The deaths in 1837 were 450; in 1838, 598—increase 148, or thirty-two per cent! In 1837, 117 per thousand of the patients died; in 1838, 121 per thousand—showing an increased rate of mortality of four per cent. Thus we see that the number of patients has been increasing at the rate of twenty per cent. per annum, and the fatality of the diseases has been augmenting at the rate of four per cent. per annum. Above all, we see that thirty years ago five per cent. of the patients died, but now twelve per cent. We see likewise that the mortality has spread (in defiance of all obstacles) into the highest ranks of society, notwithstanding the means of prevention or escape which are at their command.

What more remains to prove the alarming increase of mortality in Edinburgh? We have seen that such marshes as we have been treating of *must* produce such results; we see the results produced; what more remains in order to connect the cause and effect?

Will an increase of mortality at the rate of twenty per cent. per annum not content us? Shall we wait till the whole population be swept away before we begin to think of remedies? Think not so! The people are not ready to submit to such conditions; and if something vigorous be not speedily effected, the population will desert the place. In the next we shall give some instances of places once flourishing, now abandoned, on account of the marshes allowed to accumulate round them.

## MEDICAL EVIDENCE

RELATIVE TO THE NOXIOUS EFFECTS OF THE IRRIGATED LANDS UPON  
THE INHABITANTS OF EDINBURGH AND ITS NEIGHBOURHOOD.

*Collected by the Police Commissioners.*

We now proceed to lay before the public the opinions of a number of distinguished resident and other medical gentlemen on the effect which the effluvium from the irrigated lands has in generating or fostering disease among the population of the town. From their intimate personal knowledge of the subject, and the positive and unequivocal manner in which their opinions are expressed, any additional comment would here be superfluous; and as it is not the intention in this case to influence the opinion of the public in any way whatever, or to warp their judgment so as to enlist their aid in a party strife, we prefer allowing the simple facts and opinions to go without comment before the public, and leave them to work their silent way to conviction.\*

Dr TRAILL, Professor of Medical Jurisprudence and Police, and Clinical Physician to the Royal Infirmary, thus expresses himself on the subject, and disposes of the fallacies which have been propagated, as to the alleged excellent health of some individuals (the nightmen of London) whom circumstances or occupation have compelled to live in an atmosphere similar in the nature of its pollution to that of Edinburgh.

\* We may here state, once for all, in reference to the following medical opinions, that a great part of them are extracts from written communications, certificates, and letters sent to Mr Drysdale by the professional gentlemen whose names are attached to them; others of them are taken from official communications made on the subject to the late Lord Advocate (Lord Murray); and some consist of letters placed at the disposal of the Commissioners by different medical friends. We regret exceedingly that our limited space has not allowed us to publish at full length all these various documents, but in every instance we have been especially careful not to omit any expression that could qualify the opinion of the writer, and we have on all occasions given that opinion as nearly as possible in the identical words of the author.

“ I believe that every odour which is exceedingly disagreeable to the bulk of mankind is prejudicial to general health, and therefore ought to be abated ; and, in as far as the smell in question is very offensive, it should probably be considered as predisposing to disease. It is no argument against this view to quote the alleged health of the nightmen of London and other great cities ; we know nothing of their real state ; it has been loosely inferred from a few examples of persons in that business not having been affected by it. Such are individuals whose iron constitutions have enabled them to survive this cause of deteriorated health, just as we see some drunkards live to a good old age ; and we have no means of knowing how many have suffered from that cause, whose organization was less robust. Besides, such persons only breathe the impure atmosphere for a small portion of their existence, and spend the greater part of their time in a very different kind of air, while the inhabitants of the city, exposed to the emanations in question, are exposed to them continually night and day. Medical men of great experience have attributed the propagation of fevers to filth. Dr Heberden ascribed the fatality of the last plague, and the prevalence of fever, in London, to filth and bad ventilation among the most miserable of its population. In later times Sir David Barry ascribes the prevalence of fever at Cork to accumulation of filth in the city, and its deficient ventilation. Dr Bancroft says that jail fevers (the worst form of typhus) is lighted up by personal filth and bad air. Drs Grattan and Crampton, in the Dublin Reports on the prevalence of Fever in Ireland, a few years ago, ascribe contagion of fever, and its aggravation, to filth and the accumulation of *animal effluvia*. In France, Halle, Dupuytren, Le Girond, Portal, Permentier, Alebert, describe formidable diseases produced by the emanations from the ill-constructed Parisian necessaries, in cleaning out which many instances of instantaneous death have occurred in that capital. Even immersion of the body, though the person breathe not the gases of privies, has been known to destroy men and the lower animals speedily.

“ Any inferences from these facts would therefore be against the healthiness of the Edinburgh system of irrigation, though I cannot absolutely denounce it as producing fever.”

Dr FYFE, Lecturer on Chemistry, in giving his opinion on the subject, has observed :—

“ I have to state, that it is well known that foul stagnant water is constantly giving off effluvia, and I conceive that these effluvia must materially affect the salubrity of the neighbourhood, more particularly during summer, when they are emitted in great abundance.”

Dr D. B. REID, Lecturer on Chemistry, has expressed his opinion to us,

“ That the present system of irrigating the meadows is prejudicial to the health of the inhabitants of this city, and on the following grounds :

" 1. An immense extent of surface, covered with putrescent animal and vegetable matter, is continually exposed in a moist state to the action of the air, in the same manner as is acknowledged universally to be attended with bad effects when its power is increased by stagnation in peculiar situations.

" 2. This putrescent matter is communicated in such large quantity to the air, that I have repeatedly observed it produce in others what I have also experienced myself, viz. an impression so offensive as to be accompanied with a kind of shivering. This has occurred only, however, in extreme cases, and more especially on the Portobello Road, in particular states of the atmosphere. In a more diluted form it cannot be expected to produce such effects, but it must necessarily affect the constitution, and reduce its tone and vigour, rendering it more amenable to disease, though we may not be conscious, at the moment, of its operation.

" 3. I am inclined to consider, from the details which I have heard, that there are cases where fever appears to have occurred periodically in the vicinity of some of these meadows.

" 4. The history of all large towns where drainage and free ventilation has been an object of attention, as well as the history of innumerable local cases, abundantly prove that causes, such as are now in operation in the meadows around Edinburgh, must tend to injure the health of the inhabitants.

" 5. The smallness of the quantity of material dissolved by the air is no objection to its influence. Even 1-15000th part of some gases has been known to be extremely prejudicial; and I may be permitted to refer to a case where I was one of three who were completely knocked up in a few hours by an atmosphere containing only 1-5000th part of impurity. Farther, when air is analysed, and 100,000 cubic feet or some other large quantity used, chemical analysis is sufficient to point out peculiarities of atmosphere which had previously escaped detection.

" 6. The argument that many persons live and enjoy health in the vicinity of such places as more peculiarly abound in the effluvia complained of, is scarcely tenable in favour of the opinion that they are not on the whole very prejudicial, as it is familiarly known that habit will accustom the constitution to what might at first prove oppressive and unwholesome; further, it may be affirmed, that when such cases are minutely examined, the tone of the constitution is below what might otherwise have been expected.

" From these and other circumstances connected with the influence of a town and country atmosphere upon the general state of health; from experiments upon respiration, where excessively minute quantities of noxious ingredients have been applied for a long time; and from general considerations connected with respiration, and observations made in various parts of the vicinity of this city,—I am led to believe that no measure is more important to the inhabitants of this city, or one for which they ought to be more grateful, than the removing of the present system of irrigation from the common sewers."

Our late townsman, Mr LISTON, the distinguished surgeon, in stat-

ing his views, thus pointedly expresses himself, in a letter lately addressed to Mr Drysdale.

“ I have,” says he, “ long been convinced of the prejudicial effects on the public health by the irrigation of the low grounds and meadows around Edinburgh, with the putrescent water collected from the drains and common sewers.

“ I have long been convinced that this was a fruitful source of the fevers of various kinds, typhus, erysipelas, &c. to which the inhabitants are so much subjected, and by which they have from time to time suffered so severely. No city, certainly, is more advantageously placed to secure perfect ventilation; and some such cause as the one referred to requires to be looked for to account for the remarkable unhealthiness which of late years has prevailed.”

Mr LISTON then refers to his opinion on the same subject, contained in the first volume of the *Lancet* for 1835-36, page 325, which we find fully and forcibly expressed. In enumerating, in the course of a lecture at the North London Hospital, the various causes producing Erysipelas, or the Rose, a disease which Mr LISTON characterises as being “ calculated to mar the best efforts of the surgeon in conducting the treatment of injuries,” he thus proceeds directly to consider the situation of Edinburgh, as eminently calculated to originate and foster this dangerous malady.

“ It also,” he observes, “ often arises from putrid exhalations, and the exposure of patients to miasmata. A very remarkable instance of this occurred some time ago in the cavalry barracks in the neighbourhood of Edinburgh. Any one who has been in the north, on going into Edinburgh by the London Road, must have observed a large piece of flat ground, covered with luxuriant and rank vegetation, and presenting an intolerable nuisance to the nose. The water from all the sewers of that beautiful town is collected into a sort of filthy, putrid rivulet, which, I think, they call the “ Tumble” (the Foul Burn), and in that way is collected in reservoirs; here and there are flood-gates, and at certain periods this horrid collection is allowed to flow over and irrigate the meadows which I have mentioned; and such is the effect of this process, that you cannot pass in that direction, especially just before the setting in of wet weather, or a storm, without being almost suffocated, and finding it necessary to hold your nose all the way over half a mile or more of road. I am, in fact, astonished that the nuisance is not abated. An attempt was once made to have this lovely stream covered over, and the contents carried down to the Forth; and, if I mistake not, a bill was carried into parliament with that view; but great efforts were made by the proprietors of the land to prevent the passing of the measure, and they succeeded in getting the bill thrown out. No wonder they should be anxious to preserve a nuisance which produced them, I believe, some L.20 or L.30 an acre annually, for land which previously was not worth twenty

shillings. The cavalry barracks stand pretty nearly in the middle of this swamp ; and some time after a regiment of dragoons was stationed there, and on the very day following that upon which those sluices were opened, and the irrigation commenced, eight cases of erysipelas appeared among the troops, who were previously perfectly healthy ; and before that regiment left the barracks, a considerable number of men, and two or three of the officers, were destroyed by the disease."

Dr S. ALISON of Tranent, the author of a valuable " Inquiry into the Propagation of Contagious Poisons," published at Edinburgh during the course of the present year, has favoured us with the following opinion on the question:—

" With respect to the particular question in which you are interested, viz. the morbid agency of the emanations from the irrigated lands around Edinburgh, I beg to say, that I consider them to be of a most unwholesome nature, calculated to impair health, and very materially to promote the prevalence of epidemics of a low or putrid character, whose severity and mortality they are likewise very likely to augment.

" The atmosphere over and about the irrigated lands in the neighbourhood of Edinburgh, when loaded with the noxious emanations, is known to produce, even by very temporary action, immediate deviations from health, such as sickness, nausea, giddiness, and headach, with instances of which I am acquainted. Now I cannot doubt, even in the absence of special evidence, that an atmosphere which is capable of producing such effects in the course of a few minutes, will prove most unwholesome when respired for weeks and months and years together, and more especially when the contaminating agencies are of the same kind which, in other localities and under other circumstances, have been proved to be most active in the production of disease.

" I am not aware that any inquiry has been made into the comparative mortality of the different localities around Edinburgh ; but even were it proved that the average number of deaths in localities including irrigated lands was not greater than in those remote from such sources of atmospheric pollution, I could not assent to the inference that the emanations in question are innocuous, as the amount of disease, though not that of death, may be above the average proportion ; and likewise as it is quite possible that the amount of robust health and vigour may be below it, even where no uncommon or striking amount of disease is observable.

" I would be disposed to consider any unusually great amount of mortality in the irrigated districts as evidence of great weight in favour of the opinion that the emanations are extremely hurtful to life ; but I would not consider the absence of such a fact as proof of their being innocuous ; for agencies may not be so very injurious as to cause a perceptible increase of mortality in a district, and yet be most active in producing disease not of a very mortal character, and in im-



pairing health in a general manner, which I believe to be the mode in which emanations from putrefying animal and vegetable materials, in irrigated lands, act for the most part in this climate. Thus, for example, bread adulterated with ground flint or alum, milk with chalk, wine with logwood and other materials, must be very unwholesome, and cause numerous deviations from health, yet I am not aware that they have caused any perceptible increase of mortality in those districts in which they have been used.

“ While I hold the emanations in question to be very unwholesome, I must confess that it is my opinion that they have, on some occasions, been blamed for mischief which they never perpetrated; and that, in short, the injury which they are wont to effect has been greatly exaggerated by some writers on the subject.

“ Lastly, I hold it to be essential to health that a pure atmosphere be supplied for respiration, as well as wholesome food for digestion; and that it is the imperative duty of civil rulers, one of the most important which they owe to the public, to check, by every means in their power, the adulteration of a fluid which is necessary to the existence of every human being.”

The following opinion on the effects of this nuisance on the public health, from Dr MACKENZIE, Carlton Terrace, will, from the extent of the writer's professional experience, be regarded with interest.

“ I think it is impossible but that the effluvia, malaria, or miasma, proceeding from this concentration of all the filth of Edinburgh, must have a deleterious influence on those exposed to it. Forty years professional experience in three quarters of the globe confirm these impressions. I confess that I am unable to analyse malaria, miasma, or these unhealthy evaporations; but will add, that, however bitterly medical men may differ in technical disquisitions upon this subject, there has been but one opinion among them, and mankind generally, in all ages, as to their deleterious effects.”

Dr RICHARD HUIE, George Square, Fellow of the Royal College of Surgeons, in giving his opinion, expresses himself in the following forcible manner, in a letter addressed to Mr Drysdale.

“ How any man, and more especially how any medical man, can deny the insalubrity of those artificial marshes, is to me altogether incomprehensible. If pure air be necessary to the health and comfort of our species, and no axiom is more trite, surely foul air must be injurious to both; and if all of us, from a sense of its offensive and unwholesome nature, use every expedient to remove stagnant water from our own immediate neighbourhood, it is a little too much to assert, that the accumulation of that water, and its conversion into vapour, in the vicinage of our city, can be harmless or safe. That which is noxious on a small scale cannot but be mischievous on a large one.

“ It has been stated, indeed, that if those irrigated lands had been productive of malaria, its injurious effects would have been more ob-

vious and palpable. This, however, is by no means a fair inference. The moderate temperature of the atmosphere in this latitude, the free circulation of air arising from the elevated position of our city, and the scantiness of the population in the immediate vicinity of the marshes, are counterbalancing circumstances, which must be taken into account in estimating their comparative unhealthiness. I have no hesitation in asserting, that in a warmer climate, and in the neighbourhood of a population less favourably and more densely located, those very marshes would be productive of the most deleterious effects; and, therefore, that they cannot be innocuous, though they may be less conspicuously so where they are.

“The effects of malaria are of two kinds, immediate and remote. The immediate effects are fevers of an intermittent or remittent character, to which the inhabitants of the malarious districts are very liable, and strangers more peculiarly so. The remote effects are chronic affections of the viscera, generally, but not necessarily, preceded by attacks of fever; and to these the inhabitants of the unhealthy localities are especially subject, their constitutions being thereby gradually undermined, until dropsy or dysentery closes the scene.

“It will naturally be asked of me whether I have ever witnessed such effects from the offensive exhalations from the irrigated lands about Edinburgh. To this I reply, that, owing to the distance of my residence, I have not many patients in that neighbourhood. Some years ago, however, I did see two cases of fever, in the persons of the manager of the Caledonian dairy at Meadowbank, and his maid-servant, which more resembled the acute fevers of warm climates than any cases I ever met with in this country. Neither had been exposed to any contagion, and they were attacked too simultaneously to allow it to be inferred that the one had infected the other. Both cases were sudden in the attack, violent in degree, and requiring the most energetic treatment. Both recovered, and the disease was not communicated to any other persons about the establishment. I was fully convinced at the time, and I am equally convinced still, that both cases arose from malaria. They occurred in the latter end of July, when the weather was very warm, and the noisome exhalations from the irrigated lands in the vicinity were peculiarly offensive.”

The subjoined report on the condition of the inmates of Queensberry House, in relation to the amount of fever amongst them, possesses great interest, as, from the situation of the building, it is peculiarly liable to be impinged upon by any exhalations from the irrigated lands.

It has been drawn up by Mr SMITH, and is deserving of particular attention.

“*Queensberry House, Canongate,  
Edinburgh, 20th May 1839.*”

“Having been requested by a member of the committee appointed to consider the best means of removing the marshy grounds in the vicinity of Edinburgh, to state the result of my experience regard-

ing the prevalence and mortality of fever in Queensberry House, presently occupied as a House of Refuge for the Destitute, I feel myself enabled to report the following facts :

“ 1. During a period of six months, from October 1837 to April 1838, about one hundred and twenty cases of fever occurred among the inmates of the House of Refuge.

“ 2. Of the servants of the institution (of whom there are generally six or eight), scarcely one of them has escaped being attacked with fever after coming to the house. I state this, not so much as being applicable to the present servants (only four of whom have as yet been attacked), but as a rule applying to all who have hitherto been servants, or as a contingency upon which every one of the servants may calculate with tolerable certainty on their appointment.

“ 3. On one occasion many cases occurred among the girls, inmates of the Refuge, they were at that time kept in a detached building at the bottom of the yard, and next to the South Back of Canon-gate, and from the circumstance of there being no visible means by which the disease could be communicated to them, the medical attendant of the Institution was forced to ascribe their being affected with it to their proximity to the marshes. This occurred about two years ago, and was previous to my appointment to the situation I now hold ; but I was informed of the fact by the doctor, who stated as above, that he could not account for the prevalence of fever at that particular time otherwise.

“ J. SMITH, *House-Governor.*”

In a memorandum with which Mr Smith has favoured us, of a later date (12th October 1839), that gentleman farther observes.

“ The present house-governor of the House of Refuge has been in the situation about six weeks. He had been there only *three* weeks till he took *fever*. His predecessor had only been in office *five* weeks till *he* took *fever*, two years ago. Both were in the prime of life (35 years old). Both removed to Queensberry House from the *same* house in Bruntsfield Links. Both had been very much exposed to contagious and infectious diseases of all kinds, the one having been a city missionary for four and the other for six years. But neither of them had ever caught fever till they went to reside in Queensberry House.”

Although the preceeding report is clear and satisfactory in its nature, and presents the strongest evidence of the injurious effects produced upon the health of the inmates of that charity, by the cause in question, it may be objected that the state of that or any other public hospital does not afford a correct index of the public health, and even less of that of the immediate neighbourhood in which they are placed. Unfortunately for the health of the people of Edinburgh, there is no want of evidence of almost any description to establish the fact of this baneful influence. The reports of public hospitals, and the records of private practice, alike attest its presence and prove its ravages.

The following letter from Mr IMRIE, Surgeon, who lived and practised in the very vicinity of Queensberry House, the centre of the most infected district, proves that effects of this malign influence were not confined to the hospital, but were extended to the dwellings of the vast numbers in that populous district. The letter contains views on this subject, which are highly valuable from their direct bearing on the question.

“ I had 137 cases of fever under my care from the 1st September 1838 to the 1st of March 1839.

“ The localities in which the whole of these cases occurred were the Canongate, the North Back and South Back of Canongate, and the closes and wynds leading to or from these streets; the Abbey, Abbeyhill, Croftanrigh Wynd, Norton Place, Comely Green, Jock's Lodge, and Restalrig.

“ The greatest number of cases in proportion to the population, occurred betwixt Little Lochend's Close, Canongate, and Croftanrigh Wynd, Abbeyhill. The number of cases at Restalrig was nearly as great. The worst cases were in these two localities.

“ Nearly two thirds of these cases occurred in the months of October, November, and December. And nearly the same proportion of them had affections of the chest, bronchitis, pleuritis, or pneumonia. Headach prevailed more or less in all the cases.

“ Nearly one fifth of these cases exhibited all the worst symptoms of typhus fever. The remaining four fifths were comparatively mild cases of fever. The symptoms generally were those of simple fever, or mild inflammatory fever.

“ Both sexes, and all classes and ages, were equally affected by it; but, with a few exceptions, the worst cases were among the poorer classes.

“ In rainy weather, or when the atmosphere was moist or light, and an easterly wind blowing, there was very generally an increase in the number of new cases, of from five hundred to seven hundred per cent. But when the wind was in any other direction, or during a severe frost with an easterly wind, there was a proportional decrease in the number of new cases.

“ There were a great many more cases of fever in these localities that were attended by other medical men, and especially by those belonging to the dispensaries.”

The opinions and experience of Dr BALFOUR on this subject, reported in his letter at page 41, fully concur with those of Mr IMRIE.

The barracks at Piershill are situated in the immediate neighbourhood of a large tract of the irrigated lands. This contiguity has always proved a great source of annoyance to the officers and troops stationed there, in consequence of the very offensive nature of the exhalations or effluvia arising from these lands, and on more than one occasion has formed the subject of a medical report to the government

authorities. We have been favoured by Sir JAMES M'GRIGOR, the Director-General of the Army Medical Department, with a report on the subject, addressed to him by Dr BARLOW of the 3d Dragoon Guards, and dated 6th December 1831.

“ At this period,” says Dr Barlow, “ when so much alarm exists on the subject of cholera, and when his Majesty's Government are enforcing so strongly all the means calculated to prevent its appearance or diminish its malignity, I feel it my duty, as surgeon of the regiment now occupying Piershill Barracks, to call your attention, as the head of my department, to a public nuisance of a most extensive kind, which exists in the immediate vicinity of the barracks. It is an accumulation of every species of filth from the common sewers of Edinburgh, and spreads out artificially so as to cover a surface of several hundred acres. It begins near the Caledonian Dairy, passes close behind the Barracks, and extends all the way to the sea, a distance of more than a mile, in a direct line. The smell proceeding from it at all times, especially in a wild evening, is most offensive, at times actually perceptible in the wards of the hospital; and in the event of cholera appearing in the barracks, or any of the neighbouring places, where there is a considerable population, it could not fail to be the source of an influence of a most malignant kind, and to defeat any effort that I could make, within the barracks, to preserve the health of the regiment under my care.”

On receipt of the above report from DR BARLOW, the principal medical officer in Scotland at the time, Staff-Surgeon JEMMETT returned the following note to DR BARLOW, expressing his concurrence in the above opinion.

“ SIR,—In returning your letter to the Director-General relative to the evil influence that may result from the common sewers of Edinburgh running so near the Barracks at Piershill, I beg to state that I most fully concur with your opinion on the subject, and I believe it has been the general one of medical officers stationed there.

“ I am, &c. (Signed) ALEXR. J. JEMMETT.  
“ *Edinburgh Castle, 15th December 1831.*”

The following extract from a Topographical Report on Piershill Barracks, by the late very distinguished Dr HENNEN, has been kindly transmitted to us by Sir GEORGE BALLINGALL, who has possession of the original document.

“ This barrack is in a situation which certainly, at first glance, would not appear to be healthy, although, generally speaking, the troops have not suffered much. Some cases of ague have at times appeared among the inhabitants, and they have been occasionally affected with dysentery. This last dreadful disease raged there in the summer and autumn of 1813, among the troops, and also among the inhabitants of the district. The summer of that year had been par-

ticularly hot, the exhalations from the morass were extremely offensive, and were rendered more so by the operation of raking out the sediment for manure. To these effluvia and exhalations from the lakes in the neighbourhood of the barracks, acting upon the bodies of the soldiers, heated by the stable duties and in the riding-school, close to the morass, the disease was attributed."

Mr HENRY MARSHALL, Deputy-inspector-general of Hospitals, and a gentleman highly distinguished by his statistical works, and by his Treatise on the Diseases of Ceylon, &c. while mentioning the comparative exemption from fever of the 7th Dragoon Guards, a circumstance which, he says, "will not by any means warrant an assumption that the irrigated lands and ditches are innoxious," farther states, that

"The practice which has prevailed for some time, of irrigating the meadows below Salisbury Craigs and around Edinburgh, obviously gives rise to a very offensive effluvia, so much so as frequently to *excite nausea and sickness* in persons passing along the public road; and, consequently, the practice in question is an excessively disagreeable nuisance, which should if possible be abated. But whether the emanation which arises from the open ditches and irrigated grounds do or do not occasion fever, is a different question. I have not seen any of the cases of fevers which prevail at present in Edinburgh, and consequently I am unable to draw any inference from the symptoms or the history of individual cases in regard to the remote causes of the disease; but I am informed, from undoubted authority, that the prevailing fever very closely resembles remittent fever, which is generally supposed to originate from terrestrial emanations....One circumstance has come to my knowledge which perhaps deserves to be stated. The messman of the 7th Dragoon Guards alleges that he has found, from observation and experience, that the butcher-meat which he provides for the mess becomes very soon tainted at Piershill, much sooner than in any other place with the same temperature. So convinced is he that his inference is well founded, that he has hired a room in Edinburgh, where he preserves his meat until it be ready for dressing. Meat becomes more easily tainted in stagnant, moist, impure air, than in a dry atmosphere; and I think it very possible that it may absorb and retain offensive smells."

In addition to the evidence which we have here brought forward, we may lastly state another case, for which we are indebted to Dr M'KENZIE, and which is highly corroborative of the other medical information we have thrown together on this subject. It relates to the influence of the effluvia on the diseased horses in the veterinary hospital at Piershill Barracks. When we reflect on the great exposure of animals to the action of any morbid agency conveyed through the air, we feel convinced that this evil, in this form, exists to a far greater amount than the public are practically aware of. The case is worthy the consideration of the authorities of the Horse Guards.

"I may mention," says the doctor, "another fact, though speaking under correction, from not recollecting the name of the gentleman or the exact time. It may be three or four years ago. The veterinary surgeon to one of the dragoon regiments then stationed at Piershill barracks assured me, that when the wind blew across the irrigated lands, the cases of the horses in hospital were (and for the worse) sensibly affected by it."

*[The remainder of the page contains extremely faint, illegible text, likely bleed-through from the reverse side of the page.]*

PRESENT AND PROSPECTIVE INJURY TO EDINBURGH  
AS A PLACE OF RESIDENCE.

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We have already alluded to the fact (at page 10), that some individuals of respectability who reside in Edinburgh for the education of their families, are so alarmed at the consequences to which they are exposed from their proximity to these fetid marshes, that they actually contemplate a change of residence unless this nuisance is abated. If to these we add the number who but for this cause might avail themselves of the high classical fame of our educational establishments for the benefit of their children, or be induced to reside amongst us from the many attractions which Edinburgh offers as a city unequalled anywhere, either in architectural or natural beauties,—as the central and meeting point of the more refined society of Scotland,—and as a favoured seat for the cultivation of all varieties of literary, classical, and scientific pursuits, we may then have some idea of a present and impending pecuniary loss to all classes of the community, of an amount which few may have really and correctly calculated upon.

The following special medical certificates which we now produce, bearing directly on this subject, afford an indication of the extent to which this salutary fear operates in deterring individuals of wealth and rank from taking up their abode amongst us. These certificates were produced on the occasion of her Majesty the Queen proposing to visit the city of Edinburgh, and to reside for some time in the Palace of Holyrood. They are perhaps the more valuable as regards the present question, from being the deliberate professional opinion of the distinguished individuals by whom they were given, as to the extent to which the irrigation system affects as a place of residence the salubrity of that particular locality, and of the town generally.

We insert these documents entire, and without comment, leaving the public to judge how much longer they should calmly submit to be made the victims of this nuisance, and of the aggrandizement of a few private proprietors by it. It will scarcely be expected by strangers, that the enlightened inhabitants of the Scottish metropolis would have suffered the palace of their ancient kings, the centre of so much national feeling, and of so many historical associations, to be thus so deteriorated, that it must be declared unfit, through insalubrity, for the



residence of their Sovereign. Nor can any palliation be offered for this. It has arisen neither from any natural defect in the site, nor from any architectural deformity, but simply from the apathy of the people of Edinburgh in suffering an artificial pollution to be reared up around it.

*Letter from Dr J. H. PEEBLES to the Right Hon. the LORD ADVOCATE.*

*“ Wemyss Place, 22d January 1839.*

“ My Lord,—In reply to your Lordship’s letter of the 15th instant, requesting me to consider how far the mode of irrigation as at present practised by the use of the common sewers in the immediate neighbourhood of Holyrood is injurious to the Palace as a residence, I beg to state, that I have examined the locality to which your Lordship refers, and I am of opinion, that although the effects of the exhalations may, in some degree, be counteracted by the luxuriant vegetation produced by the contents of the sewers, the irrigation must be injurious to the general health of the population in the vicinity; and as the whole of the effluvia will be carried on Holyrood during the prevalence of south-west winds, the Palace will be rendered thereby an unsafe place of residence for her Majesty in the warm weather.

“ I would therefore recommend, before the Queen makes a visit to this country, the whole of these grounds should be well drained and cultivated, so as to remove effectually all the offensive exhalations from that locality.

“ I have the honour to be, my Lord, your very obedient servant,  
(Signed) “ J. H. PEEBLES.”

*Letter of Sir GEORGE BALLINGALL to the Right Hon. the LORD  
ADVOCATE.*

*“ Heriot Row, 22d January 1839.*

“ My Dear Lord — Since I had the honour of seeing your Lordship on Saturday, I have inspected the low ground between Salisbury Crags and Holyrood, laid under irrigation from the common sewers of the city.

“ The nuisance is more extensive than I had imagined. I am of opinion, that it is calculated to deteriorate the Palace generally as a residence, and in a very hot season, with the prevalence of south and south-westerly winds, to endanger the Queen’s health, in the event of her Majesty becoming resident in the Palace of Holyrood.

“ I have the honour to be, by dear Lord, your very faithful and obedient servant,

(Signed) “ GEO. BALLINGALL.”

“ *P. S.*—I enclose a letter from my friend and assistant Dr Balfour, whose family have been long resident in the neighbourhood, bearing on the subject of the above-mentioned nuisance.

“ G. B.”

*Letter of Dr BALFOUR to Sir GEORGE BALLINGALL, in reference to the same subject.*

“*Edinburgh, 22d January 1839.*

“*15 Dundas Street.*

“My Dear Sir George,—In reply to the question you put to me this morning, I beg to inform you, that my father’s family, who reside at St John’s Hill, have been frequently much annoyed with the effluvia arising from the irrigated ground at the foot of Salisbury Crags; and some of the members of it were liable in spring to repeated febrile attacks of an intermittent nature, which yielded to the use of bark. These attacks were attributed by my father to the miasma from the marshy ground in the neighbourhood.

“I have for many years attended the sick poor in St John’s Hill, and I have rarely been without patients in that district. From 1st January to 31st December 1838, I find, by reference to my Dispensary Book, that I visited at their own house, in that small and circumscribed locality, between ninety and a hundred sick, and of these, between thirty and forty were fever cases.

“I am, my dear Sir George, yours sincerely,

(Signed)

“J. H. BALFOUR.”

*Letter from Dr ABERCROMBIE to the LORD ADVOCATE.*

“*York Place, January 23, —.*

“My Lord,—The letter of Dr Balfour, in whom I have great confidence, contains facts more directly bearing upon the point to which it refers, than any that have come under my notice; and I cannot hesitate to concur in the opinion expressed by Sir George Ballingall, that with such a neighbourhood, the Palace might prove an unhealthy residence for her Majesty,

“I have the honour to be your Lordship’s faithful servant,

(Signed)

“JOHN ABERCROMBIE.”

*Medical Evidence given on the Trial DUNCAN v. THE EARL OF MORAY.*

In the Introductory Note our readers will learn, that so far back as 1809, certain proprietors instituted an action to have the fulsome and nauseous practices connected with the Foul Burn restrained. The result of that action we have already stated, and only refer to it now, that we may avail ourselves, for the public benefit, of a few extracts from the evidence tendered on the trial.

It may be here perhaps proper to inform the reader, that the principal grounds of complaint in that action were the nuisance and insubriety arising from the *ponds*, or *stanks* as they are sometimes called, in which the impure contents of the Foul Burn are allowed to stagnate for the purpose of forming manure. At the time of the trial, the

extent of the *ponds* was stated to be about a Scotch acre; and from an extract in another page, it will be seen that they are greatly increased since, while the irrigated land has been gradually extended, till now it amounts to hundreds of acres.

The medical evidence adduced at that trial agrees strictly with the opinions we have given from the medical gentlemen who have favoured us with their views on this subject at the present time; and shows that the evil is not altered in the mode of its operation, nor changed in any way, except in the increased magnitude of its extent and influence.

Dr DUNCAN, senior, at that time Professor of the Institutes of Medicine in our University, and one of its brightest ornaments, deponed,

“ That he was of opinion that miasmata, particularly putrid marsh miasmata, are in every case prejudicial to health; and during the course of his attendance at Restalrig, he had attended remittent fevers, which he ascribed to the marsh miasmata arising from the ponds and neighbouring morass.”

He observed, that a disagreeable odour, injurious both to the *health* and comforts of the inhabitants, would arise from the water running from the City of Edinburgh, and carrying off the filth, although it were allowed to run on in an uninterrupted stream; and gave it as his opinion, that the disagreeable and unhealthy odour is much increased by the stagnation which the pools occasion.

Dr A. DUNCAN, junior, Professor of Medical Jurisprudence and Police, and of Materia Medica, corroborated the testimony of his father, as to the offensive smell issuing from the fetid pools and the influence of the marsh miasma in producing fever in several cases, and deponed,

“ That these ponds are just *that artificial preparation of marsh*, which, in the opinion of most medical men, is *injurious to health*, and, in the deponent's opinion, detracts from the comfort of those residing in the immediate vicinity.”

The late Mr JAMES RUSSELL, Professor of Clinical Surgery, and for many years an eminent surgeon in town, in his evidence deponed,

“ That in marshy grounds, and particularly in warm climates, and when the stagnated water is drying, what is termed miasmata is produced, which occasions bad fevers and other diseases. *That under the same circumstances he would expect that similar effects would follow in very warm weather in this country.*

“ That if the current (of the Foul Burn) were allowed to run, and not collected in ponds, he is of opinion that the same quantity of miasmata and noxious effluvia would not be produced.”

Dr T. C. HOPE, the present distinguished Professor of Chemistry, deponed,

“ That from putrescent animal and vegetable matter there arise exhalations which are unwholesome, and prejudicial to health. That he had walked among the ponds, and found that their smell was extremely offensive; and *that he would not only not recommend, but would himself avoid, and advise others to avoid, a residence in that situation, on account of the ponds.*”

Lest our readers should suppose, however, that we are only labouring to make out a case, and have only quoted from the evidence the parts most favourable to our own views, we will now lay before them a few extracts from the defenders' proof, to show the small amount of medical testimony they could bring up in their support. There were only two medical gentlemen examined for the defence; and they, like the other witnesses, were principally called upon to speak of the effects which the effluvia from the manure-ponds had on the salubrity of the district. What they would have said had they been required to give an opinion on a nuisance as extensive as that we are considering at present, the reader will be able to form an idea of from their depositions.

The medical witnesses for the defence were Dr DANIEL RUTHERFORD, at the time Professor of Botany, and Dr W. FARQUHARSON, both gentlemen of the highest character and judgment, and who held a distinguished place in public opinion, as well as in the ranks of their profession.

Dr RUTHERFORD in his evidence says,

“ As a medical man he is rather of opinion, that the effluvia from the ponds are not noxious to health, on account of the current of air which passes down the valley; but that *if there were no air to carry off the vapour, in that case the vapour might be noxious to health.*”

Having given this very qualified opinion as to the salubrity of the effluvia in question, to which, it will be observed, the doctor gives simply the negative character of being only “not noxious,” even when diluted with a current of pure air; he is required to give answer to a question, which from its cogency, seems to have had almost a prophetic reference to the present discussion.

“ Being interrogated whether, if the water from the *Foul Burn*, instead of being collected in pits or ponds, *were spread over the whole surface of the meadows*, would the same effects be apprehended from the effluvia, or whether these effects would *be greater or less.* He depones, that he thinks the effects would be *greater from the mea-*

*flows being alternately wet and dry, and from there being a greater surface for the exhalation of vapour. That the injurious effects proceed from the matter when in a drying state, and particularly in warm stagnant weather. That a greater number of insects would be generated if the water was allowed occasionally to run over the whole meadow, and allowed to dry up, than if collected only in ponds."*

Dr RUTHERFORD's opinion on the innocuous character of the malaria from these ponds was happily blended with a very salutary fear, as we find him subsequently declaring that he

*"Would not recommend the village of Restalrig as a proper place of residence for delicate people, on account of the lowness of the situation, and likewise on account of the disagreeable effluvia which proceed from the ponds."*

Whatever might be Dr RUTHERFORD's professional scruples on the question at issue, it is evident that he was himself assailable by this same nuisance in as great a degree as other people. In answer to an interrogatory from the pursuers' counsel, the doctor says,

*"That in passing these ponds he has been sensible of an offensive smell proceeding from them, and to the deponent the smell was very offensive; and the degree in which it is offensive must depend upon the state in which the person is in at the time."*

Dr W. FARQUHARSON was scarcely more positive in his approval of these ponds than Dr RUTHERFORD; and in the following extract from the records of his evidence, we see every disposition on his part to be guided by the same salutary principle that animated his colleague.

*"Interrogated if he had a patient in Edinburgh who was delicate, and required country air, whether he would recommend the village of Restalrig as a proper place for him. Depones, that most likely he would not; for though he is decidedly of opinion that a delicate person would recover there as well as anywhere else, yet, on account of the difference of opinion among his brethren respecting a situation in the neighbourhood of such ponds, he would not recommend his patient to reside in Restalrig."*

## MISCELLANEOUS EVIDENCE

RELATIVE TO THE INJURIOUS INFLUENCE OF THE IRRIGATED LANDS.

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IN addition to the valuable and direct medical testimony we have adduced on this question, we will now lay before the reader a selection of facts of a general nature, from which it will be evident, that injuries arising from these marshes to the public health are not merely subjects of professional curiosity, or so hidden and occult in their operation, as to be cognizable only by a nice professional criticism, but are of such magnitude as to form a matter of general notoriety.

As a proof of the general deleterious tendency of the miasma of the putrid marshes, whether in producing fever and other contagious disorders, or in aggravating the wounds of persons exposed to its influence (to which latter circumstances Mr LISTON has borne direct testimony), we lay before the reader some information, which we have extracted from a letter addressed by Mr RANKIN, the manager of the Leith branch of the Dalkeith and Edinburgh Railway, to ALEXANDER MACAULAY, Esq. Windmill Street. The following facts have come under Mr RANKIN'S own observation, and are worthy of serious attention, exhibiting as they do the diseased state to which working people in that locality are so unnecessarily exposed.

“ Many of the workmen,” says he, “ employed in doubling the line of the Leith Branch Railway through the irrigated meadows, grew very sallow, some quite yellow, as if they had jaundice, and several left the work from sickness and never returned.”

We quote, in the preceding paragraph, the precise words which Mr RANKIN himself uses, because they pourtray so exactly (and, as we believe, quite unintentionally on Mr RANKIN'S part) the precise diseased appearance which is exhibited by the inhabitants of all those countries where the presence and action of a deleterious marsh poison is doubted by no one. Thus, Dr JAMES JOHNSON, a distinguished living medical author, and physician extraordinary to his late Majesty William IV., remarks, in his work “ On Change of Air :”

“Those who have visited the unhealthy localities within and without the tropics, and who are capable of any observation at all, are well acquainted with the peculiar and morbid aspect which malarious districts impress on the human countenance, in characters which it is impossible to misunderstand. The complexion is neither yellow nor sallow, but an unsightly and unearthly compound of the two—a never-failing effect of malaria, whatever be the parallel of latitude—whether on the pestiferous plains of Beveland or of Batavia. To the experienced eye, the features, the whole countenance, present infallible indications of a slow poison circulating with the current of the blood through every organ of the body, and gradually sapping the foundations of health and life.” “A glance,” he again observes, “at the inhabitants of these malarious countries or districts must convince even the most superficial observer, that the range of disorders produced by the poison of malaria is very extensive. Habitual exposure to malaria saps the energy of every bodily and mental function, and drags its victims to an early grave. A moment’s reflection must show us that fever and ague, two of the most prominent features of the malarious influence, are as a drop of water in the ocean, when compared with the less obtrusive but more dangerous maladies that silently but effectually disorganize the vital structures of the human fabric, under the operation of this deleterious and invisible poison.

“It is the attribute, the character, of all malarious disorders, to be slow in their development when the poison is inhaled in a dilute state, or only for a short time. Those, however, who inhabit marshy or damp situations become, sooner or later, affected with some of the proteiform maladies engendered by malaria, though they are seldom understood, unless they happen to take on a regular aguish character.

“The offspring of malaria and certain morbid agencies conjoined, as intemperance, moral afflictions, and other ills of life, would require volumes for their elucidation. The misfortune is, that both in England and Italy, the poison is often introduced into the constitution. *in doses so minute, that no immediate effect is produced.*”

The effects upon Mr RANKIN himself were scarcely less serious than upon his workmen.

“When,” says he, “the doubling of the Leith Branch Railway was in progress, I walked through the meadows twice or thrice a week, and was often an hour in the effluvia; and I never was so without having a headach, and generally a degree of swelling in the throat. I am of opinion, that if I had been a much longer time exposed to the foul meadows than I was, malignant fever or sore throat would have resulted from it.”

We have also received a communication from Mr GLASS of Marionville, which contains, amongst many other facts, the following information on this particular subject.

“Any person,” says he, “employed in these meadows, who chances to receive a wound, however small, is immediately affected with vio-

lent pain, and swelling of the parts, terminating in gangrene, much in the same way as many medical gentlemen have been who have received a puncture while dissecting, and are laid up unable to work for weeks, nay, sometimes for months." All who are conversant with this neighbourhood are familiar with the above fact. A gentleman who has had experience in this quarter for many years, gives the same statement, which is corroborated by some of the oldest inhabitants of Restalrig, and whose acquaintance with the irrigating process, and all its effects, dates from the commencement of the present system."

We may here allude, in connection with this point in the inquiry, to a fact which has been called in question by some observers, but that nevertheless rests on the strongest possible evidence, we mean, the greater tendency of butcher-meat to run into putrefaction when kept in situations strongly exposed to the marsh effluvia. Indeed this circumstance may in itself be looked upon as an imperfect test of the deleterious nature of the atmosphere of that and similar districts. Thus, Dr COPLAND of London, one of the highest medical authorities of the present day, states, in his learned Dictionary of Medicine, page 762,—

"That malaria depresses vital power, contaminates the circulating and the secreted fluids, and weakens the vital affinity or cohesion of the soft solids, is shown by its more immediate, as well as by its consecutive effects upon the living body, and *by the fact of dead animal matter running faster into putrefaction in situations where it abounds.*"

The following certificate, in addition to what has been already stated by Dr Marshall, will amply prove this to have been observed in regard to Piershill.

"This is to certify, that during our stay at Piershill barracks, I found great difficulty in preserving all kinds of meat and poultry, which in one night would be covered with a greenish slimy matter, particularly when the wind blew from the north and north-west, during the summer months. The cause of this I conceive to be the nauseous effluvia from the valley below, which I pointed out to Dr Clark, Deputy-Inspector-General of Military Hospitals, who visited the spot, and saw the effect on some meat then in store, and was particular in his inquiries concerning the same.

HENRY JENNINGS,  
Messman, 7th Dragoon Guards.

Leeds Barracks, Sept. 30, 1839.



*Injurious Effects of the Effluvia on Particular Individuals and Families.*

Although the effluvia which proceeds from the fields may not be so destructive in their nature as to produce immediate disease, or to affect in a very marked manner the health of stout and vigorous individuals temporarily exposed to its action, such as the military in Piershill Barracks, yet the prejudicial influence which it produces on sickly and delicate individuals living in its vicinity is inconceivably great. With facts such as those which are now laid before the reader, the general public can be but slightly acquainted; but to the medical practitioner, whose occupation brings him daily into contact with the diseased, instances like the following will be quite familiar. From among many cases of a similar kind with which our professional friends have kindly supplied us, we select the following, which have been amply authenticated.

The first is that of a gentleman and lady, who, with their family, reside in Fyfe Place, Leith Walk, and who have had sufficient opportunity of satisfying themselves that the bad effects they have experienced are directly traceable to the exhalations in question.

The narrative has been handed to us by the medical attendant. We extract the following from its effects upon the lady.

“When the wind,” says Mrs R., “is in the east, and carries the exhalation in this direction, it always creates immediate nausea in me, with perspirations, violent pain in the temples, vomiting, fainting, great prostration of strength. It is so intolerable to live with, and has so injurious an effect on my health, *that although we have a seven years’ lease of the house, we shall be forced to leave it.*”

The effects upon the gentleman, although, from his superior strength of constitution, not so violent, were somewhat similar. Mrs and Mr R. had both been residents in marshy climates within the tropics, and their constitutions therefore may be more than usually susceptible of the presence of malaria in the atmosphere.

“But I am not,” continues the lady, “peculiar in suffering in health from its effects. A family, Mrs ———, lived some time in that house called Comely Green, on the London Road. They were obliged to leave it in consequence of the daily-increasing bad health of their daughter, to whom the smell was intolerable, from the headaches and general failure of health which it occasioned. They came there in perfect health, and recovered gradually from the time they left it.”

“A gentleman, she also adds, going to pay the same family a visit when the atmosphere was loaded with the fetid effluvia, was so overcome with nausea and sickness that he actually fell down at the gate.

“ Another lady, Mrs —, living in George’s Place, is frequently seized with vomiting when she comes out to take her morning walk, which she attributes to the abominable vapour for ever present in the atmosphere.

These facts fully accord with what Mr MARSHALL, the deputy-inspector-general of hospitals, states in his Report, inserted at page 37, and with the facts brought out at the trial in 1809, some of which we publish in a subsequent page.

Mr RANKIN gives another case which fell under his personal observation, that bears unequivocal testimony to the insalubrity of that pestilential neighbourhood.

“ Last summer,” says he, “ I appointed a new station keeper at Sheriffhall. He and his family were then all remarkable for their sallow, flabby, dull, and languid looks. Here, living upon a dry, gravel bank, by the side of a running stream, and a fine spring well, amid grass and trees, the family have gradually become quite healthy looking, clear in complexion, firm, happy, and spirited. The striking change in their appearance made me lately ask where they had come from before they came to the railway; and the answer was, they had lived for a year in Seafield toll-bar, close to the foul meadows, and had left it only a few days before they came to the railway.”

The wife of this toll-keeper was similarly affected as the parties in the preceding cases, with nausea and vomiting, caused by the stench arising from the irrigated lands.

Mr JAMES MILLAR, Surgeon, York Place, a gentleman well known to his fellow-townsmen, has transmitted to us the following striking case.

“ A large family, under my professional protection for some years past, are constantly exposed to the effect of the ‘ irrigation-nuisance’ when at home; and the apparent consequence has been, that every spring, as soon as ‘ the floodgates are opened,’ the whole family, with scarcely any exception, are stricken with boils, appearing in successive crops, very painful, accompanied with a good deal of constitutional disturbance, and obstinate of cure. The elder members suffer most; and, on one occasion, the life of the father was actually endangered by degeneration of a boil into formidable carbuncle. Those of the family *who happen to be from home* during the prevalence of the pestilential vapours, escape all such evils. And, *previously* to their residence in Edinburgh, they all enjoyed much better health than they do now.”

A physician in town, whose name we are desired not to publish,

has given us the following written statement with regard to the case of a lady in St John's Street, who had suffered long from the noxious exhalations of the Foulburn nuisance.

"The lady," he observes in one part of his communication, "that I have above alluded to, previously delicate in health, became very sickly in St John Street from protracted fever, of *the type usually occasioned by marsh miasmata*; and I found it absolutely necessary to remove her to another locality, when it subsided. Whatever short of removal was attempted, though long persevered in, was quite unsuccessful. One or two ladies I attended for fever *in the Palace of Holyrood*, the particulars of which I cannot at this moment lay my hands upon; but it struck me at the time, that had not the range of apartments been highly elevated, the cases would probably have been worse. A professional friend of mine was recently deterred from purchasing or renting a house anywhere within the scope of the foul and foetid irrigated district to the east of this city. A family at present, farther south, I am just visiting, are complaining seriously of the stench issuing from the grounds around, they think connected with the *imperfectly drained*, or obstructed drains of the Meadows."

The family of the Rev. Dr LEE also experienced effects somewhat similar, from the same cause, during their residence at Milton House. We give the following letter of that gentleman to Mr DRYSDALE in full, in consequence of its great importance.

"16 Abercromby Place, Oct. 15, 1839.

"MY DEAR SIR,—The substance of what I stated to you with regard to the cause of my ceasing to inhabit Milton House, is this. After having lived in it seven years, and being highly satisfied with the accommodation, as well as the convenience of residing so near my church and parish, I became convinced that the situation was very unfavourable to the health of my family, in consequence, as I believed, of the offensive exhalations arising from some of the fields in the neighbourhood, an increased surface of which had been recently irrigated by a fluid of most loathsome odour. In the course of the last winter of my abode there, one of my sons was carried off by a malignant fever,—another of my family was seized with the contagion, and narrowly escaped, after a long illness, which was succeeded by great debility. About the same time I had a violent and protracted attack of dysentery, the effects of which on my constitution I have felt ever since. Other causes might have produced these maladies; but that they were aggravated by the state of the atmosphere, loaded with foetid vapour, I entertained no doubt. I felt it to be an additional disadvantage that the King's Park, the only open ground in the neighbourhood, where my children had been accustomed to walk, had, from the accumulation of nuisances, ceased to be a fit place for their recreation. These considerations weighed so strongly on my mind, that I was induced to remove to another

house, for which, though inferior in point of accommodation, I paid three times the rent.

“ I am, my dear Sir, yours faithfully,

“ JOHN LEE.”

From the cases of a similar nature with which we have been supplied, we have selected these, as, from the respectability of the parties, there can be no doubt but that they were in other respects surrounded by all the circumstances favourable to good health. Had we begun to report all the instances of disease referrible to that source which have occurred among the less wealthy classes, our limits would have been unnecessarily extended. Of the frightful amount of this increase the reports of the fever board will be the best expositor.

But it is not to cases such as those now related, numerous as they are, nor to any other of a kindred type, in which diseased action or constitutional peculiarity may be urged as a cause of the serious morbid affections produced, that the evil effects of this nauseous exhalation are confined. Families in which there have been no such serious symptoms produced, but who, from the situation of their residences, are exposed to its influence, have still to endure all the discomfort of an abominable public nuisance when they move abroad, or, when the wind is high, be subjected to its presence in their apartments.

In the letter on the subject with which we have been favoured by Dr MACKENZIE, from which we have already quoted, the reader will see the extent of the annoyance arising from this civic and domestic plague to the families living in the fashionable neighbourhood in which the doctor resides.

“ When I first occupied a house upon this hill (the Calton) in 1833, I found (or then imagined I did) that when the wind was from the east or north-east, some disagreeable smells were conveyed by it. In the year following I became convinced that it was so; bad enough during the influence of easterly winds in March, April, and May, but sickening and almost intolerable in the warm months, when the wind was from the same quarter. Since then, 1834, till now, 1839, this nuisance has greatly increased, not alone when inhaling it upon the Terrace, but actually within our rooms, and even when the windows are not open, until at length I have all but resolved to quit a situation which I deem to be the most delightful in Edinburgh as a place of residence, and, I would add, but for this nuisance, by far the most healthful. Yet I believe our cause of complaint is not confined to the Hill Terrace, but that it extends to Leith Walk, and yet further north; and if this is so, how far less endurable must it be to the occupants of houses yet nearer to ‘ Stinkomalee’ than that which I now write from in Carlton Place.”

So distressing is this nuisance to the families resident in that quar-

ter, that on every occasion when the wind blows in the direction of their houses from the marshes and tanks, they are compelled to shut up the windows to prevent the intrusion of this noxious exhalation. The windows on the side of the quadrangle of the Palace of Holyrood contiguous to the Foul Burn and irrigated lands, are regularly closed whenever there is the slightest breath of wind from that quarter, to prevent the apartments from being filled with the effluvium.

Complaints like these we have just enumerated have been of long duration, and have only increased from the extension of the nuisance by which they have been caused.

At the trial in 1809,—to the evidence produced at which we have already referred,—many of the witnesses bore testimony to the misery and discomfort which they suffered from their proximity to the ponds and stagnating waters.

Colonel LEATHOM, of the 4th Dragoon Guards, who had been quartered with his regiment *from May 1801 till August 1802* at Piershill Barracks, deponed,

“ That he was frequently sensible of a most disagreeable and offensive smell while he was in the barracks, which he was certain proceeded from the stagnant water at Restalrig. On going down to Leith with his regiment on two or three occasions, *the stench was so very strong* that for the instant it sickened him. There were frequent conversations among the officers respecting this offensive smell, and in particular they expressed *their surprise that the barracks should be built so near to such a nuisance.*”

The surprise of the officers of the 4th has been shared, we believe, as already stated, by those of every regiment that ever was quartered in that unwholesome station; but the wonder ought to be why no attempt has ever been made by the Government authorities to remove the evident and only cause of insalubrity—the surrounding marsh.

Mr SCOUGALL, the then proprietor of Marionville, who was also on the trial, appears to have been as much annoyed by this nuisance as his successor of the present day, Mr GLASS, whose opinion we have recorded elsewhere. Mr SCOUGALL thus feelingly alludes to the domestic privation he was compelled to endure, and to which the inhabitants of that neighbourhood, and all the contiguous districts of Edinburgh, are still subjected, and in a greatly augmented form. Mr S. deponed,

“ That he can say, in the strongest terms, that the comfort of himself and family is lessened by the vicinity of these ponds. His family have sometimes in the summer to keep their windows shut, in order to exclude *the bad smell from these ponds.*”

The Rev. ROBERT WALKER, at that time minister of the Canon-gate Church, another of the witnesses, deponed,

“ That many a time he had felt a smell offensive in a very high degree in the grounds of Marionville to the south of the house, *inso-much as to sicken him* ; and particularly once, at the foot of the garden, where he felt so very offensive a *smell that it sickened him, and he was unwell for two days.*”

Although from their situation the inhabitants of certain districts of the town are more exposed to this nuisance than others, there is no district entirely exempt from its effects. Encircling, as these irrigated fields do, nearly three fourths of our landward frontier, there is no ingress or egress to or from the City without encountering the annoyance. Half the pleasure-walks in the neighbourhood are deteriorated by its presence. However much the beauty of the surrounding natural scenery may delight the fancy, and its green verdure please the eye, the insupportable odour for ever present in the atmosphere inevitably destroys and dissipates all enjoyment. To all classes in their out-door recreations this nuisance is a source of intolerable annoyance ; but the poor are perhaps more under its influence than the wealthier classes, as from their circumstances they cannot command the same amount of locomotive power. To the latter a few miles of space is comparatively nothing, as it can be readily passed, and the open country attained, where an uncorrupted soil and a pure atmosphere are to be met with, ready to contribute to their reinvigoration and pleasure. But with the poor mechanic and his family the case is sadly reversed. They must necessarily confine their promenade within a narrower range, and seek, as it were, on the very verge of this Lernian marsh, that health which its putrid effluvia forbid them to enjoy. To this class of the community, unless the toil and expense of an absolute journey be undertaken, there is no avoiding the nuisance—no procuring the enjoyment of a pleasure-walk. Hemmed in on every side by a smoking fen, there seems no outlet but the pinnacle of Arthur Seat, for the lower summit of the Calton Hill affords him no immunity from this annoyance of the all-potent enemy.

The passengers by public conveyance are annoyed to an equal extent, and the nuisance forms a never-ending subject of complaint and execration among the company of the railway train and stage-coaches which have to pass through or within the margin of the fetid marsh. Mr RANKIN, the superintendent of the railway, informs us, “ that he, or the officers employed by him, have almost constant opportunities of hearing the passengers lamenting the grievous nuisance to which so populous a neighbourhood is exposed.” And the servants

of the Company make it a practice to propel the railway coaches "as rapidly as possible through these meadows, to prevent the passengers from being disgusted with the railway."

From such facts as the above the reader will wonder why such a nuisance was ever suffered to begin, and still more will he be surprised that an injured public should with such criminal apathy suffer it any longer to endure. But the question is now more than ever the subject of public discussion, and it is to be hoped its fate will shortly be determined.

#### *Effects of the Grasses raised on the Fetid Meadows.*

The disinclination which cattle have in the first instance to partake of the herbage of these marshes, forms a very characteristic and peculiar feature in the case, and merits attention. From the communication from Mr GLASS, to which we have already referred, we extract the following remarks on this subject.

"No horse or animal of any kind will eat a particle of the produce, either while growing, or when first cut, let them be ever so ill off; while, at the same time, turn them to the scanty turfs growing on the road side, and they will devour them greedily. So strongly is this inherent in these poor creatures, that when they are placed in that situation there is no cause for *herding them off the meadows.*"

What opinion are we to form of the healthfulness of that as an article of diet at which the natural appetite of the poor creatures who are doomed to eat it revolts, and which they can only be brought to consume through starvation! Of the character of the milk produced from such food, the reader will be able to form an estimate from the following extract.

"The cattle," continues Mr Glass, "when first put to eat it, have for some days an absolute loathing, and can hardly be got to feed upon it; but when they do, it causes an immense flow of milk, which is kept up by this grass, and what is called *dreg*; but whenever the supply of this grass becomes short, they are found to be incapable of digesting the usual fodder of cattle, and completely diseased, and get unfit for any purpose almost. In this state they are sold for what they will bring, and it is said they very seldom learn any thing regarding the cause of this. I am not sufficiently acquainted with the veterinary art to judge of it; but the fact has been communicated to me by a person who was engaged for some years in the milk business."

Another individual who has had seventeen years' experience in the cowfeeding line, gives us his opinion, "that the grass is most deleterious to cows; horses will not eat it, and cows, if fed on it, always die within twelve or fifteen months."

Mr ARCHIBALD WADDELL, who has had twenty years' experience in feeding cows, concurs in opinion with the preceding statement, and knows it to be productive of disease to the cows. "Has known many die from eating it; not from eating too much, and bursting from the wind," he says, "but from disease caused by the deleterious nature of the grass."

Mr JOHNSTON of Leith Walk confirms the same opinion. Several other cowfeeders have lost their cattle by the constant use of this grass. Its influence upon the health of these animals seems to be such that few can bear up against it for any lengthened period, and all in the end sink under its use, unless their fate is accelerated by a visit to the shambles.

BAILLIE CAMPBELL, Canongate, affirms "that butter taken from the milk of cows fed on the marsh grass, turns putrid in less than twenty-four hours; and that the sweet milk will not keep that time;" a fact corroborated by the statements regarding the tendency of the meat at Piershill to run into a putrescent state.

As might be anticipated, the milk afforded by cows so diseased as these necessarily are, is extremely impure in its nature, and very unwholesome as an article of diet.

Of the injurious effects produced upon the health of the public generally, and of children and sickly individuals in particular, whose diet must in great part consist of the unwholesome beverage, we can form but a very imperfect notion. But when we reflect on the extent of the irrigated land around this city, and the immense quantity of vegetable matter which it produces, it will be at once evident that the foul milk will be a great proportion to the whole quantity consumed.

If, in addition to the absolute quantity of foul milk which these meadows must produce, we reflect on the fact that diseased people and children are often ordered to take it warm from the udder, we will see that the field of injury is greatly increased. Here the foul milk may be said to have almost a monopoly of the market, because the healthful supply from the country cannot be brought to town in the required state. There is perhaps no injunction of the physician whose practice lies amongst invalids of this description more frequently repeated, in regulating diet, than a liberal supply of this healthful beverage; but instead of the patient receiving a draught of a healthful and natural fluid, he is half poisoned by a "leprous distilment," which, instead of strengthening, tends only to disorder the system.

As an instance of this kind, we select the following well-authenticated case, which, as it is of very common occurrence, we would recommend to the particular attention of parents and nurses. The case



is reported by Mr RANKIN, and as it came under his personal observation, may be relied on as correct.

“ I may mention also,” he says, “ the case of a child which came under my own observation. He was brought to Edinburgh from the country in the spring, when the cowfeeders had begun to use the first cutting of the foul meadow grass. He was a year old, and had been weaned about two months. His chief food was cow’s milk, and he was very healthy. When he got the Edinburgh cowfeeders’ milk, he invariably vomited it a few minutes after he had swallowed it. Fortunately the cause was suspected, and after a tedious search, a person was found who kept one cow for his own family use, and fed her wholly on hay, or straw and turnips, because he thought the meadow-grass unwholesome. He from kindness agreed to supply the child, and the child never again vomited his milk.”

Mr JOHNSTONE, in his valuable Treatise on the Draining of Land (p. 34), when discussing with his usual ability the importance of this operation, and directing the different modes of its application, alludes to the irrigated marshes around Edinburgh in the following terms :

“ In the immediate vicinity of Edinburgh there are several hundred acres of the richest water-meadow, producing about L.40 an acre annually; part of which, in its original state, was not worth a shilling per acre. The discharge from the common sewers that drain the City, affords a full supply for this foul irrigation; but there is a maxim in husbandry, ‘ Let nothing be lost.’ But though this species of irrigation adds to the *rental* of the owners, it contributes *nothing to the health* of those who live near it. In the summer months the malaria is almost insufferable. Part of these meadows lie within a few hundred yards of the Royal Palace and the Horse Barracks.

“ The cholera of 1832 was more prevalent in the district adjoining these *mires* than in other localities. Milk cows are chiefly fed with the product of these fields, which must affect the flavour of that most useful fluid as much as it does the salubrity of the air.”

How far the prediction of Mr Johnstone as to quality of the milk produced on these marshes has been verified, the reader has already ample evidence in the previous pages.

“ A Board of Health,” continues Mr Johnstone, “ would certainly recommend their drainage; and the ground being converted to other useful purposes, like that in the site of the North Loch.”

The individual who confines his observation to the irrigated lands alone, has but an imperfect notion of the amount of the evil, or of the wholesale manner in which this fulsome operation is carried on. On the farm of Lochend there is a regular manure manufactory of the most offensive character imaginable. For information on this point,

we refer to the following extract from a letter by a gentleman intimately conversant with the operation in all its branches, and who has been an attentive observer of the rise and progress of this unclean process.

“ I will give a little information,” says our correspondent, “ on what are called the *stanks*, for the collection of the manure from the Foul Burn. When these were first formed, they received principally only the surface water, and what it brought with it, as at that time the principal part of the soil of Edinburgh was carried by carts; there were then only two, and those of no great extent; but since the introduction of water into almost all the houses, and soil-pipes communicating with the common sewers made in the Cowgate and North Back of Canongate, the whole has been conveyed, so as to form so much additional, that, independent of the arrestment of part at the places noticed by Mr Drysdale and Mr Gavin, one individual has increased the receptacles on his farm to more than four times what they originally were, furnishing more manure than would suffice for a farm of ten times the extent. Last year hundreds of carts’ load went to a farm on the Duddingstone estate, and I am credibly informed much went to another near Kirkliston.

“ Within these few years, by an agreement with Mr Brown, a sluice has been formed at the south Musselburgh road, by which means the party has been enabled to throw a very large portion of ground under irrigation, and of course with it the additional nuisance of a larger surface being exposed to produce these vile exhalations. Besides, another greater nuisance, which has hitherto been overlooked, has been introduced by an abominable *wooden trough* carried across the valley, which, when it is full, and the wind blowing, causes complete showers, raising ten times more and worse smell than when it is carried along the surface.”

The following letter to Mr DRYSDALE, from Mr RAMSAY, the active and intelligent inspector of police, we print in full, because we consider it as important, from the confirmatory and circumstantial details which it gives with regard to the process of irrigation; and from the fact which it states with respect to the occasional complete stagnation of the impure water which is employed.

“ *Police Office, Edinburgh,*  
“ 9th October 1839.

“ DEAR SIR,—Various matters here have prevented me from sooner replying to your inquiry regarding the soil-water used in irrigating the lands in the neighbourhood of this city.

“ You are no doubt familiar enough with the process of irrigation to know, that the water is conveyed from the main channels into lateral ones, approximating in level as closely to a horizontal plane as merely to permit the water to flow. It is admitted from the main drains into the lateral ones, either by sluices or dams; both being in use in the meadows irrigated here by the city foul water. The lateral drains

are in general small and numerous ; and irrigation is effected either by making openings in their sides, or by damming up the water so as to cause it to overflow ; and, in either case, it oozes slowly over the surface till it is wholly absorbed in the soil or exhaled by the atmosphere. You must always keep in mind, that one important principle in irrigation is, that the water shall flow over the surface, not ‘ rapidly,’ but in a current so slow as to receive its slow and gradual absorption. If it were to flow rapidly, the purposes of irrigation would be imperfectly attained, the object being completely and equally to saturate the land ; and when that has been accomplished, the sluices and dams are shut till a farther supply is necessary.

“ In the application of these filthy streams to the purposes of irrigation, the smell becomes greatly more offensive ; whether arising from being spread over a large surface, and the accelerated evaporation that circumstance occasions, or from some chemical change in the quality of their contents, I know not. Such, however, is the fact.

“ One of the greatest nuisances arising from these foul burns, is the collecting of the soil into tanks and pools prepared for the purpose. These pools are numerous ; the first being immediately adjoining the Palace of Holyrood, beyond which there is a continued series to the east of Jock’s Lodge. The soil is collected in the following manner : The water being let into the tanks by sluices or dams, is suffered to remain till the soil held in suspension by the water is deposited, in the shape of soft half-liquid mud ; and when the muddy or sludgy deposit has obtained consistence enough to admit of being lifted with shovels, the surface-water is drawn off, and the mud thrown out on the banks, till it throws off a farther portion of moisture ; and in the course of a few weeks it has generally acquired consistence enough to admit of being carted off for the purpose of manure.

“ These operations are generally commenced in September or early in October, when the water is no longer required for the purpose of irrigation, and continued till April, when the water is again wanted for that purpose ; fermentation, you will observe, generally going on all the while, more or less rapidly, according to the state of the weather.

“ You have thus the irrigation itself for five or six months in the year ; and for the remainder you have the contents of the tanks fermenting around you, with all the accompanying nuisances of preparing and removing the soil deposited in them.

“ I have the honour to be, dear Sir, very respectfully, your obedient servant,

“ ALEX. RAMSAY.”

“ *To William Drysdale, Esq.*”

## REPORT OF THE POOR-LAW COMMISSIONERS OF ENGLAND,

ON THE PHYSICAL CAUSES OF DISEASE IN THE METROPOLIS.

IN the Fourth Annual Report of the Poor-Law Commissioners for England and Wales (London, 1838), there is printed in the first part of the appendix, a Report of the Commissioners to the Secretary of State, relative to the propriety of Parliament passing an act for the purpose of making the parish rates liable for certain expenses and charges which had been disallowed by the auditors of the Parish Unions. One of these charges referred to the expenses connected with the removal of *evident physical causes of disease* among the poor of particular districts. On this subject much interesting information has been collected by the Commissioners; and from the medical and other evidence adduced by them, we have made the following extracts, as more particularly bearing upon the present question of the physical sources of disease among the inhabitants of Edinburgh. This evidence can only be regarded as the more powerful in our own cause, seeing that it was originally adduced in reference to several different and distant localities, and yet bears most directly, in many leading points, upon the circumstances in which Edinburgh is at present placed.

The medical reporters, Dr Neil Arnott, author of the celebrated work on Physics, and Physician Extraordinary to the Queen; Dr Southwood Smith, chief Physician to the London Fever Hospital, and much esteemed medical writer; and Dr J. P. Kay, Physician to the Poor-Law Commission, and well known by his excellent treatise on Asphyxia, are all men so eminently distinguished as medical authors and observers, as to give the greatest possible weight to any professional opinion that may be expressed by them.

The Commissioners, in their Report to the Right Honourable Lord John Russell, observe that

“ Amongst the charges which have been unavoidably disallowed, many which increasing experience proves it necessary to submit for the sanction of the Legislature for their allowance. The chief charges which we feel it our duty to recommend for allowance are,  
“ 1. Those charges found necessary for the prevention of burthens upon the rates, occasioned by the desertion of children by their pa-

rents, or by the refusal of natural relations to contribute their proper charges ; and those charges caused by *nuisances by which contagion is occasionally generated*, and persons reduced to destitution.

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“ The most prominent and pressing of this first class of charges for which some provision appears to be required, are for the means of averting the charges on the poor-rates which are caused by *nuisances by which contagion is generated*, and persons are reduced to destitution.

“ In general, all epidemics and all infectious diseases are attended with charges, immediate and ultimate, on the poor-rates. Labourers are suddenly thrown, by infectious disease, into a state of destitution, for which immediate relief must be given. In the case of death, the widow and the children are thrown as paupers on the parish. The amount of burdens thus produced is frequently so great as to render it *good economy* on the part of the administrators of the poor-laws to incur the charges for *preventing* the evils, where they are ascribable to physical causes, which there are no other means of removing. The more frequent course has been, where the causes of disease are nuisances, for the parish-officers to indict the parties for nuisance, and to defray the expenses from the poor-rates.

“ During the last two years the public has suffered severely from epidemics. At the present time fever prevails to an unusually alarming extent in the metropolis, and the pressure of the claims for relief in the rural Unions, on the ground of destitution caused by sickness, has recently been extremely severe ; but, in the course of the investigations into the causes of destitution and the condition of the pauperized classes, carried on under the operation of the new law, and especially in the course of the investigations of the claims for relief arising from the prevalent sickness, *extensive and constantly-acting physical causes of sickness and destitution have been disclosed and rendered fearfully manifest*. With reference to the claims for relief on the ground of sickness in the metropolis, we have directed special inquiries to be made of the medical officers of the new Unions. We have also directed local examinations to be made in parts of the metropolis where fever was stated to be the most prevalent, by Dr Neil Arnott, Dr Southwood Smith, and Dr Kay, our Assistant Commissioner. The more important communications of the medical officers are comprehended in the Medical Report prepared by Dr Kay, with the concurrence of Dr Arnott.”

“ All the evidence,” the Commissioners remark, “ appears to us to be strongly expressive of the want of immediate legislative measures to check the evil, against which the Boards of Guardians have made such exertions as were within their power....And we have eagerly availed ourselves of the opportunity of making the present Report, to submit to your Lordship the urgent necessity of applying to the Legislature for immediate measures for the removal of these constantly-acting causes of destitution and death. All delay must be attended with extensive misery, and we would urge the consideration of the fact, that in a large proportion of cases the labouring classes, though aware of the surrounding causes of evil, have few or no means of avoiding them, and little or no choice of their dwellings. The Boards of Guardians have now the services of an efficient body of

officers, including experienced medical officers, to guide them in the application of sanatory measures more efficiently than was practicable by the overseers of single parishes under the old system. Until more complete measures could be obtained, and even as a temporary measure, we would recommend that the guardians should be empowered to exercise the like powers that have heretofore been exercised, and incur the like charges that have heretofore been irregularly incurred by parish-officers; that they should be empowered to indict parties responsible for such nuisances as those described, and to make arrangements with the owners of property, or take other measures, according to circumstances, for the removal of the causes of disease in cases where there is no ostensible party who can be required to perform that duty." \* \* \*

*“Report on the Prevalence of certain Physical Causes of Fever in the Metropolis, which might be removed by proper Sanatory Measures.*  
By NEIL ARNOTT, M. D., and JAMES PHILLIPS KAY, M. D.

“Among the causes which prevent the greater part of mankind from attaining the full age of seventy years or more, which the nature of the human constitution allows, certain poisons disseminated in the air hold a conspicuous place. Of these the most noted are the matters of small-pox, measles, hooping cough, and that called MALARIA, or MIASMA, the chief subject of this Report, which is generated *wherever* animal and vegetable substances are undergoing putrefactive decomposition, and which produces a *great variety of fevers*.

“This decomposition of animal and vegetable substances takes place with rapidity proportioned to the warmth and moisture of the place, and hence it attracts attention chiefly in tropical countries where organized matters abound, and in low moist situations, as along flat shores, the banks of rivers, in marshy levels, and in thick forests; it is what renders the situations described so fatal, as is known, to human inhabitants, and particularly to strangers. Englishmen, for instance, have painful mental associations with the names of many of their Indian and African colonies, as of Sierra Leone, &c., and particularly as these existed originally, when cultivation and draining were not yet begun.

“Malaria differs in different situations, according to the nature of the substances and other circumstances producing it. In tropical regions the kind produced, independently of human agency, causes the fevers to which the epithets of jungle, yellow, remittent, bilious, &c., have been applied. In more temperate climates it generates such as the fever of malaria in the Campagna di Roma, that which attacked the English army in Walcheren, and all the intermittents or agues of marshy situations. The malaria arising from matters accumulated in the business of human societies will be noticed afterwards.

“The noxious activity of malaria is proportioned to its concentration; hence wherever much air is passing, that is, where there is free ventilation to dilute the poison as it rises, its presence is often unperceived. In many flat tropical islands, for instance, as in Sincapre, beyond Malacca, where the process of decomposition must be going on with great activity, because there is a constant breeze and free

ventilation, there is no disease ; but in other situations near, where surrounding hills make deep unventilated valleys, the malaria is so powerful that the ignorant inhabitants have believed some such places to be the habitations of malignant spirits, enemies of man. And the reason why the danger in all such situations is much greater in the night than in the day, although more malaria is produced in the day than in the night, is, that during the day the sun's rays, by warming the surface of the earth, and the air in contact with it, where the malaria is springing into existence, cause the air to rise and carry away the poison ; but at night the surface of the earth, by radiating away its heat, becoming colder than the general atmosphere, then keeps in contact with it a heavy layer of colder air, in which the poison is confined and concentrated. A boat's crew of eight persons was detained from the ship for a night in the low flat on which part of the town of Batavia in Java stands ; and of the eight persons seven were dead of fever before the end of a week. Malaria being invisible and untangible, men in rude states of society are totally ignorant of its existence ; and, indeed, until lately it has been little understood even among people much more advanced. The fever said by Homer to have destroyed so many of the Greeks in the plains of Troy was occasioned, according to him, by invisible arrows shot from the bow of Apollo, who favoured the Trojans.

“ Besides the malaria arising where nature is uncultivated, we find that whenever men congregate and bring together the quantities of vegetable and animal substances which constitute their food, in the preparation of which there is much refuse, or where the excrementitious matters from their own bodies (being the matter of their food again rejected, and in another form), are allowed to accumulate, there is produced *another malaria, often as destructive to life as the most active which dwells in an Indian jungle.* The fevers called *typhus, putrid, malignant, jail, hospital, ship fever, &c.* are the produce of this malaria, and when once induced, the bodies of persons affected give out a contagious malaria, often more quickly operative on other persons than the original cause. In the early history of cities, therefore, we are prepared to find striking examples of the influence of such malaria ; and the succession of epidemics or plagues, which have almost everywhere appeared, are these examples. In London, for instance, before the fire of 1666, which destroyed great part of the city, and led to the rebuilding of it, with better drains for carrying away the noxious matters which produced malaria, and wider streets for ventilation, there occurred, within seventy-two years of the time of the fire, five epidemics or plagues, and the average destruction by each was of one fourth part of the population, as if nearly 400,000 people were now to be swept off in one year. Since the improvements which accompanied the rebuilding of the city there has been no disease deserving the name of plague until the cholera lately, and the deaths from that, instead of being 25 in every 100, were only one person in every 250 of the population ; proving the prodigious influence of knowledge, and of art founded on it, in guarding against such evils. In many of the old less-improved cities of Europe, as in Paris, Naples, &c. the cholera was as fatal as the plagues of London formerly were. We have now to show that, even in London, the securities against

the diseases of malaria are yet far from being so complete as they should be, and easily might be.

"The means of removing completely the noxious animal and vegetable matters brought to or produced in cities evidently are,

"1. A perfect system of sufficiently sloping drains or sewers, by which from every house and street all fluid refuse shall quickly depart by the action of gravitation alone; the streets, alleys, courts, &c. being moreover well paved, so that the refuse may be easily distinguished and detached.

"2. A plentiful supply of water to dilute and carry away all such refuse, and to allow of sufficiently washing of streets, houses, clothing, and persons.

"3. An effective service of scavengers to remove regularly the rubbish and impurities which water cannot carry away, and fit receptacles for such matters until removed.

"4. Free ventilation, by wide streets, open alleys, and well constructed houses, to dilute and carry away all the hurtful aeriform products of the processes of society.

"5. Keeping as distant as possible from the people the practice of all the arts or processes capable of producing malaria. Hence the situation of cattle-markets, slaughter-houses, cow-houses, tripe-shops, gas-manufactories, burying-grounds, &c. should be determined by competent authorities.

"6. Preventing the great crowding of the lodging-houses of the poor.

"The want of proper attention to these things in London has often been complained of by medical men, and is evident to any attentive observer. We shall adduce a few of the illustrative facts which have occurred to Dr Arnott in the course of his professional engagements.

"*a.* In the field behind Euston Square, towards Somers Town, now occupied by the commencement of the Birmingham Railway, there was until lately, near some very extensive cow-sheds, the meeting of several public drains or sewers in an open ditch, which often overflowed and covered a considerable space with a lake of the most odious filth. In the neighbourhood of this field typhoid fevers were frequent; and in a school of 150 female children in Clarendon Square, Somers Town, every year, while the nuisance was at its height, the malaria caused some remarkable form of disease. In one year it was an extraordinary nervous affection, exhibiting rigid spasms, and then convulsions of the limbs, such as occur on taking various poisons into the stomach; more than thirty of the girls were so affected. In another year it was typhoid fever, affecting an equal number of the children; in another ophthalmia; in another extraordinary constipation of bowels, and so forth. Since the covering of the drains all these diseases have disappeared.

"*b.* Dr Arnott has seen analogous effects produced by foul obstructed drains in private houses. In a house in Baker Street, let during three successive years to different families from the country, there were foul drains, and fever broke out in each of the families.

"*c.* In a mews behind Bedford Square a stable had been let for a time to a butcher, and a heap of dung had been formed at the door, containing pigs' offal, pigeons' dung, &c. During the act of removing this heap, a coachman's wife and her three children, of an adjoining stable, sat for a time at an open window nearly over the place until



the insufferable stench drove them away; two of the poor children died of the poison before thirty-six hours, and the mother and other child narrowly escaped.

“*d.* Some body-snatchers having mistaken the grave they meant to open, two of them died of fever caused by the effluvia from a putrid corpse. And various cases have occurred of persons suffocated by descending into cesspools, old wells, &c. filled with mephitic air from putrid animal and vegetable matters, &c. &c.

“Lately fever of the kind which proceeds from the *malaria of filth* had prevailed extensively in London, the peculiarity of season probably having rendered the ordinary causes more active. At the request of the Poor-Law Commissioners, on the 1st of May we inspected parts in the eastern extremity of London, about Wapping, Ratcliff Highway, the parish of Stepney, &c. from which many patients with fever had been carried to the hospitals. We found, as we were prepared to find, *wherever the fever had appeared, one or more of the causes now to be noticed.*

“1. Houses and courts or alleys without privies, without covered drains, and with only open-surface gutters, so ill made that the fluid in many places was stagnant.

“2. Larger open spaces containing stagnant liquid filth.

“3. Houses dirty beyond description, as if never washed or swept, and extremely crowded with inhabitants, who had no means of separation in case of disease arising among them.

“4. Pigs kept in back yards, with styes very filthy, and masses of half putrid food for the pigs in receptacles around, which in one instance were in the back room of the house, with an open door to the front room, in which was lying a man in the last stage of fever.

“5. Heaps of refuse and rubbish, vegetable and animal remains, at the bottoms of close courts and in corners.

“We have no doubt that, by proper sanitary police regulations, such as a public board of health might decide upon, the typhoid fevers of London and other places might be made to disappear; and we think the remedial measures would cost *less* than it now costs to parishes and public charities to take care of the sick, and to provide for the helpless widows or orphans of those who die. \* \* \*

“The reports of the medical officers of the metropolitan Unions refer the prevalence of the various kinds of endemic contagious fever to two classes of causes.

“A. Circumstances injuriously affecting the well-being of the poorer classes, and arising independently of their habits.

“B. Circumstances injuriously affecting their well-being, and originating to a considerable extent in their habits.

“Among the former classes of causes are enumerated,—

“I. *Imperfection or want of sewers and drains in the parish or district.*

“II. *The existence of uncovered and stagnant drains or ditches, containing vegetable and animal matter in a state of decomposition.*

“III. *Open stagnant pools of water rendered putrid by the admixture of animal or vegetable substances.*

“IV. *Undrained marsh-land.*

“V. *Accumulations of refuse, either thrown from the houses, or otherwise collected in the streets, courts, and lanes.*

“ VI. Lodgment of *filth in large cesspools* and privies, in situations where the exhalations are destructive of health.

“ VII. The situation of *slaughter-houses* in densely peopled districts, among narrow streets, and the bad regulation of these establishments.

“ VIII. The state of some of the public burial-grounds in thickly-peopled districts.

“ IX. The want of ventilation in narrow alleys and close courts inhabited by the working class.”

We shall select, from the medical Reports, a few facts illustrative of some of the principal of these classes of causes.

“ I. *Imperfection or want of sewers and drains in the parish or district.*

“ The communications received from medical officers of the metropolitan Unions enumerate this among the chief causes of fever in their districts.

“ The want of proper sewers is described as occasioning accumulations of filth in cesspools, privies, and surface drains, and rendering the streets the source of miasmata. The cellars inhabited by certain classes are said to be consequently damp, if not actually flooded, and the lower rooms of houses unwholesome, from the fetid exhalations which infest the atmosphere.

Mr Wagstaffe, one of the parochial surgeons of Camberwell, in a letter to the Board (dated 25th September 1837), after pointing out the prevalence of severe fever in and about the parish, and the principal localities in which it was found, remarks,—

“ The primary cause of this infection I believe to be the *malaria or effluvia arising from the state of the drains or stagnant filth*: the heat of the sun acting upon the mud, sends forth this kind of malaria, which, impregnating the air, is the first cause of fever, and consequently the cause of a great additional burden upon the parish by the increased number of paupers rendered wholly incapable of work, and throwing them and their families entirely on the parish.

“ According to the district or situation, so you will have the different degrees of fever, such as ague, typhus (in all its stages), yellow, and many other kinds.

“ I should therefore recommend, as a remedy and preventive, that the drains be cleaned, no filth allowed in the gutters; and, should there be any cow-yards, where pigs are kept, night-soil emptied, &c., that these be also looked to. If a few pieces of lime were occasionally thrown into the gutter, it might assist in purifying the air, &c.; and those houses where fever is or has been should be lime-washed throughout; and thus we may very possibly modify the present state of disease, and prevent worse.”

“ H. *The existence of uncovered and stagnant drains or ditches, containing vegetable matters in a state of decomposition.*

“ In visiting the district in which the patients of the London Fever Hospital had resided previously to admission, we found the nuisance to be a frequent source of fever, in some instances removeable by constantly cleansing the ditch, but at much less cost and more effectually remediable by substituting for the ditch an arched sewer of sufficient capacity.

“ Among the several communications received, this is mentioned as

the cause of fever in certain districts, of which one example from Mr Appleton will suffice :—

“ ‘The district,’ says Mr Appleton, ‘of which I have the charge (Saffron Hill) is a very filthy one, perhaps as much so as any in London; and, although it would be difficult to describe it in all its details, yet there are two or three prominent features which I may point out; first, there is an *open sewer* running the whole length of the district, not a small drain, but almost a river of filth, which passes under Farringdon Street and Bridge Street (where it was formerly known by the name of the Fleet Ditch), and empties itself at the foot of Blackfriars’ Bridge; upon the very edge of this ditch many of the poor have their dwellings, so that they may be said to live continually in an atmosphere tainted by it. Next I may mention that some of the privies in the neighbourhood of this sewer are in a very sad condition; and, lastly, the great mass of the houses in this neighbourhood are exceedingly dirty, and contain as many inhabitants as they well can. The great majority of the cases of sickness occurring in this district *are* in the locality above alluded to; and the diseases most prevalent since I have had the charge (six years and a half) are typhus and continued fevers. Six years ago fever prevailed very much in this particular neighbourhood; and again, for nearly the last two years, we have never been quite free from it... With respect to the remedy for these nuisances, I perceive no effectual one that I can recommend, but that of pulling down all the old houses arching over the sewer, and building a new street; as to any lesser remedy, it does not appear to me that more can be done than to see the privies and drains from them are well washed continually with water, and that the ashes, which are sometimes allowed to accumulate in the courts, are regularly taken away.’ ”

“ III. *Open stagnant pools of water rendered putrid by the admixture of animal and vegetable substances.*

“ The evils arising from this source are exhibited in a letter from Mr Tensh, surgeon, Homerton :—

“ ‘I may state, that in my district, comprising Homerton and Mare Street, of the Hackney Union, I am seldom without cases of a typhoid character, and have carefully searched through my register of sickness from Ladyday 1837 to Ladyday 1838, and find there have been twenty-four cases of severe typhus, of which four were fatal; fifteen of the number were in one locality, named Silk-Mill Row and Wick Street, attributable, I think, to an obstruction by a dam to a mill, which allows a large accumulation of decaying and other matter of a deleterious nature, likely to cause an atmosphere not at all congenial to health, which, aided by, I am sorry to say, the innate want of cleanliness and care on the part of the poor, frequently gives rise to fevers of this description, notwithstanding my very urgent and strenuous endeavours to inculcate the importance of it to their own welfare and comfort.’ ”

“ IV. *Undrained marsh-land is mentioned as a cause of fever* in Great Stanmore parish, Edgware, and the medical officer, Mr Foote, urges the draining of the marsh at the public expense;

“ ‘Two years past,’ he observes, ‘a fever raged at Red Hill, which I attributed to the lodgment of the filth from privies, which I had removed at the time; and the same thing occurred at the Hyde, the fever prevailing there being of the typhoid type; and I consider that, unless the ditch is cleaned, the same kind of fever will prevail again; and also at the marsh in the parish of Great Stanmore, typhus fever lately prevailed amongst the poor.

“ ‘The ditches at the Hyde and Red Hill ought to be kept clean by the parties to whom the houses belong, and I should think the draining the marsh should be a public measure.’ ”

“ Ague is said, by Mr Wright, of Woolwich, to prevail among the poorer classes in the village of Plumstead, and is ascribed to the marshy state of the land in the vicinity; but Mr Wright does not think the evil admits of a remedy by drainage.

“ ‘ With respect to the number of cases of illness ascribable to the above causes, I can state that I have attended, from the 25th February 1837 to 31st December 1837, seventy-five cases of illness. I cannot impute blame to persons on account of the continuance of the evils, neither do I think that the marshes can be more free from stagnant pools than they are at present.’ ”

“ V. *Accumulations of refuse, either thrown from the houses, or otherwise collected in the streets, courts, and lanes.*

“ This source of disease is enumerated in several of the letters received, from which which we select the following :—

“ ‘ There are two parts of the parish of Edmonton,’ Mr Radford observes ‘ which I have visited as the medical officer of the district, in which accumulations of filth are allowed to occur, namely, Archer Street and Eaton Place ; in the latter, cases of typhus have prevailed, more particularly in one house, which, on my representation to the Board, was immediately cleansed and lime-whited, and has since been free from the complaint. The accumulations are the result of the dirty habits of the people living in the places mentioned, and removable only by public means. The cases of fever arising from the exhalations from the heaps in this narrow and thickly-inhabited part are twenty. My district has been very free from fever, except in the localities mentioned, therefore I conceive that the cause is local and confined.’ ”

In a letter to the Commissioners, Mr Bowling of Hammersmith remarks :—

“ ‘ I beg to state, from an experience of thirty years, during which time I have been the medical attendant of the poor of Hammersmith, that we have always had, at certain seasons of the year, fever prevailing to a great extent among the poor, attributable in a great measure to *miasma*, produced by a quantity of water which had been left stagnant on the surface of the earth after brick-making, and which in process of time had become full of vegetable matter. Some years ago this evil had become so alarming, that the inhabitants, influenced by the respectable medical men in the neighbourhood, agreed to adopt measures for improving the drainage, and the parish expended considerable sums in so doing ; but we have still several places inhabited by paupers without any drainage at all, or what there is so very insufficient, that a great quantity of filth of all descriptions is constantly lying on the surface. In several cases this is attributable to the neglect or cupidity of the landlords, whose duty it should be to render the habitations of their tenants more healthy, and there are others capable of much improvement at the public expense.

“ ‘ It appears, by the register of sickness and mortality, that we have had 104 cases of fever from the 29th of September to the 25th of March, and the greater part of these are *certainly* to be attributed to causes that might be removed by *improved drainage* or greater cleanliness ; these are independent of small-pox and other diseases, the malignancy of which must be increased by the above circumstances.’ ”

Mr Hopke, medical officer of St George’s, states that

“ ‘ In many parts of that parish a total absence of fever is but of rare occurrence, and it is generally more prevalent in spring and autumn. Although, undoubtedly, much may be attributed to insufficient *drainage*, a great deal of disease is produced by the careless and dirty habits of the lower order of people dwelling in many parts of this neighbourhood, who, regardless of all consequences, persist in throwing rubbish and other *offensive matters* in the streets in front of their houses, which naturally engender much disease. I would particularly mention Dock and Albion Streets in the upper division, and King Street in the lower division of this parish, where fever frequently occurs in great violence. Many precautionary measures have been at different times taken by the parish authorities, but they have been in a great measure frustrated by the inhabitants themselves.’ ”

“ VI. *Lodgment of filth in large cesspools and privies, in situations where the exhalations are destructive of health, as described in the following letter of Mr Little of Goodman's Fields.*

“ You request me to describe the nature of such places where fever has most prevailed; to which I reply, that fever has been most severe in those courts and alleys where there is no free circulation of air; such as, for instance, Johnson's Change, in Rosemary Lane, in which there are about twenty houses, in almost every one of which fever prevailed.

“ The disease first made its appearance there in the month of August last, and on my first visit I found the intolerable *nuisance* of the overflowing of a cesspool or privy, which continued for some time, there being *no sewer* to carry off the soil. I have no doubt that fever would not be so severe amongst the abodes of the poor if there existed a more free circulation of air, a more perfect system of *sewerage*, and a greater attention paid to the more speedy removal of all *filth* from the numerous courts and alleys; and also if the inhabitants of these places would keep the interior of their habitations in a cleaner state.”

“ Under this class of nuisances may be also noticed the accumulation of filth in cow-yards and piggeries, especially those in close courts and narrow areas surrounded by houses.

“ VII. *The situation of slaughter-houses in densely-peopled districts, among narrow streets, and the bad regulation of these establishments.*

“ Among others, this great evil is adverted to by Dr Jordan Lynch, medical officer of the West London Union.

“ In answer, says Dr Lynch, ‘to your communication of the 27th ultimo, I beg to state, that the parish with which I am officially connected comprehends the poorest and most dirty, lowest and worst ventilated, parts of the city of London, chiefly inhabited by the humblest classes of the Irish, and the most abandoned of both sexes; West Street, John's Court, and Field Lane, with the numberless intricate labyrinths and courts, the haunts of prostitutes, pick-pockets, and thieves of every description, in which fever seems to have taken up a *permanent* abode. I have known it to exist there through heat and cold, through wet and through drought, through every variety of weather; and that the district has never been wholly free from it. Owing to the absence of cleanliness, the crowded state of the rooms, six or seven inmates sleeping in one small room, intemperance, the *accumulations of dirt and filth* that are allowed to take place, all contribute to feed disease and to futilize the efforts of the medical attendant to eradicate it. In addition to this, the number of slaughter-houses that there are in the neighbourhood, or on its immediate confines, and the Fleet Ditch, the reservoir of all the contiguous sewers, runs underneath those places, above the bed of which many of the houses in the back alleys of Field Lane are only a few feet elevated; all these circumstances constitute the constant source of the generation of contagion.’”

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“ IX. *The want of ventilation in narrow alleys and close courts inhabited by the working classes.*

“ Some of the communications from which quotations have been made in illustration of other subjects, also advert to the defective ventilation of the close courts and narrow streets and alleys in which the working classes frequently live. Many other letters advert to this evil. Thus, as Mr Odling remarks,

“ The disease principally exists among the poor, in localities where either there is no or very imperfect *drainage*, or the *drains* are open and badly kept; where filth accumulates; where the population is extremely dense, and the ventilation exceedingly defective.

“ That the localities in which typhus of the worst form usually exists, and, when prevalent, most commonly extends, are narrow courts, lanes, and alleys,

through which there is little or no current of air, in which *drains do not exist or are improperly kept*; the houses densely crowded, several persons, and often two or three families, very generally Irish, occupying a single room, in which all kinds of filth are allowed to accumulate, and little care is taken, either by the landlord or tenants, for the removal or prevention of such evils, for the establishment and maintenance of cleanliness. Such places are often, I doubt not, together with atmospheric influences, the fruitful sources of fever, and I am confident that they often act as prolific foci of contagion.' "

In concluding the Report from which we have taken these extracts, Drs Arnott and Kay recommend, *inter alia*, that the authorities should have power to direct at the public expense—

" 1. That *uncovered and stagnant drains* and ditches, or open and stagnant *pools* of water, from which *fetid effluvia* arise, should be emptied and cleansed.

" 2. The *drainage* of any *open common or waste land*, which appeared upon the report of two of the medical officers injuriously to affect the health of the inhabitants, or to cause ague.

" 3. The removal of *accumulations of refuse* thrown from the houses, or otherwise collected in the streets, courts, lanes, and entries, and the cleansing of all surface-drains of such streets, courts, lanes, and entries.

" 4. To direct the removal of *accumulations of filth from cesspools, privies, piggeries, cow-houses, stables, &c., yards of dwelling-houses, and houses*, whenever two of their medical officers certified in writing that the state of such places was likely to prove injurious to the health of the neighbourhood. \* \* \* \*

" We cannot close the Report without remarking, that the extirpation of the evils arising from these defects in the sanitary police of large cities cannot be effected unless powers are confided to some authority selected by the Legislature for the prevention of those grievous defects to which our attention has been drawn. The imperfect drainage, or the absence of all drainage whatever, the want of a proper pavement in the streets, &c., are frequently found in districts which have been recently covered with masses of new habitations, huddled together in confused groups, with streets so narrow, and courts so completely enclosed, as to prevent the dilution of the malaria arising from various sources within their precincts by the ventilation of free currents of air.

" Many of the most recently erected suburbs of our great cities exhibit so complete a neglect of the most common and obvious precautions, that it can be attributed only to the fact of the increase of the population being so rapid that the owners of such property can command tenants, notwithstanding the absolute neglect of sewerage, and the absence of many precautionary arrangements *absolutely* necessary to insure health. We do not suppose that the means of preventing the recurrence of such evils can be immediately applied; and the circumstances under which this Report is prepared do not enable us to do more than briefly to allude to the nature of the powers which it appears to us to be desirable that the Legislature should confide to some competent authority, whenever this subject can obtain the attention which its great importance justly demands.

“ We do not attempt to determine to what body these powers should be confided, nor do we consider it necessary to describe the exact mode of their operation ; but it seems most expedient, that to some authority should be confided power to cause the survey of land (in the vicinity of towns) likely to be built upon, and to enforce certain conditions on the owners and lessees of such property. \* \* \*

“ Authority should be given to require that, before any buildings are erected on any plot of ground now unoccupied, or only partially occupied, with houses, such plot of ground shall be drained by such sewers as the Board shall deem sufficient ; and provided any owner or occupier of such land should proceed to build without having provided such sewers as the Board should direct, the Board should have authority to cause such sewers to be made at the cost of such owner, and should be empowered to recover the cost from him.

“ That the Board should have authority to require that every habitation should be provided with a drain communicating with the main sewer, with a proper receptacle for every kind of refuse.

“ *Report on some of the Physical Causes of Sickness and Mortality to which the Poor are particularly exposed, and which are capable of removal by Sanatory Regulations ; exemplified in the present condition of the Bethnal Green and Whitechapel Districts, as ascertained on a personal inspection by* SOUTHWOOD SMITH, M.D., Physician to the London Fever Hospital.

“ Some of the severest evils at present incident to the condition of poverty, which have a large share in inducing its high rate of sickness and mortality, are the consequences of improvidence. Such evils are capable of being remedied only by bringing the poor under the influence of the inducements to forethought and prudence.

“ But there are evils of another class, more general and powerful in their operation, which can be avoided by no prudence, and removed by no exertion, on the part of the poor. Among the gravest, and, at the same time, the most remediable, of these latter evils, is the exposure to certain noxious agents generated and accumulated in the localities in which the poor are obliged to take up their abode, and to the pernicious influence of which they are constantly, and, for the most part, unconsciously, subjected. It is the object of the present Report to direct attention to the nature and extent of this evil, and to show how important it is that its mitigation, and, as far as may be found practicable, its entire removal, should form a part of every exertion that is made for improving the physical condition of the poor, and for lessening the burden of their support to the wealthier classes.

“ It is known to every one that the putrefaction of vegetable and animal matter produces a poison, which is capable of exerting an injurious action on the human body. But the extent to which this poison is generated, the conditions favourable to its production, and the range of its noxious agency, are not sufficiently understood and appreciated.

“ It is a matter of experience that, during the decomposition of dead organic substances, whether vegetable or animal, aided by heat and moisture, and other peculiarities of climate, a poison is generated,

which, when in a state of high concentration, is capable of producing instantaneous death by a single inspiration of the air in which it is diffused.

“Experience also shows that this poison, even when it is largely diluted by admixture with atmospheric air, and when, consequently, it is unable to prove thus suddenly fatal, is still the fruitful source of sickness and mortality, partly in proportion to its intensity, and partly in proportion to the length of time and the constancy with which the body remains exposed to it. Facts without number, long observed, such as the great amount of sickness and mortality in marshy districts, the fevers and dysenteries incident to armies on their encampment in certain localities, several hundred men being sometimes seized with disease in a single night, and great numbers dying within twenty-four or thirty hours; the dreadful destruction which occasionally took place in ships’ crews, in ships in which cleanliness had been neglected, and especially in which the bilge-water had been allowed to collect and putrefy, sufficiently attested the presence, in certain situations, of a deadly poison. But this poison was too subtle to be reduced to a tangible form. Even its existence was ascertainable only by its mortal influence on the human body; and although the induction commonly made as to its origin, namely, that it is the product of putrefying vegetable and animal matter, appeared inevitable, seeing that its virulence is always in proportion to the quantity of vegetable and animal matters present, and to the perfect combination of the circumstances favourable to their decomposition, still the opinion could only be regarded as an inference.

“But modern science has recently succeeded in making a most important step in the elucidation of this subject.

“It has now been demonstrated by direct experiment that, in certain situations in which the air is loaded with poisonous exhalations, the poisonous matter consists of vegetable and animal substances in a high state of putrescency. If a quantity of air in which such exhalations are present be collected, the vapour may be condensed by cold and other agents: a residuum is obtained, which on examination is found to be composed of vegetable or animal matter in a state of high putrefaction. This matter constitutes a deadly poison. A minute quantity of this poison, applied to an animal previously in sound health, destroys life, with the most intense symptoms of malignant fever. If, for example, ten or twelve drops of a fluid, containing this highly-putrid matter, be injected into the jugular vein of a dog, the animal is seized with acute fever; the action of the heart is inordinately excited, the respiration becomes accelerated, the heat increased, the prostration of strength extreme, the muscular power so exhausted that the animal lies on the ground wholly unable to stir, or to make the slightest effort; and, after a short time, it is actually seized with the black vomit, identical in the nature of the matter evacuated with that which is thrown up by a person labouring under yellow fever. By varying the intensity and the dose of the poison thus obtained, it is possible to produce fever of almost any type, endowed with almost any degree of mortal power.

“It is proved further, that when this poison is diffused in the atmosphere, and is transported to the lungs in the inspired air, it enters



directly into the blood, and produces various diseases, the nature of which is materially modified, according as the vegetable or the animal matter predominates in the poison. In the exhalations which arise from marshes, bogs, and other uncultivated and undrained places, vegetable matter predominates: such exhalations contain a poison which produces, principally, intermittent fever or ague, and remittent fever.

“ The exhalations which accumulate in close, ill-ventilated, and crowded apartments in the confined situations of densely-populated cities, where no attention is paid to the removal of putrefying and excrementitious substances, consist chiefly of animal matter: such exhalations contain a poison which produces continued fever of the typhoid character. There are situations, as has been stated, in which the poison generated is so intense and deadly, that a single inspiration of it is capable of producing instantaneous death; there are others in which a few inspirations of it are capable of destroying life in from two to twelve hours; and there are others, again, as in dirty and neglected ships—in damp, crowded, and filthy jails—in the crowded wards of ill-ventilated hospitals, filled with persons labouring under malignant surgical diseases, and some forms of typhus fever—in the crowded, filthy, close, unventilated, damp, undrained habitations of the poor—in which the poison generated, although not so immediately fatal, is still too potent to be breathed long, even by the most healthy and robust, without producing fever of a highly dangerous and mortal character.

“ But it would be a most inadequate view of the pernicious agency of this poison, if it were restricted to the diseases commonly produced by its direct operation. It is a matter of constant observation that, even when not present in sufficient intensity to produce fever, by disturbing the function of some organ, or set of organs, and thereby weakening the general system, this poison acts as a powerful predisposing cause of some of the most common and fatal maladies to which the human body is subject.

“ The deaths occasioned in this country by diseases of the digestive organs, for example, by inflammation of the air-passages and lungs, and by consumption, form a large proportion of the annual mortality. No one who lives long in or near a malarian district, is ever for a single hour free from some disease of the digestive organs. By the disorder of the digestive organs the body is often so much enfeebled that it is wholly incapable of resisting the frequent and sudden changes of temperature to which this climate is subject; the consequence is, that the person thus enfeebled perishes by inflammation set up in some vital organ, and more especially in the air-passages and lungs, or by consumption, the consequence of that inflammation. If, then, as is commonly computed, of the total number of deaths that take place annually over the whole surface of the globe, nearly one half is caused by fever in its different forms, to this sum must be added the number who perish by the diseases caused by the indirect operation of this poison.

“ The records of the London Fever Hospital prove indubitably, that there are certain localities in the metropolis and its vicinity which are the constant seats of fever, from which this disease is never absent,

though it may prevail less extensively, and be less severe, in some years, and even in some seasons of the same year, than in others, but still in which it is incessantly committing its ravages.

“From the constant prevalence of fever in these and other districts, it could not be doubted that the poison of fever is constantly generated in these places; but that these localities afford the conditions favourable to the production, concentration, and diffusion of this poison, so generally and in so high a degree, could scarcely have been anticipated. The two districts of Bethnal Green and Whitechapel, to the state of which this Report more especially relates, were selected for inspection principally because the records of the London Fever Hospital, from its first foundation, show, not only that fever is always particularly prevalent in these districts, but that the very worst forms of fever always abound in them.

“From the facts ascertained on this inspection, the following amongst other conclusions may be deduced:

“I. It appears that, in many parts of both these districts, fever of a malignant and fatal character is always more or less prevalent. In some streets it has recently prevailed in almost every house; in some courts in every house; and, in some few instances, in every room in every house. Cases are recorded in which every member of a family has been attacked in succession, of whom, in every such case, several have died; some whole families have been swept away. Instances are detailed in which there have been found, in one small room, six persons lying ill of fever together: I have myself seen this—four in one bed, and two in another. When fever once breaks out and becomes prevalent under circumstances such as these, the poison acquires a virulence which not only proves unusually mortal to the persons immediately attacked, and to those who attend on the sick, but the evil is frightfully increased by the extension of the infection to neighbouring houses and districts. The exhalations given off from the living bodies of those that are affected with fever, especially when such exhalations are pent up in a close and confined apartment, constitute by far the most potent poison derived from an animal origin:—

The room of a fever patient, in a small and heated apartment in London, with no perfusion of fresh air, is perfectly analogous to a standing pool in Ethiopia full of the bodies of dead locusts. The poison generated in both cases is the same; the difference is merely in the degree of its potency. Nature, with her burning sun, her stilled and pent-up wind, her stagnant and teeming marsh, manufactures plague on a large and fearful scale. Poverty in her hut, covered with her rags, surrounded with her filth, striving with all her might to keep out the pure air and to increase the heat, imitates nature but too successfully; the process and the product are the same; the only difference is in the magnitude of the result.’

“II. It appears that the streets, courts, alleys, and houses, in which fever first breaks out, and in which it becomes most prevalent and fatal, are INVARIABLY those in the immediate neighbourhood of *uncovered sewers, stagnant ditches and ponds, gutters always full of putrefying matter, nightmen's yards, and privies*, the soil of which lies openly exposed, and is seldom or never removed. It is not possible for any language to convey an adequate conception of the poisonous con-

dition in which large portions of both these districts always remain, winter and summer, in dry and in rainy seasons, from the masses of putrefying matter which are allowed to accumulate. There is no strength of constitution, no conservative power in health, capable of resisting constant exposure to the exhalations which are always arising from these collections of filth."

We shall here select a few from amongst a great variety of individual instances recorded in Dr Smith's Report, showing the constancy of the above connection between the prevalence of fever in certain districts, and the existence of imperfect sewerage and accumulations of putrefying vegetable and animal matters in the same localities.

"*a. Panderson's Gardens.*—A long narrow street; the houses have no sunk area, and the ground floor is extremely damp. Along the centre of the street is an open sunk gutter, in which *filth* of every kind is allowed to *accumulate* and *putrefy*. A mud-bank on each side commonly keeps the contents of this gutter in their situation; but sometimes, and especially in wet weather, the gutter overflows, its contents are poured into the neighbouring houses, and the street is rendered nearly impassable. The privies are close upon the footpath of the street, being separated from it only by a parting of wood. The street is wholly *without drainage* of any kind. Fever *constantly* breaks out in it, and extends from house to house; it has lately been very prevalent here, and we have lately had several fatal cases from it in the London Fever Hospital.

"*b. Lamb's Fields*—An open area, of about 700 feet in length, and 300 feet in breadth; of this space about 300 feet are constantly covered by stagnant water, winter and summer. In the part thus submerged there is always a quantity of *putrefying animal and vegetable matter*, the odour of which at the present moment is most offensive. An open filthy ditch encircles this place, which at the western extremity is from eight to ten feet wide. Into this part of the ditch the privies of all the houses of a street called North Street open; these privies are completely uncovered, and the soil from them is allowed to accumulate in the open ditch. Nothing can be conceived more disgusting than the appearance of this ditch for an extent of from 300 to 400 feet, and the odour of the effluvia from it is at this moment most offensive. Lamb's Fields is the *fruitful source of fever* to the houses which immediately surround it, and to the small streets which branch off from it. Particular houses were pointed out to me from which entire families have been swept away, and from several of the streets fever is *never* absent.

"*c. Johnson's Change, Front and Back.*—Some time ago a *cesspool* overflowed in one of these courts, and its contents were allowed to remain upon the surface several weeks; after a time, *fever* of a malignant character broke out in the house *next the cesspool*, and has since extended to *almost every house* in all the courts. There is here no drainage of any kind, there is consequently a great accumulation of filth, and the sense of closeness is stifling.

" *d. Cartwright Street.*—A long street, with an *open gutter* in the centre; in this street fever has been prevalent in *every* house. In Walton Court, a narrow and close court terminated at the extremity by a dead wall, as high as the houses, fever has prevailed in every house.

" *e. Blue Anchor Yard.*—An *open gutter* in the centre, always full of *putrefying matter*; abounds with narrow courts, in which the accumulation of filth is excessive, and it is scarcely possible for any air to penetrate. In the whole of this street fever has been *extremely prevalent*; but in the courts scarcely a house has escaped. At one extremity, Blue Anchor Yard, making a sudden curve, terminates in a street called New Martin Street, through which the same gutter runs, or rather stagnates; fever has been in every house in this street, without exception.

" The streets on the northern side of Whitechapel, as Essex Street, Castle Street, Castle Alley, Goulston Street, Petticoat Lane, Tewkesbury Court, George Yard, New Court, the whole of Wentworth Street, and all the courts, alleys, and passages in the neighbourhood, are *without any drainage*, and extremely filthy and close. *Fever has raged dreadfully* in the whole of this district; in some cases six persons of a family have been ill of it together, all in one room, and four in one bed.

" *f. Derbyshire Street.*—Small ground-floor houses, each divided into two tenements containing two rooms, very similar to those in Campden Gardens. An *open gutter* runs close to the houses. Fever has been very prevalent in all these houses.

" *g. Hackney Road Division.*—*Gibraltar Walk* consists chiefly of houses of one story; along the centre of the street is an open gutter in which all sorts of *animal* and *vegetable* matters accumulate and *putrefy*, and the odour of which is most offensive. In the upper part of this street especially, fever has been *extremely prevalent*.

" *h. Read Street and Vincent Street.*—The condition of these streets is exactly similar to that of the preceding. Families live in the cellars and kitchens of the undrained houses, dark and extremely damp. In some or other of these houses fever is *always prevalent*. 'My assistance here,' said the medical officer who was attending me, 'is always required; I am never without cases of fever here.'

" At the lower end of Orange Street the mass of *putrefying matter* on each side flows into a stagnant ditch in Wellington Row. In the houses adjacent to this ditch fever is often *extremely prevalent*. At the end of Wellington Row, and at right angles with it, a ditch from eight to ten feet broad extends nearly to the Hackney Road. In the greater part of its course gardens neatly cultivated extend from adjacent houses to its edge. The stench arising from this ditch at this moment is intolerable. The poor people inhabiting the neighbouring houses, while cultivating their little gardens with so much care as a recreation, and in the hope of promoting their health, little think that at every moment they are inhaling a deadly poison.

" III. Moreover, these people are exposed to much additional evil from the dampness of their houses. A large portion of Bethnal Green is a *swamp*, hardly any part of which is drained. In rainy weather, some entire streets are under water; and large collections of stagnant water cover, winter and summer, considerable spaces of ground

in every part of the district. The dampness of the houses is an evil almost universally complained of by the inhabitants, as well as the wet and muddy condition of the streets during a considerable part of the year. In the less open parts of Bethnal Green, and in a considerable part of Whitechapel, the closeness of the streets, lanes, alleys, and courts, is most oppressive. A fresh current of air can hardly ever reach them; and the evil is greatly aggravated by the very general custom of the people permanently to close the windows of their houses, partly for the sake of warmth, and partly to prevent the real or imaginary effects of the air on the silk used in their work.

“ IV. There is evidence derived from the history of these very localities, that the *formation of a common sewer, the filling up of a ditch, the removal of stagnant water*, and the drainage of houses, have rendered a district healthy, from which, before such measures were adopted, fever was never absent. Thus, for example,

“ *a.* This is strikingly exemplified in the present healthfulness of the upper part of the Hackney Road, in which an excellent common sewer has been recently made, the neighbourhood of which is now well drained. In this part of the district no case of fever is known to have occurred during the present epidemic, although formerly the houses, even in the principal thoroughfare, and more especially the streets, lanes, courts, and alleys adjacent, were the constant seats of fever.

“ *b.* A still more striking illustration of this fact is afforded by the altered condition as to the health of the lower part of High Street, Aldgate, in the jurisdiction of the corporation of the city of London. The south side of this street is occupied by butchers, and the slaughter-houses are behind the street. Formerly this place was in an exceedingly filthy condition. At that time fever of a typhoid character was occasionally prevalent in all this neighbourhood.

“ *c.* From Goldsmith's Place to Cambridge Heath there is an excellent underground common sewer, completely covered in. Here the inhabitants are healthy; no case of fever is known to have occurred in the neighbourhood. This sewer was made two or three years ago, before which, fever was *as prevalent here as in most other parts of the district*; but since that time there has been a remarkable improvement in the health of the inhabitants.

“ *d.* Cambridge Road is also well drained, and in like manner the inhabitants are healthy. There is here no fever.

“ *e.* Immediately behind Bethnal Green is a large stagnant ditch, surrounded by poor cottages, the inhabitants of which are constantly suffering from fever; into this ditch, among other things, is constantly flowing the filth from a number of pig-styes, where it is allowed to accumulate and putrefy.

“ *f.* About three years ago a common sewer was made by the corporation of London in this street, into which, after incredible trouble, the commissioners succeeded in inducing the butchers to open drains from the slaughter-houses and the dwellings around. Even now the blood and filth from the slaughter-houses lie sufficiently long on the surface to produce an offensive odour; but, on account of the excellence of the drainage, the same particles of matter do not lie sufficiently long to putrefy. Fever has been comparatively absent from this neighbourhood ever since the opening of these drains. Dwell-

ings, thickly crowded with inhabitants, stand all around the slaughter-houses, yet here, where the materials for the production of the worst forms of fever are most abundant, scarcely a case has occurred even during the present epidemic. On the other hand, in the passages, courts, and alleys on the very opposite side of the street, from the houses of which there are no drains into the common sewer, fever of a fatal character has been exceedingly prevalent. I have myself very recently attended several families in these courts labouring under the worst forms of spotted fever; but I have neither seen nor heard of a case on the opposite (the south) side of the street; whereas there is hardly any part of Bethnal Green or Whitechapel in which fever has been more prevalent or fatal than in the streets, courts, and alleys which go off from High Street, &c. to which the before-mentioned sewer does not extend. In the streets, courts, and alleys just adverted to, which branch off from the main street of Whitechapel, there is either *no drainage* at all, or what there is is superficial and exceedingly imperfect.

“The preceding facts point to one effectual remedy for lessening the sickness and mortality of these and similar districts, namely, the removal of the sources of the febrile poison. It is obvious, on inspection, that several of those sources in the two districts in question might be removed at no very great expense. In the mean time, to allow them to remain as they are is to incur very serious expense.

“There can be no end to the expenditure of money in relieving individual cases of fever, until the cause that produces the malady is removed; whereas the greater part of the expenditure incurred by the removal of the cause of fever is incurred but once. It becomes, then, a question whether, setting aside all higher considerations, it is not expedient, even on the ground of economy, to appropriate a part of the money expended on the poor in protecting them from fever, by removing from the immediate proximity of their dwellings the main cause that produces it, rather than by relieving a few individuals after they become affected with the disease,” &c. &c.

“It is desirable that a power should be lodged somewhere to prevent landlords from building in swampy places *without proper drainage*, to compel them to drain into common sewers when made, and likewise to compel them to keep the privies in a state of cleanliness, and to cleanse the exterior and interior of the houses, either at given periods, or when obviously indispensable to the health of the tenants.

“The previous statements connect, in the clearest manner, the prevalence of fever with poisonous exhalations, arising from *putrid animal and vegetable matter*. This connection has been long known, and the facts on which it has been established have been recorded by the original observers in most instructive histories. The accounts to which I allude, illustrate, in the most striking manner, the effects of this poison on the human body, from its simultaneous operation on large bodies of men, who immediately before their exposure to it were in sound health; but as the accounts were written long before the poisonous matter had been obtained in a tangible shape, they assume a new interest, now that it may be procured in such a palpable and concrete form as to enable us actually to experiment with it. It may therefore be worth while to cite a few of the most remarkable

facts recorded by the older observers, to illustrate the clear manner in which they perceived the existence and operation of this poison.

“ ‘When the troops were in Zealand,’ says Sir John Pringle, in his *Observations on the Diseases of the Army*, ‘they had not been a fortnight in the cantonments before several of the men belonging to the regiments which were stationed nearest the inundations, were seized simultaneously with lassitude and inquietude—a sensation of burning heat, intense thirst, frequent nausea, sickness and vomiting, aching of the bones, pain in the back, and violent head-ach. There were some instances of the head being so suddenly and violently affected, that, without any previous complaint, the men ran about in a wild manner, and were believed to be mad, till the solution of the fit by a sweat, and its periodic return, discovered the true nature of their delirium. Most of the men were first taken ill upon their return from forage; the regiment being cantoned close upon the inundations, and many of the quarters being above two leagues from the place where the magazines were kept, the men were obliged to set out about four in the morning, in order to get back before the greatest heat of the day. At this early hour the meadows and marshes on each side of the road were covered *with a thick fog, of an offensive smell*. The party generally returned before noon; but several of the men, even before they could get back to their quarters, were already in a violent fever; some, in this short space of time, were actually delirious; and a few on their way home were so suddenly taken with a frenzy as to throw themselves from their trusses into the water, imagining they were to swim to their quarters. One man, on reaching home, was suddenly seized with intense headach, got out of his quarters, and ran about the fields like one distracted.

“ ‘Major Prior gives the following account of a *malignant fever* which attacked the army of the United States, and the cause of which was traced to a *large pond in the cantonment*. An attempt had been made two or three years before to fill it up, by felling a number of large trees that grew on and near its margin, and by covering the wood thus felled with earth. This intention had not been fulfilled. In August the weather was extremely hot and uncommonly dry; the water had evaporated considerably, leaving a great quantity of muddy water, and a *thick slimy mixture of putrefying vegetables, which emitted a stench almost intolerable*. The inhabitants of the village, principally French, and very poor, as well as filthy in their mode of living, began to suffer first, and died so rapidly that a general consternation seized the whole settlement. The garrison continued healthy for some days, and we began to console ourselves with the hope that we should escape altogether; we were, however, soon undeceived, and the reason of our exemption heretofore was soon discovered. The wind had blown the air arising from the pond from the camp, but as soon as it shifted to the reverse point the soldiers began to sicken. In five days half the garrison was on the sick list, and in ten half of them were dead. They were generally seized with a chill, followed by headach, pains in the back and limbs, red eyes, constant sickness at stomach, and generally, just before death, with a vomiting of matter like coffee-grounds; they were often yellow before, but always after death. The sick died generally on the seventh, ninth, and eleventh days, though sometimes on the fifth and on the third. As some decisive measures became necessary to save the remainder of the troops, I first thought of changing my quarters, but as the station was in every respect more eligible than any other, and had been made so by much labour and expense, I determined to try the experiment of *changing the condition of the pond* from which the disease was believed to have arisen. *A ditch was accordingly cut, what little water remained was conveyed off, and the whole surface covered with fresh earth*. The effects of this scheme were soon obvious; not a man was seized with the worst form of the fever after the work was finished, and the sick were not a little benefited, for they generally recovered, though slowly, because the fever became a common remittent, or gradually assumed the intermitting form. A few cases of remitting and intermitting fever occurred occasionally, till frost put an end to it in every form. *As soon as the contents of the pond were changed, by cutting the ditch, the cause, whatever it was, seems to have been rendered incapable of communicating the disease in its worst form.*

“ Dr Macculloch relates an instance of some men aboard a ship, who were seized, while the vessel was five miles from shore, with fatal cholera, the very instant the *land-smell* first became perceptible. Several of these men, who were unavoidably employed on deck, died of the disease within a few hours; the armourer of the ship, who, before he could protect himself from the noxious blast, was accidentally delayed on deck a few minutes to clear an obstruction in the chain-cable, was seized with the malady while in that act, and was dead in a few hours.

“ Dr Potter, in a report on the rise of a yellow fever which he witnessed in a valley in Pennsylvania, *which contained numerous ponds of fresh water, and which, from the heat and dryness of the season, emitted a most offensive smell*, states that on one occasion he was called to a family residing in a house which stood on a level piece of ground, apparently beyond the reach of noxious exhalation, there being no stagnant water, as was supposed, within a mile of it. Here he found the mother labouring under a bilious remitting fever, which continued eleven days; the daughter, seventeen years of age, suffering from a similar fever; two sons, the one between eight and nine, and the other six, ill with dysentery; and the father on the brink of the grave, from a most malignant fever. There being no apparent cause for the condition of this afflicted family, the immediate neighbourhood of the house being free from the ordinary sources of malaria, the condition of the house itself was minutely investigated; the cause of the evil was manifest; the present family had resided in the house only about five weeks; immediately preceding their occupation of it a man had died suddenly in it. Dr Potter himself was seized with nausea and general lassitude immediately on leaving the house after his first visit. On examining the premises it was found that the cellar contained water about two feet deep, which had remained there from the first week in June, the country having been then inundated by torrents of rain. The cellar being useless, the door had been closed, and the only vent for the pestiferous gases was through the floor, which was open in several places. The family being immediately removed, all the sick became convalescent from the time they ceased to breathe the air of the place. The owner of the house hired two men to empty the cellar; these men, having ripped up the floor, and placed a pump in the deepest part of the water, evacuated the cellar to the dregs in one day. On the second day after the execution of this task, one of these men was seized with a chilliness, succeeded by an ardent fever, which terminated with the usual symptoms of yellow fever, namely, hemorrhages, yellow skin, and petéchiæ, and proved fatal on the third day from the attack. The day following the seizure of the first, the second man was attacked with similar symptoms, and died on the seventh day of the disease with the black vomit, in addition to the ordinary symptoms of the yellow fever.

“ In assigning the reason why Grand Cairo, in Egypt, is the birth-place and the cradle of the plague, Dr Mead long ago gave the following account of the locality: ‘ This city is crowded with vast numbers of inhabitants, who live not only poorly, but nastily; the streets are narrow and close; the city itself is situated in a sandy



plain, at the foot of a mountain which keeps off the winds that might refresh the air, consequently the heat is rendered extremely stifling; a great canal passes through the midst of the city, which, at the overflowing of the Nile, is filled with water; on the decrease of the river this canal is gradually dried up, and the people throw into it all manner of filth, carrion, offal, and so on. The stench which arises from this and the mud together is intolerably offensive; *and from this source the plague, constantly springing up every year, preys upon the inhabitants*, and is stopped only by the return of the Nile, the overflowing of which washes away this load of filth. In Ethiopia the swarms of locusts are so prodigious that they sometimes cause a famine by devouring the fruits of the earth, and, when they die, create a pestilence by the putrefaction of their bodies; this putrefaction is greatly increased by the dampness of the climate, which, during the sultry heats of July and August, is often excessive. *The effluvia which arise from this immense quantity of putrefying animal substance, with so much heat and moisture, continually generate the plague in its intensest form*; and the Egyptians of old were so sensible how much the putrefaction of dead animals contributed towards breeding the plague, that they worshipped the bird Ibis for the services it did in devouring great numbers of serpents which, they had observed, injured by their stench when dead as much as by their bite when alive.

“The preceding observations and histories show the operation of the poison on a *large scale*, and when in a *highly intense state*; but its operation is not less real or less constant, though it may be less striking, around the stagnant ditches, the uncovered sewers, the filthy gutters, and the exposed privies of Bethnal Green, and in the close, dirty, and undrained courts and alleys of Whitechapel. For the future, by proper sanitary regulations, namely, by attention to the structure of houses, the arrangement of streets, the introduction of the requisite space between streets and houses, the construction of underground sewers, the opening of under-ground drains from the houses into the sewers, and the immediate removal from the neighbourhood of dwelling-houses of all refuse matter capable of undergoing putrefaction, the generation and accumulation of this poison might be prevented to a great degree in all cities, towns, and villages. Our ancestors, who paid little regard to considerations of this kind, have no doubt opposed formidable obstacles to the proper ventilation and drainage of considerable portions of most of our cities and towns; but still, if the importance of the principle had been duly appreciated, much would already have been done to mitigate the evil, and much might still be effected. At all events, seeing that the evil as it exists at present is so vast in extent and so unceasing in its operation, and seeing that it brings such deplorable consequences on that class of the population, more especially, which is the least able to guard against and to resist them, this subject is one which deserves the serious consideration of those who labour for the improvement of the physical condition of the poor, and who are charged with providing in the most effectual and economical manner for their maintenance, when, by the prevalence of epidemic and other diseases, they are rendered unable to support themselves.

(Signed) “SOUTHWOOD SMITH.”