what was formerly stated by Bailie Rutherglen, I have now before me a distinct statement, by Mr. Smart, regarding the lodging-houses and state of fever in Calton, which enables me to give the following information:—Between 1st September, 1840, and 1st February last, 319 persons were brought before the magistrates of Calton for keeping unregistered lodging-houses. Of these 216 were ordered to desist from keeping lodgers till houses registered, &c.; 91 were fined and ordained not to keep lodgers; 12 cases were dismissed. Of the 307 convicted for keeping unregistered lodging-houses, 90 got their houses inspected and registered, 30 removed from the burgh, and 189 gave over keeping lodgers, and were refused registration—refused principally on account of the want of proper accommodation, and a few for harbouring disreputable characters. Mr. Smart also informs me that several hundreds of the worst houses of the poorer classes have been whitewashed with Irish lime, and the lodging-houses having been put under wholesome regulations, a marked improvement has taken place. In Whisky-close, New-street, for several years past, as many as 30 cases of fever occurred annually. Lime-washed in September last, and the vagrants removed; only one case of fever has been known: and Mr. Smart concludes, "I believe there are 1000 fever cases less in Calton this day than there were on 1st September last." Why should not the same measures that have been so successfully enforced in Calton be introduced into the City Proper and the other suburban districts?"

It were only a statement of the concurrent opinion of the commissioners of police, of magistrates, of medical officers, and of the guardians charged with the administration of the poor's rates, to represent the urgent necessity of legislative provisions for the general adoption of similar measures throughout the country.

IX.—RECAPITULATION OF CONCLUSIONS.

The last cited instance of the practical operation of measures for the abatement of the nuisances attendant on common lodging-houses may also be submitted as an instance of the advantages derivable from the extension of such fields of inquiries as the present. On each of the chief points included in it there would have been a loss of what I hope will be deemed valuable corroborative information, had the inquiry been confined either to England or to Scotland. The observation of the important productive use of the refuse of the city of Edinburgh would have been of comparatively little value as evidence leading to practical applications, apart from the observation of what is accomplished by the practical application of science to sewerage and drainage for the immediate and cheapest removal of all the refuse of towns by water through closed drains afforded by the operation in the Holborn and Finsbury division of the metropolis. It may be stated confidently that, if the inquiry could conveniently have had still further extension as to time and place, the information would have been strengthened and rendered more complete. From incidental facts I have met with, I am led to believe that the whole of the

effects which are the subject of the present report would have been still more strikingly displayed in many parts of Ireland.

After as careful an examination of the evidence collected as I have been enabled to make, I beg leave to recapitulate the chief conclusions which that evidence appears to me to establish.

First, as to the extent and operation of the evils which are the subject of the inquiry:—

That the various forms of epidemic, endemic, and other disease caused, or aggravated, or propagated chiefly amongst the labouring classes by atmospheric impurities produced by decomposing animal and vegetable substances, by damp and filth, and close and overcrowded dwellings prevail amongst the population in every part of the kingdom, whether dwelling in separate houses, in rural villages, in small towns, in the larger towns—as they have been found to prevail in the lowest districts of the metropolis.

That such disease, wherever its attacks are frequent, is always found in connexion with the physical circumstances above specified, and that where those circumstances are removed by drainage, proper cleansing, better ventilation, and other means of diminishing atmospheric impurity, the frequency and intensity of such disease is abated; and where the removal of the noxious agencies appears to be complete, such disease almost entirely disappears.

That high prosperity in respect to employment and wages, and various and abundant food, have afforded to the labouring classes no exemptions from attacks of epidemic disease, which have been as frequent and as fatal in periods of commercial and manufacturing prosperity as in any others.

That the formation of all habits of cleanliness is obstructed by defective supplies of water.

That the annual loss of life from filth and bad ventilation are greater than the loss from death or wounds in any wars in which the country has been engaged in modern times.

That of the 43,000 cases of widowhood, and 112,000 cases of destitute orphanage relieved from the poor's rates in England and Wales alone, it appears that the greatest proportion of deaths of the heads of families occurred from the above specified and other removable causes; that their ages were under 45 years; that is to say, 13 years below the natural probabilities of life as shown by the experience of the whole population of Sweden.

That the public loss from the premature deaths of the heads of families is greater than can be represented by any enumeration of the pecuniary burdens consequent upon their sickness and death.

That, measuring the loss of working ability amongst large classes by the instances of gain, even from incomplete arrangements for the removal of noxious influences from places of work or from abodes, that this loss cannot be less than eight or ten years.

That the ravages of epidemics and other diseases do not diminish but tend to increase the pressure of population.

That in the districts where the mortality is the greatest the

births are not only sufficient to replace the numbers removed by death, but to add to the population.

That the younger population, bred up under noxious physical agencies, is inferior in physical organization and general health to a population preserved from the presence of such agencies.

That the population so exposed is less susceptible of moral influences, and the effects of education are more transient than with a healthy population.

That these adverse circumstances tend to produce an adult population short-lived, improvident, reckless, and intemperate, and with habitual avidity for sensual gratifications.

That these habits lead to the abandonment of all the conveniences and decencies of life, and especially lead to the overcrowding of their homes, which is destructive to the morality as well as the health of large classes of both sexes.

That defective town cleansing fosters habits of the most abject degradation and tends to the demoralization of large numbers of human beings, who subsist by means of what they find amidst the noxious filth accumulated in neglected streets and bye-places.

That the expenses of local public works are in general unequally and unfairly assessed, oppressively and uneconomically collected, by separate collections, wastefully expended in separate and inefficient operations by unskilled and practically irresponsible officers.

That the existing law for the protection of the public health and the constitutional machinery for reclaiming its execution, such as the Courts Leet, have fallen into desuetude, and are in the state indicated by the prevalence of the evils they were intended to prevent.

Secondly. As to the means by which the present sanitary condition of the labouring classes may be improved :—

The primary and most important measures, and at the same time the most practicable, and within the recognized province of public administration, are drainage, the removal of all refuse of habitations, streets, and roads, and the improvement of the supplies of water.

That the chief obstacles to the immediate removal of decomposing refuse of towns and habitations have been the expense and annoyance of the hand labour and cartage requisite for the purpose.

That this expense may be reduced to one-twentieth or to one-thirtieth, or rendered inconsiderable, by the use of water and self-acting means of removal by improved and cheaper sewers and drains.

That refuse when thus held in suspension in water may be most cheaply and innoxiously conveyed to any distance out of towns, and also in the best form for productive use, and that the loss and injury by the pollution of natural streams may be avoided.

That for all these purposes, as well as for domestic use, better supplies of water are absolutely necessary.

That for successful and economical drainage the adoption of geological areas as the basis of operations is requisite.

That appropriate scientific arrangements for public drainage would afford important facilities for private land-drainage, which is important for the health as well as sustenance of the labouring classes.

That the expense of public drainage, of supplies of water laid on in houses, and of means of improved cleansing would be a pecuniary gain, by diminishing the existing charges attendant on sickness and premature mortality.

That for the protection of the labouring classes and of the ratepayers against inefficiency and waste in all new structural arrangements for the protection of the public health, and to ensure public confidence that the expenditure will be beneficial, securities should be taken that all new local public works are devised and conducted by responsible officers qualified by the possession of the science and skill of civil engineers.

That the oppressiveness and injustice of levies for the whole immediate outlay on such works upon persons who have only short interests in the benefits may be avoided by care in spreading the expense over periods coincident with the benefits.

That by appropriate arrangements, 10 or 15 per cent. on the ordinary outlay for drainage might be saved, which on an estimate of the expense of the necessary structural alterations of one-third only of the existing tenements would be a saving of one million and a half sterling, besides the reduction of the future expenses of management.

That for the prevention of the disease occasioned by defective ventilation, and other causes of impurity in places of work and other places where large numbers are assembled, and for the general promotion of the means necessary to prevent disease, that it would be good economy to appoint a district medical officer independent of private practice, and with the securities of special qualifications and responsibilities to initiate sanitary measures and reclaim the execution of the law.

That by the combinations of all these arrangements, it is probable that the full ensurable period of life indicated by the Swedish tables; that is, an increase of 13 years at least, may be extended to the whole of the labouring classes.

That the attainment of these and the other collateral advantages of reducing existing charges and expenditure are within the power of the legislature, and are dependent mainly on the securities taken for the application of practical science, skill, and economy in the direction of local public works.

And that the removal of noxious physical circumstances, and the promotion of civic, household, and personal cleanliness, are necessary to the improvement of the moral condition of the population; for that sound morality and refinement in manners and

health are not long found co-existant with filthy habits amongst any class of the community.

I beg leave further to suggest, that the principles of amendment deduced from the inquiry will be found as applicable to Scotland as to England; and if so, it may be submitted for attention whether it might not be represented that the structural arrangements for drainage would be most conveniently carried out in the same form as in England, that is by commissions, of the nature of commissions of sewers adapted, as regards jurisdiction to natural or geological areas, and including in them the chief elected officers of municipalities, and other authorities now charged with the care of the streets and roads or connected with local public works.

The advantages of uniformity in legislation and in the executive machinery, and of doing the same things in the same way (choosing the best), and calling the same officers, proceedings, and things by the same names, will only be appreciated by those who have observed the extensive public loss occasioned by the legislation for towns which makes them independent of beneficent, as of what perhaps might have been deemed formerly aggressive legislation. There are various sanitary regulations, and especially those for cleansing, directed to be observed in "every town except Berwick and Carlisle;" a course of legislation which, had it been efficient for England, would have left Berwick and Carlisle distinguished by the oppression of common evils intended to be remedied. It was the subject of public complaint, at Glasgow and in other parts of Scotland, that independence and separation in the form of general legislation separated the people from their share of the greatest amount of legislative attention, or excluded them from common interest and from the common advantages of protective measures. It was, for example, the subject of particular complaint, that whilst the labouring population of England and Ireland had received the advantages of public legislative provision for a general vaccination, the labouring classes in Scotland were still left exposed to the ravages of the small-pox. It was also complained by Dr. Cowan and other members of the medical profession, that Scotland had not been included in the provisions for the registration of the causes of death which they considered might, with improvements, be made highly conducive to the advancement of medical science and the means of protecting the public health.

I have the honour to be,
Gentlemen,
Your obedient servant,
EDWIN CHADWICK.

APPENDIX.

1.—*Evidence of* MR. JOHN ROE, *Civil Engineer, on the Practical Improvement in Sewerage and Drainage tried in the Holborn and Finsbury Divisions of the Metropolis.*

You are the surveyor to the Holborn and Finsbury Commission of Sewers?—Yes, I am.

By profession you are an engineer?—Yes; I have been engaged as an engineer in the formation of canals and railways, and in the drainage incident to such works.

How long have you acted as surveyor to this branch of sewerage in the metropolis?—Nearly four years.

Have you observed the general state of the sewerage of the metropolis?—I have only seen some of the sewers of other divisions, but I am generally acquainted with the principle of their construction.

Is it generally the same as that in which you found the sewers in the Holborn and Finsbury divisions?—Yes, except that the forms differ in a degree; some are flat-bottomed sewers, others segment-bottomed. For a long time the Holborn and Finsbury divisions have used bottoms of a semicircular form.

The effect of a flat-bottomed sewer, it is to be presumed, when the water is shallow and the flow slow, is to leave a larger quantity of deposit?—Yes; it flows sometimes in a channel, leaving a deposit on each side; sometimes the water flows on one side, leaving a deposit on the other; but in all cases the flat-bottomed sewers occasion a larger amount of deposit with the same flow of water: it is more than one-half difference of the deposit which is left.

What proportion of the sewerage of the metropolis do you believe to be flat-bottomed?—I have not examined the other divisions, but I believe the greater proportion of the sewerage to be flat-bottomed. In the City they have built some of their sewers in a form nearly similar to those adopted in the Holborn and Finsbury divisions; that is, approaching to semicircular. In the Westminster division the invert is a segment of a circle, whose chord being three feet the versed sine is six inches. Most new sewers are making an approach to the better form by having segments.

Is it not the fact that in proportion as the bottom approaches a plane it approaches to the inconvenience of the flat-bottomed sewers, and weakens the force of the current?—Yes, in a degree, it does.

Are there any practical inconveniences, or is there any material increase of expense in building semicircular bottoms?—None; and if the sides are curved also it forms the stronger sewer for the same expense.

How are the sides of the sewers generally built?—As far as I am informed, they are built with upright walls. I know none but the new sewers in the Holborn and Finsbury divisions that are built with curved sides, though I have no doubt that if any new sewers are built under the superintendence of Mr. Walker, who is president of the Engineers' Society, he would build them with curved sides.

What are the disadvantages of the flat-sided sewers?—They are not calcu-