APPENDIX.

No. I.—Conclusions obtained with respect to Cholera.

On a review of the whole of the late experience we conceive that its main results are in strict accordance with the conclusions at which the Metropolitan Sanitary Commissioners arrived from their official investigations in 1847. Before the second visitation of the pestilence had yet returned, but when the calamity appeared to be impending, from a consideration in the rise and spread of cholera in 1831, and a comparison of the circumstances which marked the severity and extent of its prevalence in the principal towns, both of Great Britain and of Europe, the Commissioners arrived at the conclusion, contrary to the view which was then commonly entertained, that the pestilence would present nothing peculiar in its course; but that it would be found to be governed by the same laws as other epidemics, and to attack in the largest numbers, and with most severity, the same classes of persons and the same places as typhus, scarlet fever, diarrhœa, and the entire class of zymotic diseases. We submit that the history of the pestilence which we have now given, relative to the persons and places that have suffered as well as to those that have been exempt, has placed this matter beyond further question.

On a consideration of the evidence which was at that time submitted to the Commissioners that the conditions which favour the origin and spread of typhus, and the other common epidemics of this country, particularly overcrowding, which year by year has gone on steadily increasing, by the increase of the population as well as by immigration, without a proportionate provision of proper habitations, or any additional means for the removal of the increased filth, necessarily consequent on augmented numbers; the congregation of great numbers of the population in all our large towns into compact masses, without fresh air and without pure water; living, many of them, over cesspools, or close on foul and overflowing privies—considering that these and other circumstances conducive to an impure condition of the atmosphere had not diminished since the former epidemic, but had materially increased, the Commissioners expressed an apprehension that the approaching epidemic would be more extensive and fatal than that of 1831. Instructed as we now are by experience as to the extent to which this apprehension has been realized, it is matter of regret that this apprehension was not at the time more forcibly urged on the attention of the Legislature. It has been already stated that the deaths in the recent have been more numerous than the recorded attacks in the former epidemic, while the attacks have been more than double; the total number of recorded deaths in England and Wales in the whole of the former epidemic being only 16,437, whereas in the single year of 1849 they amounted, including diarrhœa, to 72,180.

The terror with which the re-appearance of this disease was universally regarded at the time when its second return was expected, arose principally from the prevalent opinion that it was a sudden and uncontrollable malady, neither to be prevented nor remedied. In our first and second notifications, we made representations which appeared to us to be calculated to remove this false and pernicious popular impression, and by a large body of evidence derived from the experience of the disease in India, and in the principal towns of Europe, as well as from the experience of our own country in 1832; we endeavoured to show that, with a few exceptional cases, occurring chiefly at the first outbreak of the pestilence in a new locality, the disease gives distinct warning of its approach, in time for effectual precautions to be taken against it; and that if that time is not lost, and proper precautions are not neglected, in the immense majority of instances the malady may be stopped in its first or premonitory stage, and its progress to a fatal termination arrested. We submit that the truth of this view, which was at that time doubted even by the highest medical authorities of this country, is established by the entire body of evidence which has been detailed in the preceding pages.

It was stated in the Metropolitan Sanitary Report, that when cholera first appeared in this country, the general belief was, that the disease spreads principally, if not entirely, by communication of the infected with the healthy, and that therefore the main security of nations, cities, and individuals, consists in the isolation of the

infected from the uninfected,—a doctrine which naturally led to the enforcement of rigorous quarantine regulations; the establishment of military and police cordons; the excitement of panic; and the neglect, and often the abandonment of the sick, even by relations and friends: but that since opportunities had been obtained of a closer observation of the character of this disease, and of the mode in which it spreads through continents, nations, cities, towns, and families, facts had been ascertained which were incompatible with this view of its mode of dissemination, and of its prevention; that the disease is not in the common acceptation of the term contagious, but spreads by an atmospheric influence, its progress consisting of a succession of local outbreaks. We submit that the facts which we have now detailed relative to its progress from Asia to Europe, through the several countries of Europe, through the principal towns of Great Britain, and through the districts, streets, courts, and houses of each individual town, is in strict accordance with this view.

At the commencement of these investigations, it was believed that cholera, typhus, and other epidemic diseases were imported; this impression being derived from the observation of the frequency of their recurrence in migratory populations, whereas we have shown in our Report on Quarantine that in overcrowded low lodging-houses, the worst of fever nests in every town, as well as in close, overcrowded, and filthy ships, the conditions being the same as in a stationary population, the results are the same; and that the tramping about from town to town in the open air, except when the strength is exhausted by fatigue, instead of increasing, tends to lessen disease.

We have elsewhere stated that whereas it was formerly believed that the most powerful predisposition to this disease is induced by deficient food and clothing, and that for this reason its chief victims are found among the destitute, or persons on the verge of pauperism, a closer observation of facts showed that, while the unfavourable influence of destitution is not to be denied, a far more powerful predisposition is the habitual respiration of an impure atmosphere; that the highest degree of susceptibility is produced where both these conditions are combined, that is, where people live irregularly, or on unsuitable diet, and at the same time filthily; and that, in places in which a great degree of cleanliness is maintained, the poor as well as the rich enjoy exemption from this disease.

We submit that the tenor of the evidence derived from recent experience affords complete confirmation of these views.

It was stated by the Metropolitan Sanitary Commissioners, that even at that time experience had sufficiently proved that the circumstances which influence the origin and spread of typhus and other epidemic diseases were generally removable by proper sanitary arrangements; that consequently typhus and its kindred diseases are to a great extent preventible, and that there was reason to believe that the spread of cholera might be prevented by the like means, namely, by general and combined sanitary arrangements.

We submit that the late experience has added to our previous knowledge of the efficiency of sanitary arrangements in checking the extension of this formidable disease. For the evidence which we have now detailed shows,—

That where combined sanitary arrangements have been carried into effect the outbreak of the pestilence has been sometimes averted;

That where its outbreak has not been prevented its course has been gradually, and in several instances suddenly, arrested;

That where material improvements have been made in the condition of the dwellings of the labouring classes there has been an entire exemption from the disease, and that where minor improvements have been introduced the attacks have been less severe and less extensive, and the mortality comparatively slight;

That with reference to the measures of prevention and alleviation which we have thought it our duty to recommend, and in the instances in which circumstances appear to require it, to enforce, the immunity from the disease has been in proportion to the extent to which those measures have been carried into effect systematically and promptly.

Upon the whole we submit that the facts and results given in this Report have placed in the hands of the Legislature, for administrative execution, measures for checking the progress and lessening the severity, if not entirely preventing the occurrence, of this pestilence; and that the measures preventive of this one epidemic, which only attacks at distant intervals some of our towns and cities, are preventive of typhus and other epidemics, some or other of which are at all times in all our towns and cities, and which produce, as a constant result, nearly as great an average mortality as the apparently more destructive pestilence on its occasional visitations.

But the chief obstacles to the general and early adoption of measures of prevention arise from the difficulty of communicating to those whom it is necessary to convince, such information as may satisfy their minds of the incomparably greater efficacy of measures of prevention than of those that are merely palliative or curative; a persuasion which is only now beginning to make a due impression on the minds, and to direct the professional inquiries even of medical men, and the full importance of which cannot therefore be expected to be at present appreciated by classes less instructed on these subjects.

The Legislature, however, has recognised the full importance of this principle, by adopting it as the fundamental one both of the Public Health Act and the Nuisances Removal and Diseases Prevention Act; and the late experience has not been wanting in pointing out where the law is defective, and what further provisions are required for fulfilling the intentions of the Legislature. We regard as one of the most important of the results of the exprienece which we have now endeavoured to describe, the additional ground which it affords for the expectation that material improvement in

the physical, and through the physical, in the moral and social condition of the people will result from those permanent works which, under the Public Health Act, may be effected in towns and cities; and we submit that it is, in the mean time, essential to the protection of the public life and health that adequate legislative powers should be given for dealing effectually with those extraordinary and formidable states of disease, the occasional occurrence of which must be expected, until these sanitary works have been completed and have been introduced into all the towns of the kingdom.

No. II.—Conclusions obtained with respect to Yellow Fever.

That yellow fever epidemics break out simultaneously, in different and distant towns, and in different and distant parts of the same town, often under circumstances in which communication with infected persons is impossible.

2. That yellow fever epidemics are usually preceded by the occurrence of individual or sporadic cases of the disease, which sporadic cases are likewise common in seasons when no epidemic prevails.

3. That yellow fever epidemics, though occasionally extending over large tracts of country, are more frequently limited as to the space over which they spread, often not involving the whole of a town, and sometimes not even any considerable district of it.

4. That yellow fever epidemics do not spread from district to district by any rule of gradual progression, but often ravage certain localities, while they spare entirely, or visit very lightly, others in the immediate neighbourhood, with which the inhabitants are in constant intercommunication.

5. That yellow fever epidemics, when they invade a district, do not spread from the houses first infected to the next, and thence to the adjoining, and thus extend as from a centre; but, on the contrary, are often strictly confined to particular houses in a street, to particular houses on one side of a street, to particular rooms in the same house, and often even to particular rooms on the same story.

6. That in general, when yellow fever breaks out in a family, only one or two individuals are attacked; commonly the attendants on the sick escape; and when several members of a family are successively attacked, or the attendants on the sick suffer, either the epidemic was general in the locality, or the individuals attacked had gone into an infected district.

7. That when yellow fever is prevalent in a locality, the most rigid seclusion in that locality affords no protection from the disease.

8. That, on the other hand, so great is the success attending the removal from an infected locality, and the dispersion of the sick in a healthy district, that by this measure alone the further progress of an epidemic is often arrested at once.

9. That such dispersion of the sick is followed by no transmission of the disease, not even when the sick are placed in the wards of a hospital among patients labouring under other maladies.

10. That no one of the preceding facts can be reconciled with any other conclusion than that, whatever may be the exciting cause of yellow fever, it is local or endemic in its origin: and the evidence of this conclusion is therefore cumulative.

11. That the conditions which influence the localization of yellow fever are known, definite, and, to a great extent, removable; and are substantially the same as the localizing causes of cholera and of all other epidemic diseases.

12. That, as in the case of all other epidemic diseases, in proportion as these localizing causes are removed or diminished, yellow fever ceases to appear, or recurs at more distant intervals, and in milder forms.

13. That besides the common external localizing causes, there is one constitutional predisposing cause of paramount importance, namely, non-acclimatization—that is, the state of the system produced by residence in a cold climate; in other words European blood exposed to the action of tropical heat; the practical lesson being that the utmost care should be taken to prevent individuals or bodies of men, recently arrived within the yellow fever zone, from going into a district in which the disease actually exists or has recently been present.

14. That there is no evidence to prove that yellow fever has ever been imported.

15. That consequently the means of protection from yellow fever are not quarantine restrictions and sanitary cordons, but sanitary works and operations, having for their object the removal and prevention of the several localizing conditions, and when such permanent works are impracticable, the temporary removal, as far as may be possible, of the population from the infected localities.

No III.—Conclusions obtained with respect to Quarantine.

That the chief pestilence in respect to which quarantine establishments have been kept up in this country, the oriental plague, is, in its antecedent circumstances or causes, in the localities, classes, and conditions of the population attacked, in its rise and progress, a disease of the same essential character as typhus; being, according to the most recent authorities who have had practical experience of the malady, a form of that disease modified and rendered more intense by peculiarities of climate and of social condition.

That the notion of the propagation of the plague by means of goods appears from one uniform mass of evidence to be as entirely unfounded as the opinion which formerly prevailed in this country that typhus could be propagated in the same mode.

That the true danger of the propagation of plague is not by contact of the affected with the healthy, but by exposure on the part of susceptible subjects to an infected atmosphere, under the like conditions which are known to produce and propagate typhus fever in this country.

That the quarantine establishments in this country, and in every

other of which we have information, are wholly insufficient, even on the assumption on which they have hitherto been maintained, to prevent the introduction and spread of epidemic disease.

That these establishments are of a character to inflict on passengers extreme and unnecessary inconvenience, and to subject such of them as may be sick to extreme suffering and danger, while they maintain false securities in relation to the means of preventing the spread of disease.

That typhus and other dangerous epidemic diseases are frequent on board merchant-seamen vessels at sea and in port, for which no effectual or suitable provision is at present made.

That, as far as relates to the cases of epidemic disease generated at sea, the principle of the concentrating of responsibility on the shippers, in making it their pecuniary interest to complete the voyage with healthy passengers, operates most effectually in the cases where it has been applied, such as to emigrant, transport, and convict ships, and should be extended to all cases; and that in respect to ships in port, the regulations applied to the prevention of the spread of epidemic diseases from houses in towns are applicable, and would practically be highly beneficial.

That the substitution of general sanitary regulations to ships in port, for the existing quarantine regulations, would far more effectually extinguish epidemic disease, and afford better protection to the uninfected on shipboard, whilst it would relieve passengers and crews from grievous inconvenience, abate the motives to concealment of sickness and to false representations as to its nature, greatly lessen commercial expenses, and remove obstructions to the free transit of goods and uninfected persons which the existing system of quarantine occasions.

It follows that we propose the entire discontinuance of the existing quarantine establishments in this country, and the substitution of sanitary regulations.

By such substitution the most effectual security which the present state of knowledge affords would be taken against the importation of foreign contagion, the maintenance of infection, and the origin and spread of epidemic disease.

The British Parliament has legislated on the conclusion, submitted with an accumulation of demonstrable evidence, that the causes of epidemic, endemic, and contagious diseases are removable, and that the neglect on the part of the constituted authorities to remove such causes, as far as they are obviously within their control, is a punishable offence. The foundation which the Legislature has thus laid for the physical, and consequently for the moral, improvement of the people is recognised. Half a century ago it was said by a great physician and philanthropist, to whom we have already referred, that the time would come when the Legislature would punish communities for neglected the known means of preserving the public health; and that prediction the British Parliament have been the first to realize.

"To all natural evil," says Dr. Rush, "the Author of Nature has kindly prepared an antidote. Pestilential fevers furnish no exception to this remark. The means of preventing them are as much under the power of human reason and industry as the means of preventing the evils of lightning and common fire. I am so satisfied of the truth of this opinion, that I look for the time when our courts of law shall punish cities and villages for permitting any of the sources of malignant fever to exist within their jurisdiction."

We believe, from such information as we have been able to obtain, that the immediate adoption of the changes which we now recommend would be attended with no difficulties or inconveniences commensurate with the advantages that would accrue from the relief to commerce, the freedom of international communication, and the security of the public health.

No. IV.—Conclusions obtained as to Extramural Interments.

I.—*Metropolitan Interments.*

1. That with a view to remedy the evils of intramural interment, as at present generally practised, it will be necessary to obtain separate Acts for London and the country.

2. That, after the passing of the Act for London, all interments in churches and within the precincts of the metropolis, except in special cases, under licence issued by the Metropolitan Interment Commission, should, as soon as the necessary preliminary arrangements are completed, be specially forbidden.

3. That public burial-grounds be provided at a suitable distance from the metropolis; that, with a view to prevent the near approach of the population to such burial-grounds, no new dwelling-houses be permitted within a distance proportioned to the size of the cemetery and the number of interments for which it is calculated; and that, in order to render possible the advantages of extramural interment, without, at least, enhancing the cost to the poor, to secure the proper decencies of burial, and to put an end to the injurious influence to health occasioned by the careless and unchecked disposal of bodies—it be, with the exceptions above referred to, unlawful to inter in any other place than the public burial grounds within the prescribed precincts.

4. That, considering the river as a highway passing through the largest extent of densely-peopled districts, the facilities for establishing houses of reception on its banks, the conveniences arising from the shorter distance within the larger portions of the same area for the removal of the bodies to such houses of reception, the advantages of steam-boat conveyance over that by railway in respect to tranquillity, and the avoidance of any large number of funerals at any one point at any one time, and of any interference with common traffic, and with the throng of streets; and, lastly, taking into account its great comparative cheapness, it is desirable that the chief metropolitan cemetery should be in some eligible situation accessible by water-carriage.

5. That it be unlawful to inter in any burial-ground more than one corpse in one grave.

6. That the price of funerals be regulated according to a series of scales or classes; and that the whole expense of each funeral be included in the charge fixed for its class, and be paid for in one sum.

7. That, it being essential to the success of the proposed improved practice of interment that it be administered on one system, under one responsible authority,—all public burial-grounds and the whole arrangement for burial be entrusted by commission to a small body, not exceeding five, of whom not less than one should be paid, specially qualified and responsible.

8. That in every cemetery there be a part consecrated and a part unconsecrated, and that in the consecrated part there be erected a church adapted to the purpose, and fitted also for full services according to the doctrine and discipline of the Church of England; and that in the unconsecrated part there be erected a commodious chapel.

9. That the new consecrated grounds be under the same ecclesiastical jurisdiction in matters spiritual, and in respect to the performance of the service and the superintendence of the chaplains, as the parochial burial-grounds for which they are to serve as substitutes now are; that the inhabitants retain the same right of sepulture as they would have had in their respective burial-grounds, subject to the general provisions which may be necessary for the public health and the convenience of sepulture; and that the incumbents have the right of performing the burial-service for any of their parishioners in the public cemetery, subject to the regulations established for the same.

10. That inasmuch as the fees and voluntary offerings paid to the clergy constitute one of the least of the charges incident to interment, and at the same time form in some instances almost the whole, and in many instances the greater part, of the funds on which they have been accustomed to rely, provision be made for compensation to the benefice, on account of the receipt of fees for interments, on the average of three years before the passing of the Act.

11. That compensation be made to the proprietors of private burial-grounds and to holders of cemeteries established by Act of Parliament according to the awards of juries.

12. That provision be made for placing the existing burial-grounds under such regulations as may be most conducive to the public health and advantage.

13. That although, if the whole work were to be done afresh for the first time, one part of a general scheme of extramural cemeteries would have included the formation of a corresponding set of intramural officers to receive orders, to give instructions, to collect and enforce payments, and to transact other general business, yet, to avoid the unnecessary creation of new offices, it be provided that the present parish clerks and sextons, or both, as the case may be, should be retained, and their offices made use of for maintaining the parochial connexion with the cemeteries.

14. That the whole immediate outlay for carrying into effect this scheme may be obtained without any aid from the Treasury, and without the levying of any new rate, in the following way: that is to say, by loan; the principal and interest of such loan to be defrayed out of the receipts of the cemeteries, security being given by Act of Parliament for making good from the rates whatever deficiency may occur, should there eventually be any.

There is reason, however, to believe that, along with equitable arrangements as to compensations, and even with a considerable reduction on the existing charges for interment, there will be no deficiency to be defrayed by rates.

II.—*Extramural Interments in Country Towns.*

At the conclusion of our report on a general scheme of extramural sepulchres for the metropolis, we stated the following uses which we believed would be fulfilled by its adoptions:—

1. That it would put an end to intramural interments, with all its attendant evils.
2. That it would obviate any injurious effects on the public health from the practice of extramural interment.
3. That by the regulation of the price of funerals at a certain fixed scale of charges, and by the payment of the whole cost of the funeral in one sum, it would relieve families at the moment when they are the least capable of attention to such matters from care and trouble and from the possibility of extortion.
4. That by the saving of expense effected by the whole of the interments being performed on one system and under one direction, it would render the cost of burial moderate to all classes, and give to the poor the advantage of extramural interment at a reduction of the price which they at present pay for burial in the parochial graveyard.
5. That by the appointment of officers of health, and the establishment of houses of reception, it would diminish or remove the physical and moral evils which result from the long retention of the corpse in single, living, and sleeping rooms, and that thus for all these reasons it would fulfil the primary object of the change, namely, the removal of the whole of the sanitary evils which arise from the present practice of interment.
6. That it would greatly diminish the practice now so common of funeral processions in crowded streets.
7. That it would increase the solemnity and impressiveness of burial.
8. That it would elevate the celebration of the funeral rites of the poor man, and tend to remove, in respect to the services of the Church in the performance of burial, the distinction between rich and poor.

With reference to the scheme of extramural interment for county towns, on a consideration of the whole of the evidence above presented, we recommend:—

1. That as soon as proper places for extramural interment can be provided, interment within the precincts of towns should be prohibited.
2. That the preliminary expenses incident to the examination and settlement of schemes of interment, or to the employment (upon application from different localities) of an inspector of the General Board of Health, as well as the expenses of any plans of works which may be required. should be thus provided for:—In localities where a Board of Health is established, or from which petitions have issued praying that such localities may be brought under the operation of the Public Health Act, these expenses should be charged upon the general district, as provided by section 11 of the Public Health Act. In localities which are not in the position described, these preliminary expenses should be charged upon the poor rates.
3. That where a Local Board of Health is established, any such scheme of interment as is contemplated by section 12 of 12 & 13 Vict. c. 111 (the Diseases Prevention Act) may, with the concurrence of a majority of such Local Board be forthwith carried into effect by an Order in Council according to the provisions of section 10 of the Public Health Act.
4. That such an Order may authorize the Local Board to exercise any of the powers conferred upon the General Board of Health by the Metropolitan Interment Act, and may embody so much of that Act as may be suitable to the circumstances of the case, with the exception of clause 24, which forbids the establishment of any new burial ground within 200 yards of any dwelling, and which should be repealed.
5. That by such Order a scheme of interment may be framed including more places than one with the consent of such Local Board of such places, to be executed by a joint committee of such Local Boards, and with such a number of members as shall be agreed upon.

6 That the proposed site, plan, charges, and conditions of each district cemetery should be printed in the same manner as the reports of preliminary inquiries into the sanitary conditions of towns under the Public Health Act are now printed, and that copies thereof should be sent to the incumbents of all parish churches, and the ministers of the chapels of all religious denominations within the district to which it is intended to apply the scheme; and that one month from the date of the publication of such scheme, &c., should be allowed to intervene before it is finally sent to the General Board of Health for examination and approval.

7. That the approval by the General Board of Health of the site, plan, &c., &c., of each district cemetery should be required before such district cemetery can be used for purposes of interment.
8. That the General Board of Health be empowered to make such regulations from time to time, with reference to the mode and practice of interments in cemeteries as may be conducive to the preservation of the public health, and the decency and solemnity of burial.
9. That in all towns to which the Public Health Act shall have been applied, the Local Board of Health be the local administrative authority for the burial of the dead.
10. That in all such cases, powers be given to the Local Board of Health to establish cemeteries beyond the boundaries of the district constituted by the Public Health Act, and to compel, under the provisions of the Lands Clauses Consolidation Act, the sale of ground for the formation of cemeteries, and to make contracts for the performance of funerals.
11. That with reference to out townships, power be given to enable vestry meetings to empower churchwardens to agree with local boards on behalf of such out townships, for permission to bury in the common cemetery, and to regulate the amount of fees to be paid in such cases.
12. That power be given to a majority of the town councils of towns not under the Public Health Act, and of the Commissioners of towns having Commissioners only, to petition the General Board of Health for the application of the proposed Act, which should contain provision for the creation of a local administrative body for its execution.
13. That in like manner power be given to the vestries, boards of guardians, and churchwardens of towns which have neither town councils nor commissioners to petition the General Board of Health for the application of the Act.
14. That in all cases where land shall be required by the General Board of Health for cemeteries, under the Metropolitan Interment Act, as well as in all cases where Local Boards of Health shall require lands for the formation of cemeteries, and where the owners of such lands shall, on the service of the notice required by Section 18 of the Lands Clauses Consolidation Act, either neglect to treat for the purchase of the same, or shall not agree in the premises, the General Board of Health or the Local Board of Health, as the case may be, be empowered to summon a jury to assess and award the amount of compensation payable to the parties interested in such land, according to the provisions of Section 22 of an Act intituled "An Act to empower the Commissioners of Her Majesty's Woods, to form a Royal Park in Battersea Fields, in the county of Surrey," 9 & 10 Vict. c. 38.
15. That after the formation of burial districts, it shall be unlawful for any person to perform any funerals therein without the sanction of the proper authority.

16. That Local Boards of Health be empowered to make equitable arrangements as to compensation, on the principle of the Metropolitan Interment Act, the awards of such Boards in cases of dispute being liable to revision by the Lords Commissioners of Her Majesty's Treasury.

17. That the local authorities be empowered to borrow the funds for the purchase and construction of cemeteries on the security of the public rates, with the sanction of the General Board of Health, to be repaid by annual instalments out of the fees arising from interments in a period not exceeding thirty years.

No. V.—Conclusions obtained on the Supply of Water to the Metropolis.

Having directed our medical and engineering inspectors to inquire, as closely as the time would permit, into the state of the water supplies of the metropolis; having through them consulted the most recent practical experience of other districts where new supplies of water improved in quality and distribution have been introduced; and having taken an extensive body of evidence thereon, we find, as relates to the quality of the water of the river Thames—

1. That for domestic use it is inferior to the average quality of waters supplied to towns.

2. That its inferiority as a supply for domestic use arises chiefly from an excess of hardness.

3. That even when taken above the reach of pollution from the sewers of the metropolis, it contains an excess, varying with the season, of animal and vegetable matter:

4. That although this latter cause of inferiority may be in part removed or corrected by filtration, the excess of hardness will still remain, rendering this water especially unfit for the following uses, namely, for cleansing the skin, and for the ordinary purposes of washing, by occasioning an excessive consumption of soap; for the preparation of tea, by occasioning waste to the like extent; and for all culinary processes by diminishing their efficiency and increasing their expense.

5. That the quality of the water of the river Lea and of the New River is, in this respect, no better than that of the Thames water taken beyond the influence of the sewage of the metropolis:

6. That the water taken by the Lambeth Company from the Thames opposite Hungerford Market is charged with animal and vegetable impurities, apparently the effect of the discharge of sewer water, which render it wholly unfit for use, and highly dangerous to the health of the persons who drink it.

7. That of the seven principal Companies by which pipe water is conveyed to the metropolis, four deliver it without previous filtration.

8. That the defects in the quality of the water at present supplied, when collected in its least objectionable condition, and

the evils arising from its distribution in the unfiltered state, are all aggravated by the practice of intermittent distribution.

9. That the practice of intermittent distribution occasions, in the case of the better description of houses, the retention of the water in cisterns and butts, and, in that of the poorest classes, in tubs, pitchers, and such other vessels as can be obtained; and, as a consequence of such retention, the water imbibes soot and dirt, and absorbs the polluted air of the town, and of the offensively close, crowded, and unhealthy localities and rooms in which the poor reside.

10. That from the inferiority of the water at its source as at present collected, and from the additional pollution and deterioration occasioned by the mode of its distribution, a large proportion of the population is rendered averse to the daily use of water as a beverage, and is inclined and almost forced to the use of fermented liquors and ardent spirits to an extent greatly beyond the consumption of such drinks where purer water is more accessible:

11. That the annual cost of the construction and maintenance in repair of cisterns and their supports and connected apparatus in the houses of the middle and wealthier classes, often exceeds the annual water-rate:

12. That the cost of the pipe water supply, and the additional expense and inconvenience resulting from the present mode of its distribution, cause the population in some suburban districts to resort for water to open ditches, and in other crowded localities to shallow springs or wells; sources which are subject to increasing pollution from cesspools, from badly constructed house-drains and sewers, and from overcrowded grave-yards:

13. That the localization and intensity of cholera in such districts as those alluded to was promoted in a most marked manner by the use of water containing decomposing animal and vegetable matter, derived from sewers, drains, and other impure sources:

14. That the districts most severely visited by epidemic cholera, as well as those most afflicted by ordinary epidemic diseases, are low-lying districts, where, from the defective state of the drainage, there is an excess of damp and of putrid decomposition; and that such excess of damp is aggravated by the waste of water attendant on the intermittent mode of supply; a waste which appears to exceed the whole of the annual rainfall on the inhabited area of the metropolis.

Many practical difficulties having been urged against the substitution of the constant for the intermittent system of water supply in the metropolis, we have particularly examined into the working of the constant system in towns where it is established, and in some of which it has been in operation for 15 and 20 years, and we find—

15. That the waste of water is so far less instead of greater under the system of constant supply, that although the inhabitants have unlimited command of water, and use what they please,

though the actual use of water by the inhabitants is greater, the quantity delivered by the Companies is less, frequently less by one-half, in consequence of there being less waste from the more perfect delivery:

16. That the water, under the system of constant supply, is delivered purer and fresher, of a lower temperature in summer, and that it is less subject to frost in winter:

17. That the inconveniences apprehended from the interruption of supply during repairs and alterations are never experienced, the work being executed under such simple precautions that no complaint has ever been known to have been made on this account:

18. That the interruptions of supply which are so constantly experienced on the intermittent system from the waste in the lower districts, from the neglect of turncocks, from limitation of quantity, from inadequate or leaky butts and cisterns, or from deranged ballcocks, are scarcely ever known on the constant system:

19. That the system of constant supply admits of great economy in pipes, as they may, under that system, for the most part, be considerably smaller, and not being subject to the violent hydraulic jerks of the intermittent system are less liable to burst:

20. That the pipes for the house service may not only be considerably smaller and cheaper, but that the cisterns and apparatus connected therewith, which, in the smaller class of houses, now cost more than the whole public portion of the works, may be entirely dispensed with.

In respect to the quantity of water actually supplied, and to the quantity needed for the domestic use of the metropolitan population, and for other purposes, we have to report—

That in consequence of statements made by several of the Companies of the quantities of water which they pumped for the use of the metropolis, quantities which appeared to be inconsistent with the known habits of the population and the apparent amount of water consumed for domestic purposes, we deemed it desirable to cause the consumption of water in different districts, by different classes of the population, to be gauged from the cisterns and butts, and also the run through house-drains and sewers on days when there was no rainfall.

From these observations it appears,

21. That—whereas it was returned, in 1832, that the average quantity of water delivered to their respective customers by the several Companies was 220 gallons per house or dwelling; and more recently, as returned to us, was stated to be 164 gallons per house or dwelling; that is, 44 millions of gallons per diem for the whole of the metropolis—making allowances for a considerable and injurious waste of water by permeation through badly constructed channels, the results of the gaugings of the run of water through drains and sewers, on days when there is no rainfall, do not appear materially to differ from the later statements of the

several Companies as to the quantity of water which is actually pumped into their several districts; while from the gaugings of the quantities of water consumed from cisterns and butts during the intervals of the intermittent delivery, and from the capacity of the storage receptacles themselves, it appears that the average daily consumption does not exceed five gallons per head on the population; and that, with all allowances for the quantities used for manufactures, steam-engines, and other purposes, the gross quantity consumed does not exceed one-half of the quantity delivered:

22. That this waste is a consequence of the present intermittent mode of supply, and does not take place to any such extent where the constant system of supply has been substituted; and probably may be prevented altogether where the house service-pipes are properly provided and arranged under a system of combined works:

23. That this waste, as now ascertained by official investigation, appears to have gone on without any knowledge of its great amount on the part of the Companies, although it involves a double expense of pumping, and exceeds, as above stated, the whole of the annual rainfall on the covered area of the metropolis:

24. That this waste is of no equivalent benefit for the cleansing of house drains and sewers, inasmuch as, from the inaptitude of these works, owing to their bad construction, for the discharge of water containing matter in suspension, accumulations of decomposing matters do take place in them, to the great injury of the public health; accumulations which, notwithstanding the flow of the waste water through them, required to be cleared away by hand-labour, by flushing, or by other means:

25. That the waste water, having sewer matter mixed up with it, permeates through the brick drains and sewers, saturates the sites of houses with polluted water, and keeps up an excess of moisture, which, rising into the porous and absorbent walls and plaster of the houses, contributes to render them damp even in the driest weather:

26. That this excess of moisture is aggravated by the extremely defective drainage in the low-lying and worst-conditioned districts, where, as has been already stated, epidemic disease is almost invariably present, and where the recent visitation of epidemic cholera has been the most severe:

27. That, taking into consideration the actual domestic consumption of water by the population of the metropolis, regarding also the extent of the increased supplies needed for various purposes of sanitary improvement not hitherto contemplated by Companies, nor included in new schemes, all the engineering estimates put forward by private Companies of the quantity of water required for the service of the population appear to be greatly in excess:

28. That there appears no probable demand for a general average consumption of water exceeding the present rate for houses of the higher class, namely, about 75 gallons per house per diem, or in all

22 millions of gallons per diem, inclusive of the increased supply which will be necessary on the abolition of cesspools; and that, estimating the additional requirements for baths, for street cleansing, for large consumers, for fires, and for other purposes, the whole quantity of water needed under an improved system of distribution does not exceed 40 millions of gallons per diem:

29. That it appears that the resolutions of parochial meetings and the statements of the promoters of new Companies, alleging a deficiency in the total amount of water already introduced, and proposing to bring in additional supplies, have been made in ignorance of the actual present domestic consumption of the population, and of what is really needed, according to the best information, for the execution of practical measures of sanitary improvement.

30. That the several schemes which propose to bring in more water in addition to the quantity now wasted, and to make such additions mainly from the same sources which supply the water now generally consumed, without reference to improvements in the system of domestic distribution, and without combination with improved drainage-works for the removal of the waste water, would aggravate the existing sanitary evils, and increase the excessive charges already incurred for defective works constructed in ignorance.

Having particularly examined the statements as to the increased quantities of water required for the flushing of drains and sewers, and the working of an improved system of drainage, we find,

31. That upon a system of drainage such as that at present in use, consisting of brick house-drains and sewers which cause accumulations of decomposing deposit, there would be required, for the intermittent removal of those accumulations by flushing, considerable additions to the present quantities of pipe water pumped in for the supply of the metropolis, but that any system of house or main drainage which occasions the accumulation of decomposing refuse, and renders necessary the continuance of the practice of intermittent flushing, is in itself highly injurious to the public health, and ought to be prevented.

32. That recent trial-works have placed beyond doubt the soundness of the conclusion of the Metropolitan Sanitary Commissioners; namely, that systematically adjusted tubular house-drains and sewers are kept clear of deposit by the force of the soil or sewer water alone, when conducted away at proper levels; and that no addition of water is required for this purpose.

With reference to those extensive districts of the metropolis, the levels of which are below high-water mark, where the sewer water is at present penned up until it can be discharged at low water, and where putrefying deposit is accumulated in the sewers in consequence of the flow being arrested during high water, it appears,—

33. That it will require no addition of water, and certainly no increased expense in pumping, to cause such a continuous flow of the waste water as will prevent deposit; and that this prevention

of deposit is the true object to be aimed at, and not the supply of additional quantities of water to remove, by flushing deposit which ought not to have been allowed to accumulate.

34. That besides the great injury to the public health from the ponding up of sewer-water and the consequent conversion of large sewers and reservoirs into extended cesspools; and besides the waste of water and the expense of pumping it into the district for the removal of accumulations, the intermittent system of draining the districts below high water mark by gravitation, without the aid of pumping for their relief, must necessitate the continued pollution of the Thames, and obstruct or delay the application of the refuse as manure.

35. That, except in extreme cases of absolute deficiency, the pumping in of additional supplies of water, before properly constructed house drains are laid down for its removal, would, by increasing damp, still further deteriorate the sanitary condition of the population, and occasion still greater dilapidations and injury to tenements.

36. That the separation of works of pipe-water supply from those for the removal of waste water occasions delay in the execution of works of primary importance for sanitary improvements, as well as increased expense.

37. That it appears that while the expense of sewers and drains is reduced by an improved tubular system of drainage, the expense of earth-work, of digging and of making good, is one-half of the total expense, and that, therefore, the separate laying down of water-mains and drainage-mains must frequently cause this last portion of the expense to be materially increased.

38. That on these grounds, and on the principles already recognised, the only way of securing systematic works with economy and efficiency, as well as with the least delay, will be to consolidate under one and the same public management, the whole works for the supply of water, and for the drainage of the metropolis.

39. That it is essential to the economy and efficiency of all such works that the whole distributory apparatus, small as well as large service pipes, and house drains, together with water-mains, public drains and sewers, should be laid down under one system, and kept in action under one supervision.

40. That it appears from the examination of improved works which have been in operation for a sufficient length of time to test their efficacy, and from detailed estimates made by different competent engineering officers upon house-to-house examinations of the worst-conditioned districts, that combined works, comprising a water-pipe for the service of each house, a sink, a drain, and waste-pipe, and a soil-pan or water-closet apparatus, may be laid down and maintained in action at a cost not exceeding on the average three-halfpence per week, or less than half the average expense of cleansing the cesspool for any single tenement.

41. That the general survey being now sufficiently advanced, such works may be executed for separate districts, without waiting for the completion of any general measure or plan of main sewers.

Having considered the evidence in relation to the qualities of the water requisite for the supply of the metropolis, we find:—

42. That in addition to the properties of clearness and freedom from animal and vegetable matter, which is apt to pass into decomposition and to prove injurious to health, one of the most essential properties of water is *softness*, or freedom from lime and other substances productive of what is termed hardness:

43. That having made careful and extensive inquiries, with the aid of the Department of the Ordnance Geological Survey, as to the most suitable sources of supply, having had those districts which appeared to be the most eligible specially examined by our engineering inspectors, with other aid, we find upon their unanimous testimony that, from a tract of upwards of 150 square miles of gathering ground, there is derivable a supply nearly double the present actual domestic consumption, of a quality varying from one-tenth to one-third the hardness of Thames water, and of a purity equalling the general average of the improved soft water supplies of the districts which have yet been brought under examination:

44. That water obtained from silicious sands, such as those which cover the tract above described is proved to be a quality only equalled in excellence by the water derived from mountain granite rocks, or slate rocks or other surfaces of the primitive formations:

45. That upon the best estimates which have been obtained, this water may be brought to the metropolis, and delivered pure and filtered into each house, on the system of constant supply at high pressure; and, at the same time, on the plan of combined works, the waste water may be removed by a proper system of drainage, at a rate not exceeding an average of 3*d.* or 4*d.* per week per house, or from 30 to 50 per cent. less than the present charges for defective water supply alone:

46. That the saving in soap, from the use of soft water, in the operation of washing (the expense of washing linen and other clothes being estimated, at an average of 1*s.* per head per week, to be nearly 5,000,000*l.* per annum on the population of the metropolis) would be probably equivalent to the whole of the money expended at present in the water-supply:

47. That the saving in tea from the use of soft water may be estimated at about one-third of the tea consumed in the metropolis:

48. That other culinary operations would be much facilitated by the use of soft water:

49. That soft water is peculiarly suitable for baths as well as for washing:

50. That the soft water would prevent those incrustations and deposits in boilers and pipes, which render hard water unsuitable for manufacturing purposes.

We therefore advise the rejection of all the schemes promoted by water companies or by parochial vestries and associations, which adopt, as sources of supply, the Thames and its tributaries of the

same degree of hardness, wells, and springs from the chalk or other formations which impart the quality of hardness:

And further, whilst we believe that Thames water, taken up beyond the influence of the metropolitan drainage, and filtered, may be used without injury to the public health, and may be employed temporarily until other sources can be laid under contribution, we advise that Thames water, and other water of like quality, as to hardness, be as early as practicable abandoned.

In respect to the existing companies which have no property in any of the sources of water supply, but whose capital is invested in engines and distributory apparatus, we recommend that their plants should be purchased, but we are not prepared to recommend any pre-appointed terms of purchase; and we find—

51. That, if the management of the water-supply be consolidated, five if not six out of the seven principal pumping establishments may be discontinued, and an expenditure of from 80,000*l.* to 100,000*l.* per annum saved by consolidating the management of these works and connecting them with combined works of drainage and sewerage, and that further reductions may be made in the expenses of these latter establishments.

Having considered, as required under the Metropolitan Sanitary Commission, the means of supplying water to extinguish fires, and having examined the practical experience of improved works in relation therein to other towns, we find—

52. That the inadequacy of the supplies of water under the intermittent system occasions great danger to life and property; but that by arrangements which are practicable under a system of constant supply at high pressure, the whole force of the water in the mains may be brought to bear at any point for extinguishing fires in from one to five minutes, or in about one-fourth the time that it takes the best appointed fire engines now to gain the spot and be in action after the alarm of fire has been given:

53. That, judging from the experience of various places where improved arrangements have been put in practice, it appears that by the general adoption of these arrangements more than two-thirds of the fires which now occur in the metropolis may be extinguished, before any extensive damage takes place:

54. That the insurance risks on life and property may be diminished in a yet greater proportion:

55. That the crime of incendiarism may be checked, and that these consequences alone, were there no other advantages to be obtained, would render it worth while to make the change from the intermittent to the constant system:

56. That these advantages may be best given by the same means by which a more perfect and cheaper surface cleansing of courts, alleys, foot pavements, and carriage ways than that by hand may be effected, namely, by jets of water distributed under high pressure.

Having considered the most eligible administrative provisions for the execution of the required works, we concur in the principles recommended by the Commission of Inquiry as to the best means

of Improving the Health of Towns, and confirmed by Parliament in the Public Health Act, viz:

57. That the works of water supply, and those for drainage, or the removal of soil or waste water, should be carried into effect by one and the same administrative body:

58. But that the magnitude of the metropolis, the diversity of its local jurisdictions, and its position as the seat of Government, and the occasional residence of persons from all parts of the empire, the large minorities requiring protection, and the unaccustomed magnitude of the requisite outlay, render distinct and special provisions necessary for it, and that the amendments required may be most speedily, safely, and economically executed by special or by provisional arrangements:

59. That a general survey, under the direction of the engineers of the Board of Ordnance, and other surveys, trial works, and preparations essential to the safe and economical execution of combined works of water supply having been contemplated, under the direction of the consolidated Metropolitan Sewers' Commission, such combined works may now be executed and maintained at a lower rate of charge per house than has heretofore been incurred for any of their various branches executed separately:

60. That the initiation and executive direction of such works by members, however highly qualified, giving casual attendance at meetings held weekly or fortnightly, causes grievous delay, and that in cases in which measures for preventing disease or arresting its progress, require the utmost promptitude:

61. That considering the great loss and suffering incurred by the delay in carrying the required works into execution, it will be expedient to confide their further preparation and superintendence to a few competent and responsible officers, of whom a certain proportion should be paid, giving their whole time and attention to the subject. That the whole of these works be carried into execution by contract upon open tenders, not merely for the construction of the works, but for maintaining them in good action and repair for terms of years.

62. That the means provided by the Public Health Act for giving publicity to plans and estimates of intended works, with opportunities of suggestion and appeal, be extended to the works proposed for the sanitary improvement of the metropolis:

63. That the proper execution of the works will be best guaranteed, the responsibility of the persons charged with their execution best ensured, and the interest of the poorest classes of the population (the inhabitants of the most depressed districts, who though they pay no direct local rates pay heavy rents), will be best guarded in the special case of the metropolis, at all events provisionally, by the direct control of Parliament; the importance of the proposed measures to the health, convenience, and comfort of large masses of the population, the magnitude of the required constructions, the amount of outlay, and the dangers of failure and waste as well as delay being, from experience of separate works already constructed, such as to render it necessary that the highest order of continued and undivided attention and responsibility should be secured for the execution of such works as this Report recommends.

The observations already collected under the Public Health Act, of the comparative purity of different waters, appear to us to establish the axiom we have enunciated, that the shorter the space of land which water has to traverse, or the shorter the time which it remains upon it, the less will be the quantity of adventitious impurities which it will imbibe. We have had 424 different specimens of water from different parts of the country tested, and we find, that in respect to hardness, the following are the results:—

1. Wells and springs (264 specimens), average hardness, 25·86.
2. Rivers and brooks (111 specimens), average hardness, 13·05.
3. Land and surface-drainage (49 specimens), average hardness, 4·94.

The new process of land drainage furnishes a means for the filtration and depuration of impure waters on a large scale, with considerable advantages over the larger sand-strainers or common filters. The new method of relieving land from surplus surface water, by drainage *through* the land, instead of *over* the surface, besides diminishing the injury to vegetation from the lowering of temperature by surface evaporation, and rendering the soil permeable to air, and thereby facilitating the processes of decomposition and assimilation, arises from this, that the particles of organic or inorganic matter which may have been on the surface are carried down on the first fall of rain water, and lodged in the subsoil or amongst the roots, where they serve as food to the plants. On the first working of land drains—in land which has long been water-logged, there is often for a time a considerable discharge of loose matter, until the table of land drained has been brought to a good working condition. Then, where the drains have been tolerably well adjusted, the water from this deep drainage is seen running away perfectly pellucid. Where there happen to be two branch outfalls into one main, the one a branch outfall from mere surface-drained land, the other an outfall from thorough drained land, the water from the thorough drained land may be seen running perfectly limpid, whilst the water from the surface-drained land runs away turbid, and of the colour and consistency of pea-soup, from the inorganic or organic particles which it contains.

Incomplete as the investigations of this subject as yet are, still they suffice to show that the process of drainage through some soils, with or without vegetation, is capable of effecting more for the depuration of surface water than is practicable by the common sand-filters or strainers. Thus, water containing peat in solution is by reservoir filtration, only deprived of the fibrous matter held in suspension, whilst, by filtration through land, it is rendered comparatively, and sometimes perfectly, pellucid.

APPENDIX VI.

A RETURN of NEW WATER WORKS carried out under the PUBLIC HEALTH ACT; showing the Comparative Results obtainable from new and old Modes of Water Supply.

Name of Town.	Nature of the adjacent River Water.	Degrees of Hardness.	Description of the former Supply to the Inhabitants, whether from Wells or Springs.	Average Hardness of former Supplies.	Description of New Supply, whether from Land Springs or from Land Drainage Supply.	Degrees of Hardness of New Water Supply.	Whether Open Reservoir or not.	If in Action, average Daily Consumption of Water.	Average Charge for the Public per House per Week to all the Houses.	Average Public Charge to Cottages or Fourth-class Houses.
LANCASTER	Turbid in times of flood, and brackish at high water. Spring tides.	Average, 6·50°.	Pumps and wells, in subsoil on which the town stands.	25°.	Springs from Mill-stone Grit, on the moor, at an elevation of 1,300 feet above the town. Distance from town, six miles.	Springs. 0½°.	Covered reservoir.	Daily supply about 600,000 gallons.	1*d.*	¾*d.*
ORMSKIRK	None	- - -	From pumps and wells.	80°.	Springs. Water pumped 130 ft. into a tank, the tank on water tower being 120 feet above the town.	Springs. 5·50°.	Covered tank.	The daily supply will be about 120,000 gallons.	Not exceeding 1½*d.*	1*d.*
HITCHIN	River receives the surface drainage of the district, and is much flooded.	18°.	Wells, springs with pumps, and the contaminated river water.	25°.	From springs; brought in an earthenware conduit to engine-house, and pumped 100 feet high to reservoir.	Springs. 15·50°.	Covered reservoir.	The daily supply will be about 120,000 gallons.	1*d.*	¾*d.*
MORPETH	Not used for water supply.	Not known.	Old imperfect works to part of town, wells, springs, and pumps.	16°.	Springs and land drainage from the moor. Earthenware conduit to covered reservoir.	Springs. 6·50°.	Covered reservoir.	The daily supply will be about 120,000 gallons.	1·153*d.*	Decimal of a penny, ·092.
ALNWICK	Not used for water supply.	Not known.	Public pants, pumps, springs, and wells.	20°.	Springs, conveyed by earthenware conduits a distance of three miles to covered reservoir.	Springs. 8°.	Covered reservoir.	The daily supply will be about 150,000 gallons.	1·153*d.*	Decimal of a penny, ·092.
PENRITH	Comparatively pure from Ulswater Lake.	2°.	Stream from Mill-stone Eye running through the town, pumps, springs, and wells.	25°.	From filter beds connected with the river Eamont. Pumped 170 ft. (and 350 ft. for high service) by water-wheel on the river into covered reservoirs.	2°.	Covered reservoir.	The daily supply will be about 200,000 gallons.	1·90*d.*	1*d.*
ASHBY-DE-LA-ZOUCH.	No River	- - -	Pumps, wells, and springs.	26° to 40°.	The stream of a small brook that may be called land drainage water. An alternative supply by an immense spring, but this will not be needed for a generation to come.	About 15°; the softest water within 15 miles. 26°.	The water, after filtration, forced into a small open reservoir outside the town. About two days' supply.	Not yet ascertained.		
BARNARD CASTLE.	The water is affected by the load flushings.	- - -	The river and wells.	From 40° to 49°.	Deep springs - - - -	3°.	Covered reservoir.	110,000 gallons per 24 hours.		
CROYDON	The river was polluted with sewage.	16°.	Wells and river -	From 18° to 48°.	Deep springs - - - -	12°.	Covered reservoir.	400,000 gallons.		
SOUTHAMPTON.	Itchen and Test Tolerably pure.	16°. 15·6°.	Deep well on common and land drainage.	From 3° to 18°.	Chiefly from springs. Works in progress; the result cannot be given at present.	Expected to be from 3° to 15°.	Open reservoirs of considerable capacity. Area, 76,000 square feet.	The daily supply will be about 800,000 gallons per 24 hours.	Not yet fixed.	Not yet fixed.
OTTERY ST. MARY.	- - -	- - -	Pumps, brooks, and wells.	10° and 15°.	Land springs - - - -	12° before boiling; 3½° after.	Covered.	100 gallons per house.	8*d.* in the pound.	½*d.* per week.
TOTTENHAM	Lea - -	- - -	Pumps and wells.	From 7½ to 39¼.	Land springs - - - -	Under 6°.	Covered.	63 gallons per house.	3*d.* in the pound.	2*s.* 6*d.* per year.
RUGBY	Avon. Derived from clay district.	15° to 18°.	Wells and pumps in general, and rain water collected from roofs.	Well water, very hard; some as hard as 36° to 60°.	Underground collection - -	8°.	Covered reservoir.	80,000 gallons: about 13 „ per head.	3¼*d.*	5-6ths of a penny.
ST. THOMAS, EXETER.	River Exe -	Soft - -	Wells, pumps, and River Exe.	From 12½ to 26½.	River Exe - - - -	3°.	Will be covered	Not known -	10*d.* in the pound.	2*s.* 6*d.* per annum.
SANDGATE	Small stream, spring fed from green sand.	18° to 20°.	Wells sunk in the beach, sometimes brackish from sea water. Water works small.	Wells, varying from 16° to 32°. Water works, Undercliff, 16½°.	Artificial springs from green sand.	9° to 11°.	Covered reservoir.	About 30,000 gallons.	Annual rate of 1*s.* in the pound.	Cottages 4*s.* per annum.
LAUNCESTON	A brook, tributary to the Tamar.	Almost 5°.	Wells and pumps, small water works, and rain water.	Wells and springs; from 4° to 14°. Water works, 1°.	Spring water - - - -	3°.	Covered reservoir.	Just coming into use.	Not ascertained.	Not ascertained.

No. VII.—Conclusions obtained as to House Drainage and the Sewerage and cleansing of Sites of Towns.

In addition to the conclusions set forth in the Report on the Sanitary Condition of the Labouring Population, and confirmed and adopted by the Commissioners for inquiring into the means of improving the Health of Towns, namely,—

That no population living amidst aerial impurities, arising from putrid emanations from cesspools, drains, or sewers of deposit, can be healthy, or free from the attacks of devastating epidemics; and—

That, as a primary condition of salubrity, no ordure and town refuse can be permitted to remain beneath or near habitations;—and, that by no means can remedial operations be so conveniently, economically, inoffensively, and quickly effected as by the removal of all such refuse dissolved or suspended in water; may be enumerated the following:—

That it has been subsequently proved by the results of draining houses with tubular drains, in upwards of 19,000 cases, and by the trial of more than 200 miles of pipe-sewers, that the practice of constructing large brick or stone sewers for general town drainage, which detain matters passing into them in suspension in water, which accumulate deposit, and which are made large enough for men to enter them to remove the deposit by hand-labour, without reference to the area to be drained, has been in ignorance, neglect, or perversion of the above-recited principles.

That whilst sewers so constructed are productive of great injury to the public health, by the diffusion into houses and streets of the noxious products of the decomposing matter contained in them, they are wasteful from the increased expense of their construction and repair, and from the cost of ineffectual efforts to keep them free from deposit.

That the house-drains, made as they have heretofore been of absorbentbrick or stone, besides detaining substances in suspension, accumulating foul deposit, and being so permeable as to permit the escape of liquid and gaseous matters, are also false in principle, and wasteful in the expense of construction, cleansing, and repair.

That it results from the experience of works constructed upon the principles developed in these inquiries, that improved tubular house-drains and sewers of the proper sizes, inclinations, and material, detain and accumulate no deposit, emit no offensive smells, and require no additional supplies of water to keep them clear.

That, under a proper system of works for water supply combined with house and town drainage, such as is contemplated and sanctioned by the Public Health Act, no ordure is detained so long as to allow it to enter into advanced stages of decomposition, either in the house-drains or in the public sewers; but that all refuse is put in course of constant and inoffensive removal, at a rate of discharge of about three miles an hour.

That where the absence of a natural fall impedes the continuous removal of town refuse, and of surplus rain or spring water, an artificial fall may be obtained by steam power, at a rate of cost (on a scale for a large district) which is inconsiderable compared with the evils it would obviate; and that, at such rate of cost, or from 1*s.* to 2*s.* per house per annum, in many cases, not only may the house-refuse be removed from near habitations, but the foundations of houses and the whole sites of towns may be relieved from the damp of low-lying districts, and the consequent excessive unhealthfulness and decay of habitations thereon diminished.

That all offensive smells proceeding from any works intended for house or town drainage, indicate the fact of the detention and decomposition of ordure, and afford decisive evidence of malconstruction, or of ignorant or defective arrangement.

That the method of removing refuse in suspension in water, by properly combined works, is much cheaper than that of collecting it in pits or cesspools, near or underneath houses, emptying it by hand-labour, and removing it by cartage.

That by a proper system of combined works, and properly adjusted tubular drainage, three districts at the least may, under ordinary circumstances, be drained and supplied with water completely at a rate of expense heretofore incurred in one for imperfect works, which accumulate decomposing deposits, and gave off offensive and injurious smells.

That under ordinary circumstances, where new and combined works are properly executed, the expense of the main water supplies, and the main drainage works have, on the average of the whole town, been less than at the rate of 3*d.* per house per week.

That where combined works have been properly constructed, a service-pipe has been introduced from the water-main for the conveyance of a constant supply of water, a sink and dust-bin provided, the cesspool filled up, and an apparatus of the nature of a water-closet substituted, connected by a house-drain with a main drain or sewer, and put in good action, at a charge under ordinary circumstances, and for the greatest number of habitations, payable by an improvement rate of little more than 3*d.* weekly, being less than the ordinary rates of expense for forming and keeping in repair common pumps, and the expense of cleansing cesspools attached to houses in towns

That where combined works have been properly executed, the expense of the complete works has not hitherto exceeded the average expense of cleansing and repairing house-drains, and of cleansing cesspools, as declared upon a house-to-house inquiry, including 8,000 houses, in three average parishes of the metropolis.

That it is important, for the sake of economy, as well as for the health of the population, that the practice of the removal of refuse in suspension in water, and by combined works should be applied to all houses, especially to those occupied by the poorest classes.

VIII.—Conclusions obtained as to the Drainage of Suburban Lands.

1. Excess of moisture, even on lands not evidently wet, is a cause of fogs and damps.

2. Dampness serves as the medium of conveyance for any decomposing matter that may be evolved, and adds to the injurious effects of such matter in the air:—in other words, the excess of moisture may be said to increase or aggravate atmospheric impurity.

3. The evaporation of the surplus moisture lowers temperature, produces chills, and creates or aggravates the sudden and injurious changes or fluctuations of temperature by which health is injured. (*Vide* Sanitary Report 1842, pp. 80-92; Second and Third Metropolitan Sanitary Reports, and postea, pp. 66-69.)

The following are the chief agricultural advantages of land drainage to individual occupiers or owners:—

1st. By removing that excess of moisture which prevents the permeation of the soil by air, and obstructs the free assimilation of nourishing matter by the plants.

2d. By facilitating the absorption of manure by the soil, and so diminishing its loss by surface evaporation, and being washed away during heavy rains.

3d. By preventing the lowering of the temperature and the chilling of the vegetation, diminishing the effect of solar warmth not on the surface merely, but at the depth occupied by the roots of plants.

4th. By removing obstructions to the free working of the land, arising from the surface being at certain times, from excess of moisture, too soft to be worked upon, and liable to be poached by cattle.

5th. By preventing injuries to cattle or other stock, corresponding to the effects produced on human beings by marsh miasma, chills, and colds, inducing a general low state of health, and in extreme cases the rot or typhus.

6th. By diminishing damp at the foundations of houses, cattle sheds, and farm steadings, which causes their decay and dilapidation as well as discomfort and disease to inmates and cattle.

IX.—Conclusions obtained on Application of Sewer Water and Town Manures to Agricultural Production.

The general aspect and important sanitary relation of the subject are thus described in the Sanitary Report of 1842:—

"Within many of the towns we find the houses and streets "filthy, the air fœtid; disease, typhus, and other epidemics rife "amongst the population, bringing in their train destitution, and "the need of pecuniary as well as medical relief, all mainly arising "from the presence of the richest materials of production, the com- "plete absence of which would, in a great measure, restore health, "avert the recurrence of disease, and, if properly applied, would

"promote abundance, cheapen food, and increase the demand for "beneficial labour. Outside the afflicted districts, and at a short "distance from them, as in the adjacent rural districts, we find the "aspect of the country poor and thinly clad with vegetation, (except "rushes and plants favoured by a superabundance of moisture,) the "crops meagre, the labouring agricultural population afflicted with "rheumatism and other maladies arising from damp and an excess "of water, which if removed would relieve them from a cause of "disease, and the land from an impediment to production, and if "conveyed for the use of the town population would give that "population the element of which they stand in peculiar need as a "means to relieve them from that which is their own cause of "depression, and return it for use on other land as a means of the "highest fertility.—The fact of the existence of those evils, and that "they are removable, is not more certain than that their removal "would be attended by reductions of existing burdens, and might "be rendered productive of general advantage, if due means, guided "by science and applied by properly qualified officers, be resorted "to."

Later investigations of the subject have established two general conclusions applicable to the subject,—that,

> In towns all offensive smells from the decomposition of animal and vegetable matter indicate the generation and presence of the causes of insalubrity and of preventible disease, at the same time that they prove defective local administration:

And correlatively that,

> In rural districts all continuous offensive smells from animal and vegetable decomposition indicate preventible loss of fertilizing matter, loss of money, and bad husbandry:

As *sanitary* results of the examination of the various means in practice of collecting, removing, and applying town manures, it appears,—

1. That it is preferable to incur the total loss as manure, of ordure and urine, or of animal and vegetable refuse in towns, than to allow it to be retained for occasional removal, to putrefy and create noxious gaseous impurities, amidst or near dwellings:

2. That there have been no trials of chemical substances, as "deodorisers" or "disinfectants," made on a large scale, which have been satisfactory as preventives; that impurities are created before such means can be applied, and when they are applied, the labour of applying them, and the expense of the materials used, equal or exceed the proper cost of effectual arrangements for the immediate removal of all offensive matter:

3. That it is a primary condition of salubrity that all ordure or town refuse should be immediately removed from beneath or near habitations, and that this object may be the most completely as well as economically effected by removal in water:
4. That it is far less injurious to the public health to have the refuse of towns in water in the next river than underneath or amidst dwellings:
5. That the application of manures to the surface of land by means of irrigation is less injurious than the application of the same quantities of manure in the common method as top-dressings; but that the common practice of irrigation with plain water is often productive of ague, and, when conducted near dwellings, is otherwise injurious to health; and that the creation of largely extended evaporating surfaces from sewer water near towns (though still far less injurious than the retention of refuse, and its decomposition within towns and underneath habitations,) ought to be avoided:
6. That the necessity of any such exposure is avoided by the conveyance of sewer water in closed impermeable pipes underground, and by its distribution by steam power, or by gravitation, through pipes, by jets, after the method of distribution of garden watering, or by shedding from a hose, whereby the extent of exposure to evaporation is so far reduced in amount and time, and the absorption by the land so immediate, that it is, as in garden cultivation, inappreciable in its effect on the atmosphere, or on the health of persons exposed to it.

As *agricultural* results, it appears from these examinations:

1. That the applications of a considerable proportion of the manures of towns in the liquid form, that is to say, as sewer water, have produced heavier crops than any other known description of manure; and that the superiority of a fourfold production of grass above the ordinary growth on similar soils has been maintained for upwards of half a century by means of the application of the sewer manure near Edinburgh and Milan:
2. That the like increase of fertility has been obtained by a similar application of the common farm manures in the liquid form:
3. That the great increase of the fertilizing power of manures by their proper application in the liquid form has been displayed on various descriptions of soil, on sands as well as on clays and loams, laid down with various descriptions of arable cultivation, but more particularly with green crops, and that the quality as well as the quantity of the produce has been improved:

4. That the ordinary augmentation of produce by the full application of the fertilizing powers of liquified or liquid manures on grass land has been four and five fold above the ordinary amount of production in this country:
5. That the chief advantages of the application of manure in the liquid form consist in the economy of the manure, in the promptitude of its action, in the prevention of the loss which occurs by its drying when applied in the solid form, in the like prevention of injurious emanations while it is preserved in solution in water, and in its being better fitted for quick absorption, and more readily carried beneath the surface of the soil to the roots of plants:
6. That the method of distribution of liquid manure by steam power through fixed and flexible pipes, by jets or by shedding, is cheaper and more effectual than any other yet practised, particularly for distribution on an extensive scale and at considerable distances:
7. That this mode of distribution has great advantage over the ancient method of irrigation by means of water-meadows:—in requiring less original outlay than the particular method usually available,—requiring less water, and applying the manure with less waste and with less danger to the public health,—in not impeding pasturage, in not confining the land to one description of cultivation, and in being applicable alike to arable and grass lands:
8. That the apparatus for the distribution of liquid manure by means of steam or other power through fixed and flexible pipes will be equally applicable to the distribution of water on a large scale at a cheaper rate than by any other method yet known of supplying water to plants:
9. That by the provision of the apparatus for the distribution of the manures of towns on a large scale in the liquid form, the necessity will be avoided of any considerable outlay for machinery or fixed capital on the part of the owners or occupiers of land, previously to the adoption of the improved methods of culture consequent on the use of sewer manures:
10. That whilst the proper drainage of the land diminishes the losses arising from an excessive moisture, from continued rain or excessive floods, the apparatus of under-ground pipes, and the surface apparatus for the removal and application of sewer water or liquified substances as manure, will equally serve for the application of simple water, and for the diminution of the losses and inconveniences which are occasioned to the agriculturist by the irregular falls of rain and long-continued droughts.

The chief economical results of high cultivation, as in the examples cited, to the extent of a four or five fold produce, appear to be almost as if, for the payment of 6s. per acre of new annual

charges for pipes, the fertility of three or four additional farms were put upon one; and also as if, at the same time, the fences and gates, and length of roads to be maintained, and the distance for the transport of materials and produce in the farm, and for other purposes, were reduced to one fourth or to one fifth of the ordinary proportions. In the neighbourhood of towns the economy of space for cultivation has peculiar advantages.

X.—Tests for the Examination of Candidates for the Office of Superintending Engineering Inspectors.

The General Board of Health have received your application for an appointment as a Superintending Inspector under the Public Health Act, with the testimonials as to your professional standing and qualifications for such an office.

In deciding upon the merits of candidates the General Board feel themselves called upon to keep in view the conclusions as to the requirements of such an office arrived at by the Sanitary Commissioners, and stated by them in the following terms:

"The more the investigation advances the more it is apparent that the progressive improvement and proper execution of this class of public works, together with the appliances of hydraulic engineering, cannot reasonably be expected to be dealt with incidentally or collaterally to ordinary occupation, or even to connected professional pursuits, but require a degree of special study which not only place them beyond the sphere of the discussion of popular administrative bodies, but beyond that of ordinary professional engineering and architectural practice.

"In justification of this conclusion, and to show the evil of the perverted application of names of high general professional authority, we might adduce examples of the most defective works which have received their sanction.

"All the improvements which the public have yet obtained in this branch of public works have been the result of the special and undivided practical attention of well-paid qualified officers."

That the Board may be enabled to judge of the positive as well as of the relative ability of the candidates for employment in this service, they will require, in addition to the ordinary testimonials as to general ability and moral trustworthiness, to be furnished with proofs of a special aptitude for originating, expounding, and superintending the execution of the class of works in question.

In the Public Health Act you will find set down the various duties of a Superintending Inspector, and, among others, that of dealing with the owners and occupiers of districts in the way of exposition, examination, and judicial decision.

It will be evident to any one who has followed the course of the inquiries relating to public health works that the principles that have been established for future operations will render inapplicable much of the experience that has been formed in the execution of existing works of house, street, and land drainage, water supply, and general cleansing.

It is stated in the first report of the Health of Towns Commission that, "of the replies of the fifty towns on the subject of "draining and cleansing, in scarcely one place can the drainage or "sewerage be pronounced to be complete or good, while in seven "it is indifferent, and in forty-two decidedly bad, as regards the "districts inhabited by the poorer classes," and on the subject of the supply of water, that "in only six instances could the arrange-"ments and the supplies be deemed in any comprehensive sense "good, while in thirteen they appear to be indifferent, and in "thirty-one so deficient as to be pronounced bad."

As the means of enabling the Board to judge of your application they would ask you to lay before them your views of the means of remedying these defects. To this end they would wish you to state, in the first place, the general principles which, during an inquiry and inspection of any city or town, would govern your determination of the boundaries which might be most advantageously adopted for the purposes of the Public Health Act, and then to select or suppose some case of defective house and land drainage, water supply, and cleansing, and show in detail the way in which you would treat it.

Take, for example, a small provincial town or large village, or a detached suburban district of five or six hundred houses, on an undrained heavy clay or marshy site, and it may be affected with ague or typhus.

Let the locality you fix upon be either on the borders of a river, and in whole or in part below high water mark, or on a flat ground with no river near, and state the arrangements that you would make for its thorough and perfect drainage, that is to say, for complete surface drainage, including the drainage of the land and open spaces of the neighbourhood, sub-soil drainage, and the relief from floods, especially in low lands. Reference will, of course, be required to be made to the materials, forms, sizes, and inclinations of the drains, the machinery that might be requisite, and the cost of the works.

In the next place, you would require to show how you would select, gather, store, and distribute water for domestic use, for cleansing, and for the prevention of fires, with the character and cost of the works, and also to state the principles that would guide your procedure in this important department. It will be most to the purpose to choose for this object a town with no suitable river water at hand. The qualities requisite in water to be supplied to towns, the materials to be employed in waterworks, their sizes and proportions, and the amount of supply necessary for a given population are, you are aware, all essential to be attended to.

The paving of the streets of the different classes of main and secondary streets and courts, including the materials, the method of forming the foundation, the form and inclination of the surface, with the cost of work, would also require to be given in reference to any place that you might select or suppose, and also the means you

would adopt for cleansing streets and courts, and for disposing of the refuse. The disposal of solid refuse from the habitations would likewise have to be provided for.

You will, moreover, be expected to give a very precise and detailed account of your views as to house drainage. One of the chief objects of sanitary works being the immediate removal of all decomposing refuse, soil, and waste water from, around, amidst, or beneath human habitations, it is desirable that you should fix upon a house—for example, one of the fourth class, or of the kind inhabited by the labouring population—and show by what materials, forms, sizes, and construction, and at what price, you would accomplish this object. The same ought also to be done for blocks of houses. It would be requisite to distinguish between the cases of old houses, and the applications that you would propose for new buildings or new districts.

You ought further to show by what methods you would avoid the retention of solid decomposing refuse in the neighbourhood of habitations, as well as the pollution of rivers with soil water, and at what expense you would accomplish these objects.

The Board would require to receive your exemplifications of these points in as compact a form as possible, and with such sketches and illustrations as you may think necessary for the elucidation of the subject.

It is assumed from the fact of your application that you have devoted special attention to the subjects of which a knowledge will be essentially required for the satisfactory discharge of the responsible duties of the office which you seek, and the Board consider that under such circumstances a fortnight would be sufficient time for the preparation of your answer, but the Board do not desire to restrict you to this period should you wish to have it extended.

XI.—Instructions of the General Board of Health to the Superintending Inspectors.

Sir,

On proceeding to the town to which your service is directed you will inquire for the list of places required to be made out by the 9th Order, under the Epidemic Diseases Prevention Act, where cases of typhus and other epidemic and endemic diseases have most frequently occurred. You will seek the assistance of the clergy and ministers of religion, who may be able to afford valuable aid in your inquiry, and you will also put yourself in communication with the chief medical officers and the medical practitioners, who, as union surgeons or otherwise, have probably been led most frequently into the houses and streets where epidemic diseases have prevailed.

You will request the superintendent registrar of the district to attend your first meeting with the list of the places of epidemic disease; you will also request the medical officers to attend at the same time, and also a committee or deputation of the petitioners, the surveyor, inspector of nuisances, and the high constable or other chief

officer of police, to be in attendance upon you; you will read the Registrar-General's return of the average proportion of deaths from epidemic disease, and also the average rates of infantile mortality, and also any other such particulars as may be in your possession from previous returns with which you will have been furnished, *viz.*—the answers made to the first sanitary inquiry; also the answers made to the inquiries of the Commissioners of Inquiry into the means of Improving the Health of Towns; and state that you are instructed to view the places where epidemic diseases have been most rife, and to judge for yourself as to the condition of the houses, and of what may be done by public measures, and the exercise of the powers by the General Board of Health, for the remedy of the evils in question, and for the advantage of the population.

You will then ask, if there be any evil, or any place to which any person in the meeting wishes you to direct your special attention. If there be, you will take a note of it, and endeavour to attend to it as far as it may appear to require it, and as your time may enable you.

You will endeavour to confine your first meeting to the hearing of such statements, and ascertaining the parties who will give the most trustworthy information.

If there be any parties opposed to the petitioners, or to the inquiry generally, or to proceedings on the ground of expense, the objection will involve references to the condition of some places, or to the condition of the town generally; and you must necessarily suspend your judgment until you have seen with your own eyes. After you have done so, you will judge how far it may be necessary to incur the expense or delay of a further hearing before you have made your report, when they will see what is proposed to be done, and when it is hoped that their apprehensions will be removed, and when, if not, they will have the opportunity of being heard according to Section 9. You will select the medical or the relieving officers, or other persons who will guide you to the track of fever cases, and also any town surveyor or inspector of nuisances, or officer of police, who may be required to attend you to give explanations.

From what is established in relation to the haunts of typhus and epidemic disease, it may be presumed that the list of places of their occurrence will have carried you to ill-drained and ill-cleansed and filthy places. In these places you will inquire and examine as to the state of the water supplies.

From the inspection of these places you will proceed to the other better-conditioned districts, and to the general perambulation of the town, and to the suburbs.

You will next collect your information as to the soil, subsoil, the beds of clay or strata, and the geological condition of the site of the town, its permeability and absorbency, and its state as to springs and surplus water, as affecting the state of damp, whether of tenements within the town or of lands in the suburbs.

Having taken a general view of the covered portion of the town, and of the whole site, it is to be presumed from the known common

causes of epidemic disease that you have been brought upon ill-drained and ill-cleansed districts, with accumulations of filth and cesspools in yards, or in extended cesspools constituted by ill-constructed drains and covered sewers, or by stagnant open ditches which serve as sewers, upon houses with damp floors, or walls, and upon spaces surcharged with moisture.

You will then have to consider in what way the soil and animal and vegetable matter, filth, and refuse may be most rapidly, conveniently, safely, and economically removed.

From trials of works it may be taken as demonstrated that you will find that such removal may be best effected by means of impermeable tubular drains, which will allow of no escape of noxious gases; and from their comparative smoothness, and the better adaptation of forms and concentration of the stream, will allow of the best scour and consequently the least deposit.

You will have next to consider the direction of the discharge, which usually need not be to the pollution of the nearest stream, but in the direction of agricultural demand and application for the purpose of production; but in making this provision you will consider of the discharge of the drainage into such channels as will not pollute the atmosphere of the town, but will yet serve for relief: should the early demand for it for agricultural production prove inadequate, the system of impermeable tubular drains might convey the refuse of the town through sites surcharged with surface water from the rain-fall on the uncovered spaces, or from springs, and from the percolation of upland-waters, and thus avoid adding to the noxiousness of the emanations from stagnant water charged with the common marsh impurities.

You will have to consider, together with the means of relief by the conveyance of night-soil and other refuse in tubular impermeable drains, the clearance of the table site or natural area of the town from surplus rain or spring water by means of a corresponding system of permeable agricultural tile drains, and other means, according to the position of the land; and you will have to direct your attention to the protection of low-lying districts from upland flood waters as well as from the ordinary rain-fall.

The natural drainage area usually determines itself by the line of water shed from the hill top to the river or stream, dividing the valley or the lines of water shed of a natural basin. But where a river dividing a town through the natural drainage area on each bank, might in an engineering point of view, be drained separately, yet this would require double, or weaker, or less economical establishments, clashing regulations and administrations in parts of the same town. You will find the advantages resulting from the principle of administrative consolidation exemplified in a charge delivered to a jury at a Court of Sewers at Westminster by Lord Morpeth.

You will, however, wheresoever you can, avoid going beyond existing civil boundaries for the sake of time in procedure and on other grounds. In all places where there is no corporate body, it will be desirable that you should report your views upon the best

mode of constituting the local board in conformity with the provisions of the Act as to numbers and the continuance or incorporation of any local body.

Considering the superior economy as well as the sanitary advantages of removing, as far as may be practicable, all the refuse and filth in a state of suspension in water, and the greater efficiency and economy of distributing all such matters as manure in the like suspension in water, you will next have to consider of the application of existing supplies, or of new supplies of water for these purposes, and also for domestic and manufacturing purposes and other uses.

You will have to consider of the sources of such supply, and of gathering grounds or storage grounds, for the collection, storage, and distribution of water for the purposes above specified.

The consideration of the works necessary for these purposes will lead to the determination of the natural drainage area, and also of the jurisdiction of the administrative area within which the several objects above described may be most economically and conveniently accomplished.

You will only go beyond the existing civil boundaries where there is a physical necessity for doing so, or where there will be manifest advantage to the occupiers and owners of the district included in the new jurisdiction, as well as the owners and occupiers within the existing civil jurisdictions.

Where schemes of local amendment have been proposed in relation to any place, you will see and examine the place itself, and make your own notes of what appears to be necessary to be done, and of the applicability of established principles of works, before you look at any of the schemes and plans of works which may be tendered for examination. You will bear in mind that you will not be warranted in incurring delay and expense in the examination of plans which *primâ facie* are erroneous in principle, or defective in detailed application in respect to the important subject of the application of the refuse of the town to agricultural production. It is desirable to ascertain and determine to what extent town manure is at present used by the farmers near the town? What is paid for it according to the present methods? What is the expense of hand-labour in its collection, and of cartage in its removal? and also what is the usual expense of its application as top-dressing? and what is the produce from the manure as at present applied?

You will inquire as to the state of the adjacent land for the reception of sewerage manure, as to its permeability from drainage or from the natural condition of the soil and sub-soils, and also as to any waste or common land, or public lands held under tenures, favourable to adaptation as examples of successful cultivation.

You will endeavour to make known as widely as you can, that every district will be protected by the General Board of Health from contributing more than its fair share of rates, proportioned as

nearly as may be practicable to its share of the advantages which it is hoped will be derived from the measures which you will be required to prepare.

The Reports of the Commissioners of Inquiry into the means of Improving the Health of Towns show an extent of expenditure in useless and wasteful works which may well justify apprehension as to future expenditure under the same management for the same objects. In the present depressed state of many commercial and manufacturing districts you will probably experience a great dread of any new outlay whatsoever. The Legislature, in authorizing a new expenditure, has appointed the new Board, whose agent you are, for carrying the Act into effect, for the purpose of preventing the repetition of the former insufficiency and waste.

It will be your duty, by your report, to allay, as far as may be practicable, unfounded apprehension on these heads.

You will show the description of works required, and state the charges at which it may be confidently pronounced that such works may be executed under a proper management. You will allay apprehensions of immediate outlays being required, by expounding the principle and the equity of the distribution of charges over periods of time as sanctioned by the Legislature.

You will state the weekly charges per house, and the charges per head on the population, in order that the annual rental, as well as the immediate outlay, which is to last for years, may not, as is commonly done, be fallaciously set against the daily and weekly convenience and economy.

You will moreover take care to ascertain and set forth what are really the existing charges in respect to which it is hoped the new charges will serve as means of reduction, the existing immediate charges of emptying cesspools by hand-labour and cartage; the charges of repairing defective house-drains and cleansing badly constructed sewers; the charges for the construction and repairs of pumps and wells, and of tanks and cisterns where supplies of water are only intermittent; the charges of fetching, carrying, and distributing water by hand-labour, and the charges of dilapidations of premises arising from damp and ill-drained foundations.

It is important to ascertain such existing charges, as a point of departure as well as of contrast. One mode of doing this will be by a set of house-to-house queries, such as have been distributed by the Metropolitan Commissioners of Sewers. You will exercise your discretion as to the distribution of these queries. In order to keep them within a manageable extent, you may send them to be answered by the petitioners, or you may distribute them to the occupiers of different classes of houses. You may take a block of houses of each of the chief classes, and after having ascertained the existing charges in relation to them, set forth the proposed house-drainage and other works, and show in detail the proposed new charges in relation to them.

You will also advert to the expenses of sickness and mortality. The extent of inquiry and exposition on this topic will be entirely at your own discretion.

In the event of your deciding to hold an adjourned meeting to hear any parties on any contested question, you will remind the persons applying, or the rate-payers, of the expenses incurred by any delay, and ask from what fund the prosecutors of the contested question expect payment?

You will bear in mind that your examination is mainly one as to works, or as to engineering appliances for the removal of the evils in question, and you will conduct the inquiry according to your own professional views and methods of investigation: and where you deem it necessary to examine witnesses, it will be inexpedient that you should attempt to adopt the technical procedure of the courts of law, which is instituted for the determination of questions as to matters of fact with a view to legal decisions. You alone will be responsible for all inquiries, and you only are authorized to conduct them. The statute gives no authority for incurring the expense of hearing counsel and attorneys. It will be your duty to put such questions to witnesses as may appear to be necessary. If any one wishes any questions to be put on points to be investigated, you will request him to hand them to you in writing, and you will judge of their relevancy and direct the inquiry. You will bear in mind, and state to parties, if requisite, the inutility and grievous expense of former investigations as to the necessary or comparative merits of engineering works, when conducted according to the methods adhered to by courts of law on the trial of more definite questions of fact which are put in issue in those courts.

You will also point out the privilege of appeal secured by the Legislature to parties interested by the provision, "that within a "certain time, being not less than the time of such publication "and deposit, written statements may be forwarded to the Board "in respect to any matter contained in or omitted from the said "report, or further report, or any amendment proposed to be "made therein." You will give the assurance that the General Board will, to the best of their power, pay attention to all written and deliberate appeals on a matter in which their only desire and interest must be to see that no just cause of dissatisfaction prevails.

You will bear in mind, as a representative of the General Board, the general nature of its objects and position as collected from the tenor and spirit of the provisions of the Act, first, as an agency for the removal of those evils in the repression of which the public at large have an interest; next, as an authority of appeal and adjudication between rival or conflicting local interests; thirdly, as a security in the distribution of charges, for the protection of minorities and absentees against wasteful works or undue charges in respect to them; and fourthly, as a means of communication to each locality, for its guidance, of the principles deduced from the experience of all other places from which information may be obtainable.

In this last view, in respect to works, each of you will be expected to note and communicate to each other reciprocally in detail whatsoever information you may obtain.

You will keep diaries of your proceedings and accounts of your expenses, and transmit them weekly to the General Board in the forms provided.

In the diaries you will note any facts or observations that may occur to you, and that you may not deem of importance enough for a separate letter.

The Board will regard your labours with great interest, and will be glad to hear from you upon all matters that may illustrate the progress of the measure.

The Board will in general refer to you any correspondence relating to the places with which you may be charged.

APPENDIX XII.

STATEMENT

"Of the Number of Letters and Documents received by the General Board of Health, and of the several descriptions of business transacted, and of the number of Boards held since the creation of the Board, 1848, to 31st December 1853.

"Of the debtor and creditor account of all Monies received by the General Board of Health from any source, and of the Monies paid by them since the creation of the Board in 1848; and of the unpaid debts and liabilities of the General Board of Health, made up to the 31st day of December 1853."

"Of the amounts of Money repayable from Local Boards; and the net expenses of the Board of Health during each year, apart from the expenses of any service specified as extraordinary."

RETURN showing the number of Letters and Documents received, and of the several descriptions of business transacted, and of the number of Boards held, from the formation of the Board to the 1st of January 1854.

Number of Boards held	1,245
Number of letters received	*33,148
Number of letters, &c. despatched	114,040

*This return is exclusive of the communications to the Board reporting the cases of cholera during the prevalence of that epidemic in 1848-9 During its worst periods, the number of returns averaged above 200 daily. The number of cases of cholera and diarrhœa coming within the cognizance of the Board may be estimated at upwards 800,000; deaths between 50,000 and 60,000. During the latter portion of the last year, 1853, cholera was again prevalent in various parts of Great Britain, the number of deaths in Scotland reported to the Board having been between 1,300 and 1,400; while in England there have been reports received of about 3,500 deaths. Upwards of 3,000 returns have also been received from pilots with respect to cases of cholera and diarrhœa on board vessels arriving at ports in Great Britain during the last four m nths of the year.

Representations made to the Board for assistance under the Nuisances Removal and Diseases Prevention Act, and complaints as to public nuisances	2,597
Reports of medical inspectors, &c., on the condition of places where cholera had broken out, or relating to the supply of water, received and considered	807
Reports on plans of drainage, &c., and on other (miscellaneous) subjects by Superintending and Medical Inspectors	425
Number of deputations from towns and districts.	145
Number of towns, &c., from which applications have been received for the application of the Public Health Act	284
Number of places to which the Public Health Act, 1848, has been applied by provisional order, confirmed by Act of Parliament (exclusive of nine places for which Acts have been obtained, incorporating the Public Health Act. In other instances the Act has been incorporated in Local Acts, though no petitions had previously been presented to the Board from these places).	86
Number of places to which Act has been applied by Order in Council	88
Bills prepared by the Board and laid before Parliament	26
Legal opinions in answers to questions submitted by Local Boards, &c. about	1,670

Documents issued in print by the General Board of Health, from its formation to 31st December 1853.

General report on the execution of the Public Health Act, and Nuisances Removal Act.

Report by Superintending Inspectors on the local examination of 243 towns (*exclusive* of reports on further inquiries in 72 towns, &c.)

General report on quarantine. Translation of first quarantine report in French (for circulation to foreign states). Ditto in Italian (ditto).

Second report on quarantine (yellow fever), with appendices, 1852. Translation of second quarantine report in French (for circulation to foreign states).

Report of the Board on the epidemic cholera of 1848-9.

Report of Appendices (Dr. Sutherland and Mr. Grainger's reports) (A) and (B).

Report on the progress and character of the epidemic cholera prevailing in Germany in 1852; by R. D. Grainger, Esq.

Fourteen public official notifications, giving information and directions to the officers of poor-law unions, and other local authorities in England and Scotland, on the subject of the cholera &c.

Eight official circulars of public documents and information directed by the Board to be printed, chiefly for the use of union medical officers, members of local boards, and others charged with the execution of the provisions and regulations issued under the authority of the Public Health Act, and Nuisances Removal Act, 1848.

Eleven various forms of instruction, schedules, queries and returns, in reference to cholera, supplied to local registrars, medical officers of unions throughout England, Wales, and Scotland.

Minute on the interpretation of the Nuisances Removal and Diseases Prevention Act.

Minute of instructions (with instructional letter) on duties of local boards of health, and their officers.

Two model maps for the survey of towns or districts, also minute of proposed surveys.

Byelaws for regulating the business of local boards, stating the duties of officers, and containing suggestions for keeping the accounts of local boards, with exemplifications annexed.

Minute in relation to the appointment of officer of health, under the 40th section of the Public Health Act.

Exposition of the office and regulation of the duties of officer of health.

Summary of experience on disease and comparative rates of mortality.

Minutes of information collected on the practical application of sewer water and town manures to agricultural production (ordered to be printed for the use of local boards of health, and their surveyors engaged in the administration of the Public Health Act, December 1851).

Minutes of information collected in respect to the drainage of land, roads, &c., and the facilitation of the drainage of suburban lands.

Minutes of information collected with reference to works for the removal of soil water or drainage of dwelling houses and public edifices, and for the sewerage and cleansing of the sites of towns.

Reports to the General Board of Health on the sanitary condition of the epidemic districts of Whitechapel, Bermondsey, Lambeth, St. Saviour's Union, Newington Union, St. George's in-the-East, St. Giles and St. George, Bloomsbury, Kensington, St. Margaret and St. John, Westminster, Bethnal Green, Chelsea, St. George's, Southwark, Rotherhithe, St. Olave's, Southwark (by John Sutherland, Esq., M.D., Medical Superintending Inspector).

Notification as to the discontinuance of the use of certain descriptions of cellar dwellings, under the 67th clause of the Public Health Act, 1848, and also as to the Common Lodging-houses Act, 1851, and the Labouring Classes Lodging-houses Act, 1851 (14 & 15 Vict. cc. 28 and 34).

Report on the present state of certain parts of the metropolis (Agar Town, &c.), and on model lodging houses of London, by R. D. Grainger, Esq. (laid before Parliament, July 1851).

Report by the General Board on the supply of water to the metropolis (1850).

Appendix No. 1. (containing returns to the queries addressed to the several metropolitan water companies).

Appendix No. 2. (containing engineering reports and evidence).

Appendix No. 3. (containing report and evidence; medical, chemical, geological, and miscellaneous).

Appendix No. 4. (containing reports, &c., on the cesspool system in Paris).

Supplemental report to the General Board of Health, with papers of suggestions on the proposed gathering grounds from the soft water springs of the Surrey sands.

Byelaws for lodging-houses.

Ditto for slaughter-houses.

Ditto for street cleansing.

Ditto for towns cleansing.

Report on a general scheme of extramural sepulture, (presented to both Houses of Parliament, by command of Her Majesty, 1850).

Report on a general scheme of extramural sepulture for country towns (presented to both Houses of Parliament, by command of Her Majesty, 1851).

Report to the General Board of Health on interments, by Robert Rawlinson, Esq., C.E.

Report to the General Board of Health on intramural interments, by William Ranger, Esq., C.E.

Report to the General Board of Health on interments in towns visited during 1849 and 1850, by William Lee, Esq., C.E.

Scheme for providing a burial-ground in the township of Huddersfield, in the parish of Huddersfield, and for regulating the same under the provisions of the Nuisances Removal and Diseases Prevention Act, 1849.

Certificate of the General Board of Health for closing burial-grounds within the municipal borough of Newcastle-under-Lyme.

Certificate of the General Board of Health for closing the burial-ground of St. George's church, in the municipal borough of Wolverhampton.

Certificate of the General Board of Health for closing burial-grounds within the district of the borough of Reading.

Scheme for providing a burial-ground in the borough of Dorchester, and for regulating the same under the provisions of the Nuisances Removal and Diseases Prevention Act, 1849.

Papers received by the General Board of Health, exhibiting the operation of the Common Lodging-Houses Act. Laid before Parliament.

Statement of the preliminary inquiry by Southwood Smith, Esq., M. D., and John Sutherland, Esq., M.D., on the epidemic at Croydon; together with reports by Richard Dugard Grainger, Esq. and Henry Austin, Esq., C.E., to the General Board of Health, on the circumstances connected with the epidemic attack of fever at Croydon. Presented to Parliament.

Further Report from the consulting engineer to the General Board of Health on the Croydon drainage. Presented to both Houses of Parliament.

Business transacted under "Metropolitan Interments Act, 1850."

The correspondence connected with the Metropolitan Interments Act, not specially alluded to under the above head, is included in the statement already given of the gross office correspondence.

Board meetings, at which business under the Metropolitan Interments Act has been transacted - - - 209

Examination by a deputation from the Board to Paris of the mode of interment pursued there, and of the police regulations connected therewith.

Digest of the forms used by the French government in connexion with the interment of the dead.

Report of the management of Reception-houses in Germany.

A report on each of the metropolitan cemeteries, together with estimates of their proximate value.

A general report on all the cemeteries, with estimates of the value thereof, and of the works existing thereon, chiefly with a view to their adaptation for purposes of interment.

Reports on sixteen sites offered to the Board for metropolitan cemeteries.

Reports on Erith, Epping Forest, Epping Lower Forest, and Hainault Forest, as sites for cemeteries.

Reports on the division of the metropolis into medical districts, and on the means of carrying the dead by canal.

Reports on cemetery arrangements.

Report on the architectural construction and embellishment of reception chapels for the dead.

Business connected with the preparation of plans of reception chapels.

Reports on the planting and monumental decorations of cemeteries, and on the arrangement of cemetery chapels.

Reports on the burial vaults of metropolitan churches.

Report on the best mode of ascertaining the facts relating to the amount of compensation which may be payable under the Metropolitan Interments Act to the clergy and officers of the various metropolitan parishes.

Business preparatory to the commencement of the inquiry as to claims for compensation, under sections 32, 33, 34, and 35 of the Metropolitan Interments Act.

Report explanatory of the principles followed by the officers of the Board in estimating the value of the Brompton and Nunhead cemeteries.

Report on the suitability of Abbey Wood estate, at Erith, for a cemetery, with estimates of its value.

Plans of reception houses and chapels required in new cemeteries. (Prepared.)

Forms prepared, adapted to the registration and transfer of mortgage securities, under the Metropolitan Interments Act.

General report on the compensation inquiry.

Report on the preliminary proceedings of the Board, under the Metropolitan Interments Act, from 5th August to 31st December 1850. (Presented to Parliament.)

Return of persons engaged as officers or assistants under the Metropolitan Interments Act, and of all sums expended in relation thereto. (By order of the House of Commons.)

Report on the Metropolitan Places of Interment, in which the evils arising from overcrowding are most glaring.

Report on the amount of compensation which becomes payable on closing the grave-yards included in the foregoing report.

Report on the best means of providing temporary interment of the dead in the parish of Kensington.

Draft Bill for facilitating the establishment of extramural cemeteries for provincial towns.

Second annual report of the General Board of Health, under section 73 of the Metropolitan Interments Act. (Presented to Parliament by Her Majesty's Command.)

Correspondence was had, altogether, with the clergy of 173 parishes, within the Metropolitan Burial District, in relation to their claims for compensation.

Circulars were issued in every case to the clergy of each metropolitan parish, inviting them to attend the inquiry, (enclosing forms of compensation, returns, and printed instructions); also circulars to the parish clerks, the vestry clerks, and to the sextons, in relation to the same subject, during the progress of the same inquiry, under the Metropolitan Interments Act, 1850.

In the whole, the claims of 170 parishes to compensation were received; the accounts relating thereto examined; the evidence of the different claimants recorded; and the result of such examination and evidence reported.

Returns prepared for and laid before Parliament, in relation to the Metropolitan Interments Act, 1850.

Copies of the minutes of the General Board of Health respecting their proceeding under the Metropolitan Interments Act, 1850; and of all correspondence relating to the purchase of cemeteries, and of the Abbey Wood estate. (Presented August 1851.)

A further return was afterwards made to the House of Commons, continuing the above correspondence to a later period.

Returns of the names and salaries, &c. of officers engaged in carrying out the provisions of the Metropolitan Interments Act, 1850. (Presented April 1852.)

1. Account of all monies received by the General Board of Health from any source, and of the monies paid by them since the creation of the Board in 1848, to the 31st December 1853.

Dr.		Cr.	
To Amounts received -	£65,161 10 8	By Amounts paid - -	£63,969 4 6
		By Balance - - -	1,192 6 2
	£65,161 10 8		£65,161 10 8

2. Amounts repayable by Local Boards, £23,500.

3. Annual Expenditure from September 1848 to 31st December 1853.

Period.	Amount voted.	Total Expenditure.	Total Expenditure under the Public Health Act.	Total Expenditure under Nuisances Removal Act.
	£	£ s. d.	£ s. d.	£ s. d.
For the year ending 30 Sept. 1849	15,152	14,730 12 1	9,768 18 11	4,961 13 2
„ 18 months „ 31st March 1851	20,700	18,928 10 11	14,376 4 1	4,552 6 10
„ year „ 31st March 1852	9,969	9,278 14 1	8,380 16 7	897 17 6
„ Year ending 31st March 1853	10,745	11,748 1 9	9,877 1 4	1,871 0 5
„ 9 months „ 31st Dec. 1853 -	8,997	9,283 5 8	6,984 13 2	2,298 12 6
	65,563	63,969 4 6	49,387 14 1	14,581 10 5

* Note.—The total amount voted was 11,996*l.*; the above sum is three-fourths of the vote for the year.

Liabilities for expenses incurred to 31 December 1853 - - - - -	£1,150 0 0
Balance of amount voted after deducting amount expended for the whole period and the liabilities	443 15 6
Average annual expenditure under the Public Health Act, after deducting amount repayable by Local Boards - - - -	4,931 0 0

Ages.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Accidents or Violence.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Other Causes.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Total.	Proportion per Cent. of Deaths at each Age.
Under 5 years	35·	3,161	23·	44,089	33·4	158,815	37·7
„ 5	2·8	1,330	9·7	3,352	2·6	19,137	4·5
„ 10	1·9	923	6·7	1,981	1·5	10,431	2·5
„ 15	2·3	998	7·3	1,889	1·4	13,741	3·3
„ 20	3·1	982	7·2	2,190	1·7	16,565	4·
„ 25	3·3	833	6·	2,384	1·8	15,406	3·6
„ 30	3·5	719	5·2	2,648	2·	14,249	3·4
„ 35	4·	670	5·	2,921	2·2	14,220	3·4
„ 40	4·4	603	4·4	3,101	2·3	13,826	3·3
„ 45	4·9	629	4·6	3,329	2·5	13,597	3·2
„ 50	5·5	529	3·4	3,725	2·8	13,665	3·3
„ 55	6·3	472	3·8	4,370	3·3	14,597	3·5
„ 60	6·5	438	3·5	5,909	4·5	17,428	4·1
„ 65	6·3	352	2·8	7,453	5·6	18,543	4·4
„ 70	5·	296	2·	10,644	8·	20,717	5·
„ 75	3·3	298	2·	11,968	9·1	19,909	4·7
„ 80	1·4	181	1·3	10,511	8·	14,450	3·4
„ 85	·4	100	·7	6,280	4·8	7,867	1·9
„ 90	·08	35	·2	2,219	1·7	2,577	·6
„ 95 and abov	·02	6	·06	767	·7	840	·2
Ages not specified.	·04	165	1·2	115	·1	397	·09
Total. - -	100	13,720	100	131,835	100	420,977	100
Proportion of Deaths from each Class of Fevers to Total Fevers		-		-		-	
Proportion of each Class of Zymotic Disease to Total Zymotic Deaths		-		-		-	
Proportion of Deaths of each Disease of the Respiratory Organs, to Total Deaths of the Respiratory Organs		-		-		-	
Proportion per Cent. of each Class of Deaths to Total Deaths - -	·8	3·3		31·3		100	
Average Age at Death -	M. 33·	Yrs.M. 27·2		Yrs.M. 41·9		Yrs.M. 31·1	

DEATHS, AND CHIEF CAUSES OF DEATH,

Compiled from the Tenth Annual Report

A Return of the Deaths, and the Chief Causes of Deat

ZYMOTIC OR EPIDEMIC, ENDEMIC, AND CONTAGIOUS DISEASES.

Ages.	Fevers.														Other Zymotic or Epidemic, Endemic, and Contac							
	Typhus Fever.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Scarlatina.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Remittent Fever.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Infantile Fever.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Puerperal Fever.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Rheumatic Fever.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Total Fevers.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Small Pox.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Measles.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Diarrhœa.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Dysentery.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.
Under 5 years	4,364	14·4	9,638	65·6	366	53·6	591	87·7	-	-	6	2·1	14,965	31·5	3,114	73·7	7,681	88·4	7,770	67·4	1,095	33·7
„ 5	2,807	9·3	3,743	25·4	107	15.7	74	11·	-	-	15	5·2	6,746	14·2	527	12·5	798	9·2	331	2·9	181	5·6
„ 10	2,158	7·1	799	5·4	33	4·8	9	1·3	-	-	29	10·1	3,028	6·4	111	2·6	116	1·3	91	·8	69	2·1
„ 15	2,600	8·6	189	1·3	16	2·3	-	-	53	6·8	39	13·6	2,897	6·1	100	2·4	34	·4	81	·7	66	2·
„ 20	2,604	8·6	112	·8	18	2·6	-	-	194	24·7	21	7·3	2,949	6·2	151	3·5	23	·3	86	·7	89	2·8
„ 25	2,068	6·8	47	·3	15	2·2	-	-	188	24·	23	8·	2,341	5·	91	2·2	10	·1	128	1·1	114	3·5
„ 30	1,959	6·4	49	·3	21	3·	-	-	144	18·4	20	7·	2,193	4·6	55	1·3	12	·1	101	·9	113	3·5
„ 35	1,812	6·	30	·2	13	2·	-	-	135	17·2	16	5·6	2,006	4·2	25	·6	5	·06	93	·8	136	4·2
„ 40	1,944	6·3	26	·2	13	2·	-	-	54	7·	18	6·3	2,055	4·3	23	·5	4	·05	132	1·1	131	4·
„ 45	1,720	5·7	11	·08	7	1·	-	-	13	1·6	15	5·2	1,766	3·7	12	·3	4	·05	126	1.1	137	4·2
„ 50	1,461	4·8	11	·08	12	1·7	-	-	2	·2	15	5·2	1,501	3·2	4	·09	2	·02	176	1·5	158	4·9
„ 55	1,200	4·	9	·07	12	1·7	-	-	-	-	22	7·7	1,243	2·6	8	·2	-	-	188	1·6	140	4·3
„ 60	1,262	4·3	10	·07	11	1·6	-	-	-	-	18	6·3	1,301	2·8	1	·02	-	-	362	3·1	200	6.2
„ 65	933	3·	11	·08	13	2·	-	-	-	-	11	4·	968	2·	2	·05	-	-	360	3·1	203	6·3
„ 70	734	2·4	5	·04	10	1·5	-	-	-	-	10	3·5	759	1·6	1	·02	-	-	500	4·4	166	5·1
„ 75	448	1·5	2	·02	7	1·	-	-	-	-	7	2·5	464	1·	2	·05	-	-	537	4·6	132	4·
„ 80	146	·5	-	-	6	·9	-	-	-	-	-	-	152	·3	-	-	-	-	326	2·8	79	2·4
„ 85	68	·2	1	·01	2	·3	-	-	-	-	1	·4	72	·2	-	-	-	-	148	1·3	28	·9
„ 90	10	·03	-	-	-	-	-	-	-	-	-	-	10	·02	-	-	-	-	46	·4	6	·2
„ 95 and above.	-	-	-	-	1	·1	-	-	-	-	-	-	1	·002	-	-	-	-	8	·07	2	·06
Ages not specified.	22	·07	4	·03	-	-	-	-	1	·1	-	-	27	·06	-	-	1	·01	5	·03	2	·06
Total. - - -	30,320	100	14,697	100	683	100	674	100	784	100	286	100	47,444	100	4,227	100	8,690	100	11,595	100	3,247	100
Proportion of Deaths from each Class of Fevers to Total Fevers	63·9		31·		1·4		1·4		1·7		·6		100		-		-		-		-	
Proportion of each Class of Zymotic Disease to Total Zymotic Deaths	-		-		-		-		-		-		48·5		4·3		8·9		11·8		3·3	
Proportion of Deaths of each Disease of the Respiratory Organs, to Total Deaths of the Respiratory Organs	-		-		-		-		-		-		-		-		-		-		-	
Proportion per Cent. of each Class of Deaths to Total Deaths - -	-		-		-		-		-		-		-		-		-		-		-	
Average Age at Death -	Yrs.M. 29·6		Yrs.M. 5·2		Yrs.M. 14·9		Yrs.M. 3·2		Yrs.M. 29·2		Yrs.M. 35·10		Yrs.M. 21·9		Yrs.M. 6·2		Yrs.M. 3·4		Yrs.M. 20·7		Yrs.M. 32·10	

NOTE.—In the proportions occasionally two decimals have been used, which w

OF DEATH, IN ENGLAND AND WALES (1847).

Tenth Annual Report of the Registrar General.

Chief Causes of Death prevalent amongst the Population, from

Epidemic, Endemic, and Contagious Diseases.								Other Diseases.																	
	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Dysentery.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Other Zymotic Diseases.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Total Zymotic Diseases.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Consumption.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Diseases of the Respiratory Organs. Pneumonia.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	All other Causes.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Total Deaths.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Diseases of the Brain, Nerves, and Senses.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Diseases of the Digestive Organs.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Accidents or Violence.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Other Causes.	Proportion per Cent. of Deaths at each Age, to each Class of Disease.	Total.	Proportion per Cent. of Deaths at each Age.
0	67·4	1,095	33·7	66	67·6	49,991	51·1	5,195	9·7	15,914	67·9	6,097	22·	22,011	43·1	25,811	53·2	8,557	35·	3,161	23·	44,089	33·4	158,815	37·7
1	2·9	181	5·6	10	5·3	9,793	10·	1,656	3·1	754	3·2	319	1·2	1,173	2·3	1,160	2·4	673	2·8	1,330	9·7	3,352	2·6	19,137	4·5
1	·8	69	2·1	178	·8	3,593	3·7	2,342	4·4	250	1·1	179	·7	429	·8	709	1·4	454	1·9	923	6·7	1,981	1·5	10,431	2·5
1	·7	66	2·	176	·8	3,354	3·4	5,526	10·4	330	1·4	302	1.1	632	1·2	774	1·6	568	2·3	998	7·3	1,889	1.4	13,741	3·3
6	·7	89	2·8	266	1·1	3,564	3·6	7,420	13·9	429	1·8	433	1·6	862	1·7	790	1·6	757	3·1	982	7·2	2,190	1·7	16,565	4·
8	1·1	114	3·5	313	1·4	2,997	3·1	6,666	12·5	422	1·8	467	1·7	889	1·7	816	1·7	821	3·3	833	6·	2,384	1·8	15,406	3·6
1	·9	113	3·5	287	1·2	2,761	2·8	5,467	10·2	402	1·7	604	2·2	1,006	2·	799	1·6	849	3·5	719	5·2	2,648	2·	14,249	3·4
3	·8	136	4.2	280	1·2	2,545	2·6	4,757	9·	450	1·9	761	2·8	1,211	2·4	1,129	2·3	987	4·	670	5·	2,921	2·2	14,220	3·4
2	1·1	131	4·	269	1·3	2,634	2·7	3,750	7·3	471	2·	1,037	3·8	1,508	3·	1,148	2·3	1,082	4·4	603	4·4	3,101	2·3	13,826	3·3
6	1.1	137	4·2	344	1·5	2,389	2·4	2,938	5·5	495	2·1	1,351	4·9	1,846	3·6	1,275	2·6	1,191	4·9	629	4·6	3,329	2·5	13,597	3·2
6	1·5	158	4·9	335	1·5	2,176	2·2	2,372	4·4	514	2·2	1,604	5·8	2,118	4·1	1,392	2·9	1,353	5·5	529	3·4	3,725	2·8	13,665	3·3
8	1·6	140	4·3	417	1·8	1,996	2·	1,899	3·5	562	2.4	2,031	7·3	2,593	5·1	1,716	3·5	1,551	6·3	472	3·8	4,370	3·3	14,597	3·5
2	3·1	200	6.2	584	2·6	2,448	2·5	1,464	2·7	613	2·6	2,739	9·9	3,352	6·6	2,233	4·6	1.592	6·5	438	3·5	5,909	4·5	17,428	4·1
0	3·1	203	6·3	639	2·8	2,172	2·2	1,020	2·	594	2·5	2,979	10·8	3,573	7·	2,448	5·	1,533	6·3	352	2·8	7,453	5·6	18,543	4·4
0	4·4	166	5·1	728	3·2	2,154	2·2	499	·9	534	2·3	2,812	10·2	3,346	6·5	2,538	5·2	1,240	5·	296	2·	10,644	8·	20,717	5·
7	4·6	132	4·	673	3·	1,808	1·9	237	·4	389	1·7	2,209	8·	2,598	5·1	2,201	4·7	801	3·3	298	2·	11,968	9·1	19,909	4·7
6	2·8	79	2·4	389	1·8	946	1·	67	·1	208	·9	1,105	4·	1,313	2·6	1,089	2·2	343	1·4	181	1·3	10,511	8·	14,450	3·4
8	1·3	28	·9	178	·8	426	·4	19	·04	84	·4	413	1·5	497	1·	437	·9	108	·4	100	·7	6,280	4·8	7,867	1·9
6	·4	6	·2	45	·2	107	·1	5	·009	21	·1	98	·4	119	·2	73	·2	19	·08	35	·2	2,219	1·7	2,577	·6
8	·07	2	·06	13	·05	24	·02	-	-	5	.02	18	·07	23	·04	16	·04	4	·02	6	·06	767	·7	840	·2
5	·03	2	·06	11	·05	46	·05	18	·03	6	·03	10	·03	16	·03	28	·06	9	·04	165	1·2	115	·1	397	·09
5	100	3,247	100	22,721	100	97,924	100	53,317	100	23,447	100	27,668	100	51,115	100	48,574	100	24,492	100	13,720	100	131,835	100	420,977	100
	-		-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	11·8		3·3		23·2		100	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-
	-		-		-		-	-	-	45·9		54.1		100	-	-	-	-	-	-	-	-	-	-	-
	-		-		-		23·2	12·7	-	-		-		12·2	11·5	5·8		3·3		31·3		100			
	Yrs.M. 20·7		Yrs.M. 32·10		Yrs.M. 17·3		Yrs.M. 18·9	Yrs.M. 30·3		Yrs.M. 16·4		Yrs.M. 46·8		Yrs.M. 32·6		Yrs.M. 26·4		Yrs.M. 33·		Yrs.M. 27·2		Yrs.M. 41·9		Yrs.M. 31·1	

ls have been used, which will account for the totals (100) not always entirely agreeing.

APPENDIX XIV

APPENDIX XIV.

COMPARISON OF THE COST IN LIFE OF WAR, AND PESTILENCE, AND CIVIL VIOLENCE.

WAR.

OFFICIAL RETURNS of the number of British killed and wounded, both in the Army and Navy, in 22 years of war.

KILLED - - 19,796

WOUNDED - - 79,709

Annual Average Army - -	733	Total Average 899
Navy -	166	
Annual Average Army - -	3,151	Total Annual Average. 3,623
Navy -	472	

LOSSES IN PARTICULAR BATTLES.

	Killed.	Wounded.
Waterloo (total British killed on the field) - -	1,771 -	5,892
Salamanca - - - - - - - - -	388 -	2,714
*Vittoria - - - - - - - - -	501 -	2,807
Talavera - - - - - - - - -	670 -	3,406
Lord Howe's victory - - - - - -	287 -	806
Trafalgar - - - - - - - -	449 -	1,214
Nile - - - - - - -	218 -	677
Copenhagen - - - - - -	254 -	689
Barossa - - - - - - -	202 -	1,040

PESTILENCE.

Total number of Persons killed by Cholera and Epidemic Diarrhœa in 1848 and 1849, in England and Wales. *KILLED - 72,180

* Of these 34,397 were able-bodied persons, and of an age to get their own living, being between the ages of 15 and 60. But it is known that there was much omission and falsification of returns, and that these amounts are under-statements of the fatality of the disease.

The number of attacks from Cholera is estimated at two attacks to one death.

The number therefore would be - - - ATTACKED - 144,360

Of those attacked so many are permanently reduced in strength as to be made more susceptible to the prevalent causes of disease, as to be subjected to premature deaths—equivalent to the premature deaths and wounded in battle.

ANNUAL AVERAGE DEATHS from preventible, *i. e.* Typhus and other zymotic diseases, from which well-managed public establishments and improved dwellings are kept clear - - - - - - - - - - 115,000

Annual deaths from other causes, eventually preventible in civil life; those by violence, by improvement in the education and industrial training of manual labourers, rendering them more discreet by improvement in the arts, rendering processes and engines more safe, and by moral, religious, and physical training of intellectual labourers less liable to mental aberrations and to suicides; these deaths are from year to year nearly as they were returned in 1849, viz.:

Fractures - - - -	4,170
Burns and Scalds - - -	2,761
Drowning - - - -	2,433
Hanging and Suffocation - -	1,069
Wounds - - - -	542
Poison - - - -	444
	11,419

or more than eleven times as many as the average loss of life in battle.

Losses from CHOLERA and DIARRHŒA in particular districts, 1848-1849.

Metropolis 1848 and 1489

Cholera -	14,139	
Diarrhœa -	3,489	
	Total killed - -	*18,036

Of these 8,903 were able-bodied persons.

Newcastle, 1853, killed by Cholera - - -	1,543
Gateshead - - - - -	560
Total -	2,103

* Sir Richard Henegan, formerly head of the field train department of the Allied Armies under the command of the Duke of Wellington, states in a work narrating his military experience during seven years campaigns throughout the Peninsular War:—"Allowing half "the shots served out to have been fired at the Battle of Vittoria, 3,675,000 rounds "were fired against the enemy, of whom 8,000 were killed or wounded; consequently, "only one musket shot out of 459 took effect; and this calculation includes the injury "inflicted on the enemy by 90 pieces of artillery, which on the average fired 73 rounds of shot "and shell each, making a total of 6,870 rounds. The cavalry were but slightly engaged "during that day. At every battle in the Peninsula except Barossa, the author remarked "the same undue expenditure of ammunition in relation to the small extent of damage."

The Official Returns show that during the last forty-one months of the Peninsular War whilst 24,930 privates died of disease, only 8,999 died of wounds or were killed in battle. The deaths during the campaign were, of the privates in battle 42 per cent., of disease 11·9 per cent.; of officers in battle 6·6 per cent., of disease 3·7 per cent. per annum. The average deaths in four battles, Talavera, Salamanca, Vittoria, and Waterloo, were 3·9 per cent. of officers; 2·11 of privates.

In the Peninsular War there were generally 22½ per cent. of men absent on account of sickness, and a reduction of the proportions of sick to 6 per cent. would have set free 10,000 men from the hospitals to be added to the effective force of the army.

The highest increased charge for insurance of military men during the Peninsular campaigns was ten guineas per cent. The extra premiums taken on the insurance of military lives in service in India and China are from three to five guineas per cent., governed, however, by the unfavourable chances of the climate to which the campaign leads, as well as by the increased risks from battle.

The extra premiums on naval officers in hostile service is usually from three to five guineas per cent., governed by the consideration of the climate.

On the Medical Inspectors being sent from the General Board of Health to make preparations in the West Indies against the threatened visitation of the Asiatic Cholera, application was made for insurances; but none could be obtained from any respectable office in London, under less than 12 per cent. on the amount insured. Of the three one was so reduced by the climate, that he died immediately on his return, and another had a dangerous attack of yellow fever.

Of the medical men engaged in the actual visitation and treatment of the severe epidemics, as many as 12 per cent. have died; in some instances, as many as 20 per cent. have been killed.

The Secretary of the London City Mission Society states that though the missionaries have many of them previously been born and bred in poor districts, and accustomed to hard and trying labour, a considerable number of them are continually laid aside, and very many who promised best have to give up altogether in a few years. "Indeed very few of them with all these advantages, can stand many years work on the really bad districts of London, although thirty-six hours visiting each week is all which is required of them.

"We sustain as much loss of life and health in prosecuting missionary work in London as those societies do, the object of which is to send missionaries to foreign parts, many of which are notoriously unhealthy. This is a reproach to the metropolis of our country. There are some districts respecting which we almost feel sometimes a question whether we ought to expose the health and life of men, by placing them on them: and there are other districts on which missionary after missionary has broken down when located there: while even in a large number of our districts, the energy, strength, and vigour of our missionaries become impaired by their constant exposure to impure air."

The widowhood and orphanage from pestilence, inasmuch as there is always a large proportion of married adults attacked, are immeasurably greater in proportion to the gross numbers of killed than in war. In 1842, on an enumeration, it appeared that there were then 27,000 cases of premature widowhood and upwards of 100,000 orphans then chargeable to the poor rates from preventible causes. In the returns from twelve Unions, where there had been 11,170 deaths from Cholera, it was found that there were 3,567 widows and orphans chargeable to the epidemic cholera of 1848-49, and an expenditure, for only four years' relief, of £121,000. In the same proportion for the whole of the 72,000 deaths, the total number of widows of the class falling into destitution would be 23,000 and the four years' charge of them, 780,000*l.*

The total expense of funerals is estimated at 500,000*l.*, and the total private as well as public expenses of that one epidemic at not less than two millions, notwithstanding extensive checks and mitigations.

Taking as the test of the obtainable rate of mortality the rate obtained in good old dwellings improved by self-cleansing drainage works as well as by improved supplies of water, as well as in the new model dwellings, namely, 13 in a thousand (the common average of the whole kingdom being 23 in a thousand), the total annual losses from preventible disease, from lost labour by premature death, and excessive and premature sickness, and the expense of excessive numbers of funerals, is under estimated at 12 millions per annum, or about the tota annual charge of the entire army and navy.

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