PUBLIC HEALTH ACT.

(11 & 12 Vict., Cap. 63.)

REPORT

TO THE

GENERAL BOARD OF HEALTH,

ON A

PRELIMINARY INQUIRY

INTO THE SEWERAGE, DRAINAGE, AND SUPPLY OF WATER, AND THE SANITARY CONDITION OF THE INHABITANTS

OF THE TOWN OF

STRATFORD-UPON-AVON.

BY GEORGE THOMAS CLARK,

SUPERINTENDING INSPECTOR.

LONDON:

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FOR HER MAJESTY'S STATIONERY OFFICE

1849.

NOTIFICATION.

THE General Board of Health hereby give notice, in terms of section 9th of the Public Health Act, that on or before the 18th June, written statements may be forwarded to the Board with respect to any matter contained in or omitted from the accompanying Report on the Sewerage, Drainage, and Supply of Water, and the Sanitary Condition of the Inhabitants of the Town of STRATFORD-UPON-AVON, or with respect to any amendment to be proposed therein.

By order of the Board,

HENRY AUSTIN, *Secretary.*

Gwydyr House, Whitehall.
16*th May*, 1849.

PUBLIC HEALTH ACT (11 and 12 Vict., cap. 63).

Report to the General Board of Health on a Preliminary Inquiry into the Sewerage, Drainage, and Supply of Water, and the Sanitary Condition of the Inhabitants of the Town of STRATFORD-UPON-AVON. By GEORGE THOMAS CLARK, Superintending Inspector.

MY LORDS AND GENTLEMEN, *London, 20th March*, 1849.

IN accordance with your instructions, and pursuant to notice given, as directed by the Public Health Act, I proceeded to the borough and parish of Stratford-upon-Avon and Old Stratford, and at public sittings in the Town Hall upon the 16th, 18th, and 19th of December last, and by personal examination of the localities in the course of the same days, I obtained a sufficient knowledge of the condition of the town, under the heads pointed out in my instructions, and such data as the time and opportunities allowed for the devising and recommendation of remedies.

2. I believe that my estimates will be found to be above the actual cost of the works to which they relate; but I think it necessary to request your special attention to the fact that they must be regarded as proximate only, having been formed without the usual advantages of a regular survey and sections. Although I think myself warranted in affirming that the town may be drained and properly supplied with water for the sum estimated, it is very possible that the result of a survey will lead to a considerable modification of the details of the measures for the water supply, and possibly to a diminution of the expense.

3. I have to acknowledge the support of the mayor and corporate officers of the borough, especially of Mr. W. O. Hunt, town clerk and clerk of the peace, and the aid of Dr. Thomson, who accompanied me throughout the courts and alleys, and furnished me with much information regarding the sanitary statistics of the place. In many of these localities I was also accompanied by Mr. Flower, one of the charity trustees, and by various other townsmen, who will, I believe, bear me out in the accuracy of my description of the existing state of things.

4. The corporation map of the borough, and an engraved

map to a smaller scale, are old and incomplete. I found no other map, and there are no levels or sections. I have to acknowledge, upon this head, the assistance of Mr. Gibbs, surveyor.

5. General Description and Government.—Stratford-upon-Avon lies wholly upon the right bank of the river Avon, here a copious but sluggish stream, flowing from Warwick towards Pershore, and winding amidst level meadows in a valley of considerable breadth and high fertility.

6. By much the greater part of the town is a municipal borough, governed by four aldermen, including a mayor, and 12 councillors, 16 in all; who elect out of their body a Watch Committee and a Committee for General Purposes.

7. The corporation manage and collect the revenues of their own estates, amounting to about 2000*l.* per annum, out of which they pay over certain sums annually to the charity trustees for the maintenance of the grammar school and almspeople, amounting to nearly 700*l.*; but the remainder of the funds are under the control of the corporation, and from them the salaries of the vicar and his assistants, the police expenses, and part of those of lighting the borough are paid. The poor's rate, highway rate, &c., are all levied by consent of ratepayers in the usual way. The corporation do not levy any borough rate.

8. Besides the borough, the town includes a part of the parish of Old Stratford, upon which is built the church, a few houses on the south side, and the whole of New Town on the north side, a modern and very unhealthy district.

9. This district, though to all intents and purposes a part of the town, is independent of the borough, rated by the parish, and managed by the parish authorities. The whole of the borough, the adjacent part of the parish, and a part of a cluster of houses, called Bridge Town, in the parish of Alveston, form part of one town, and would be more efficiently and more economically managed if under one control.

10. Stratford slopes gently towards the river. The north-west or highest corner is between 30 and 40 feet above the Avon, at the bridge. The fall, at first gradual, is then sudden, and the lower or south-eastern district, in front of the river, and called "Water-side," is within reach of an extraordinary flood. South of the town, towards the church, the ground upon the river bank is somewhat higher. The natural fall of the west or upper side of the town is towards the south, and terminates upon the river a little below the church and the mill.

11. Although some of the adjacent lands to the north-east are a little higher than the town, their drainage is cut off by

the Stratford Canal, which sweeps around the town from the north to join the river, to which it descends by a chain of locks, altogether amounting to about 38 feet. West of the town the ground is nearly level, but appears to drain south-west into Church Farm or Marle Brook. Below the town is a mill-dam, by which the water is penned back about seven feet, and which is a material though most ancient injury to the drainage, as at present conducted, of the lowest part of the town. The navigation clears this dam by means of a lock on the left bank of the river.

12. The subsoil of nearly the whole of the borough is gravel, about 14 feet thick, resting upon lias clay. That part of the parish between the borough and the canal rests at once on clay, and being at least equally ill drained, is more unhealthy than other parts of the town, excepting perhaps, some of the houses close upon the water side.

13. Stratford is an ancient town, and has grown up without any general plan or any attempt at general drainage arrangement, cleanliness, or ventilation. Nevertheless, from its position, it is exposed to a considerable wind current, and from its porous soil it only needs moderate attention to secure a good subsoil and main, and therefore a good house drainage.

14. Stratford is not a place of any manufacture, or of much trade. It has a railway of about 17 years' standing, and extending 17 miles, to Moreton-in-the-Marsh, worked by horses, and chiefly employed in exchanging coal for corn. This communicates with the river near the canal mouth.

15. Suburban Drainage.—The uplands about the town appear to be pretty well drained. The meadows are not drained, but their soil is moderately porous. They touch upon the town at one point only, above the bridge foot, on the right bank of the river. Here also is a very deep ditch, the site of an old inlet for barges, and now an unhealthy swamp.

16. Between the road and the railway bridges the bed of the river is broad and shallow, and in parts exposed and offensive in the summer season. Lower down in front of the houses is a large withy-bed, which acts as a receptacle for all kinds of filth, and is much complained of as a nuisance.

17. Population.—At the census of 1831 the population of Stratford-upon-Avon, Old Stratford, and the Hamlets, included 5,044 persons, dwelling in 1,037 houses. In 1841 the township of Stratford-upon-Avon contained, of inhabited houses, 665; vacant, 68; building, 3: total, 736. Old Stratford contained, of inhabited houses, 532; vacant, 59; building, 5: total, 596. The whole district including Stratford-upon-Avon, Old Stratford, and its hamlets of Luddington and Dodwell, includes 6,860 acres.

18. In 1841 there were in Stratford-upon-Avon 3,321 persons, of whom 1,593 were under 20 years, and 1,728 were 20 years of age and upwards. At the same period there were in Old Stratford 2,579 persons, of whom 1,215 were under 20 years, and 1,364 were 20 years of age and upwards.

19. The present population of the *town* is computed to consist of about 5,000 persons, dwelling in 1,130 houses. The area of the town is about 165 acres.

20. MORTALITY.—Taking the borough population at 3,269, and the average annual deaths between 1841 and 1847 inclusive at 69$\frac{3}{7}$, this gives a mean annual mortality of 21·02 per 1000. In the parish, during the same period, with a population of 2,363, the deaths were 61$\frac{3}{7}$, being an average annual mortality of 25·93 per 1000. The mean mortality of the town, therefore, will be about 23·47 per 1000, a high rate, seeing that of the registration district is only 17·5 per 1000.

21. In the above calculation, for the particulars of which I am indebted to Dr. Thomson, the deaths of inhabitants of the Union workhouse not belonging to the borough or parish of Stratford are excluded.

22. This statement is startling, for even allowing that there may be some causes of mortality inseparable from large towns, such cannot apply to a place like Stratford, where, under proper regulations, the population ought to be as healthy as in an ordinary village similarly situated.

23. The causes of this excessive mortality in Stratford are, however, apparent enough, and they are, I believe, removable.

24. It appears from the lists of epidemic and endemic diseases, and diseases of the bowels, furnished to me, that those diseases particularly prevail in localities ill drained and exposed to the effect of certain local nuisances.

25. The sums expended in the out-door relief of the poor of the borough and parish, including the town and something more, for the three years ending Lady-day, 1848, were in—

1845 and 1846 . .	£ 876
1846 and 1847 . . .	1165
1847 and 1848 . .	1592

A considerable part of this excessive increase is attributed to the operation of the Poor Law Removal Act, but no small share of the expenditure is due to the increase of sickness, and has been incurred chiefly in localities which I found to be low, damp, ill drained, and dirty. I have met with no case in which the connexion between damp and dirt, and sickness and increased expenditure, has been more clearly established; nor can it reasonably be doubted that had the town been properly drained and supplied with water three years ago, not only would a large proportion of this heavy outlay have been

spared, but it would have been replaced by a certain amount of profitable labour.

26. I found, on my arrival, that the Board of Guardians had already been actively engaged in carrying out the Nuisances Removal Act, and had appointed a committee of their body to examine into the localities visited by disease. The relieving officers of the Union had been appointed inspectors, and various nuisances removed and abated. Mr. Hobbes, clerk of the Union, whose co-operation I have to acknowledge, observes, "that though the nuisances may in some measure be considerably abated, yet that the want of an efficient system of drainage operates to prevent an entire removal of them."

27. What the Guardians had done for the parish the Corporation effected for the borough, and I found everywhere symptoms of very recent activity in cleansing various objectionable spots.

28. I was accompanied in my inspection by Dr. Thomson, who has long paid attention to the health of the town, and to whom I am indebted for much valuable information, acquired by him in his professional capacity.

29. The street called the Guildpits, a main thoroughfare, is one of the filthiest and least healthy quarters of the town. Upon one side, between the houses and the road, is a row of muck-pits, cesspools, privies, piggeries, and small enclosed gardens, all very filthy, smelling offensively, and much complained of. This street is the boundary of the borough, and when these nuisances sprung up was the margin of the town. The extension of the houses beyond it, by throwing it into the town, have of course materially increased the nuisance.

30. Between Guildpits and Bridge-street are several crowded courts, all ill-drained; the cellars, where there are any, are damp or flooded, the privies falling into open cesspools or miskins, into which is thrown indiscriminately all the filth, refuse, and rubbish of each house. The road here is liable to be flooded for some distance. The people complained that meat would not keep in their houses, and in one most objectionable court, at the angle of the streets, was a mass of privies, cesspools, muck-heaps, and pigsties, and a large and very offensive gutter-grate.

31. At the court behind Mr. Restall's, between the Guildpits and Henley-street, are some premises in which these evils, and in addition a pump with water tainted by the cesspool, may be seen, and the existence of which is a discredit to the town.

32. Between Guildpits and the canal are a number of new streets and houses of the lower class recently built. This is the most unhealthy quarter in the town. In one street I found three houses vacant, from sickness brought on among

their tenants in consequence of an offensive nuisance, removed just before my arrival. These houses stand on clay. They are wholly undrained, and the soil does not here, as elsewhere, absorb any considerable part of the moisture. They also are rather abundantly provided with foul open cesspools, muck-heaps, and piggeries, and the streets and ways are unpaved and unmade, and some of them, at the time of my visit, were impassable.

33. Also this whole quarter of the town lies under the bank of the canal, the puddle of which pens back the upland waters, which, as it appears, find their way and rise up beneath the foundations and through the floor of the houses. *Summer-row*, *Shakespeare*, *Mulberry*, and *Great William streets*, with their courts, all in this quarter, may be cited as abounding in nuisances. *Shakespeare-row* is an instance of a court in which the inhabitants do their best to be cleanly, but in the absence of proper public arrangements and regulations fail in amending the chief evils. In *Victoria-terrace*, which has produced many fever cases, the cellars are damp or full of water. Shakespeare-street and Victoria-terrace show by the return the greatest proportion of cases of zymotic disease in the town.

34. A principal sufferer from the canal overflow and the want of public drainage, is Mr. Flower, who has built a large brewery and a dwelling-house in this quarter, and whose cellars, though in a good position for drainage, are liable to be flooded from the canal, which appears to be very insufficiently provided with a waste culvert. Mr. Flower's statement, the correctness of which I have verified by inspection, adds:—

1st. There is no surface drainage except a drain not two feet deep running down Brewery-street, which is generally stopped up with filth, and in consequence all the slops from the cottages are thrown into the open street.

2nd. There is no drainage whatever for the cellars, which are constantly damp, and after heavy rains are a foot or more deep in water, which can only be emptied by means of pumps; by a surface drain 2 feet deep round my own house I succeeded in lessening the quantity of water in my cellars, but the drain is now often an injury rather than a benefit, in consequence of the following nuisance.

3rd. When I built my brewery I made the lowest floor a few inches above the highest level of the canal (determined by the waste culvert), but within the last few years a considerable quantity of surface water, which used to run into the Shottery Brook, has been diverted from that channel, in consequence of a deep ditch being made along the Birmingham road, and it now runs into the canal, and as the culvert which takes off the waste water has not been enlarged, after rain the canal frequently rises much above its proper level, inundates the floors, backs up the drains, and the water soaks into the earth, thereby increasing the damp.

4th. Having no drainage the miskins and privies are so constructed that they can only be emptied from the top, and the contents carted away; my own house slops and water closets drain into a closed cesspool.

5th. The soil about this part is a stiff clay, and a great portion of the surface has been disturbed in brickmaking; in some cases where the miskins are made near the wells they have drained in and tainted the water, as I know to be the case from the cottagers having occasionally applied to me for pure water from my well.

6th. I have in my brewery-yard stabling for eight horses, manure and pig-yards, the construction of which I am waiting to alter in conformity to any general plan that may be adopted for the public good.

7th. The streets in this part of the town are in a filthy condition generally, in consequence of there being no scavengers employed to sweep and keep them clean.

35. In other parts of the town the nuisances are greater and more frequent, but with one or two exceptions the soil is absorbent, and fever less constantly prevalent. *Russell and other courts in Ely street, Mere-street, Greenhill-street, Waterside, Scholar's-lane, Garden-row, Chapel-street,* and *Sheep-street,* especially its north side, are very bad. They all contain privies common to many houses, open cesspools, muck-heaps, and gutter-grates, giving off offensive smells, and the floors are in many cases damp, and the ways mostly ill paved. Of these, *Scholar's-lane* and *Garden-row, Russell-court* and *Ely-street,* towards one of which the ground falls and conducts the water into the houses, were specially brought under my notice as fever localities.

36. Beyond the grammar-school privies frequented by 30 to 40 boys, overhang an open cesspool placed about 20 yards from the front door and bedroom windows of the vicarage; the alms-houses, though at a level far above the river, are damp, and the floor of one tenement has recently been flooded. In some of the first-class houses, standing on high ground, the cellars are liable to be flooded by springs. Between two of the best houses in the town I found one of its most flagrant and offensive nuisances. At the National school, a new, well-built, and well-arranged building in an airy situation, the privies discharge into an open cesspool.

37. The Union-house, including the poor of 36 parishes, stands just outside and above the town on its west side, in an excellent position, fairly drained and supplied with spring and rain-water from wells and tanks by forcing and lifting pumps on the premises. The arrangements of this Union appear to be very good, and its cleanly condition is deserving of high praise.

38. The following table exhibits the number of cases of zymotic disease occurring in the streets and lanes of the town

in the years 1845, 1846, and 1847. The data are furnished by Dr. Thomson.

Names of Streets, &c.	Number of Houses.	Per Centage of Cases upon Population, taken at 5 per House.
Shakespeare-street and Victoria-terrace	80	27·2
Chapel-lane	12	18·3
Bull-lane	45	16·4
Windsor-street	35	14·8
Scholars'-lane and Garden-row	41	14·0
Mere-street	38	13·2
College-lane	31	12·9
Guild-pits	16	12·5
Brewery-street and Milton-row	24	12·5
Rother-street	38	12·1
Ely-street and Russell-court	79	11·1
Greenhill-street	42	8·8
Shakespeare-row	14	8·5
Sheep-street	66	7·8
Water-side	60	7·0
College-street	22	6·3
St. William-street and Summer-row	70	5·4
Bridge-street	44	3·6
Church-street	62	3·2
Henley-street	66	3·0
Ryland-street	34	2·9
Birmingham-road, Clopton, and Pound-lane	55	2·5
Wood-street	54	1·8
High-street	38	1·0
Houses included in the statement	1,066	Average per 100 9·3

This statement, which I have received and worked out since the completion of the inspection, shows very sufficiently the connexion between damp and filth and diseases of the zymotic class.

39. Sewerage and Surface Drainage.—The town of Stratford is deficient in sewerage, and the want was complained of to me by all parties as a very serious evil. There are no maps, sections, or records of any kind, showing the course, fall, or area of any public drains that have been constructed. Their utter insufficiency was strongly pointed out to me by Mr. Lane, whose local experience as surveyor of highways is very considerable. Their very small extent is the less to be regretted that they are generally admitted to be fitted only for surface drainage, no sewer being laid at a depth sufficient to drain a cellar. The shallow drains however are allowed to receive a portion of the overflow from various cesspools, the direct consequence of which is the ascent of offensive effluvia through the gutter grates, affecting the health and comfort of those who live near to them. A butcher's shop in

New Town may be mentioned as being thus materially injured.

40. The town much needs *sub-soil drainage*, owing to the strength of the land springs in its gravelly soil. In some of the streets the gardens slope towards the houses and render them permanently damp.

41. There is no such thing as *house drainage*, good or bad, in the town, and it was stated to me that but very few of the houses contain water-closets.

42. The contents of the cesspools are disposed of by private arrangements. They are emptied by the persons who purchase the manure, and who mix it with lime and ashes, and cart it upon the land. A good load of four tons, half soil and half ashes, sells for 10*s*. to 14*s*. It is used chiefly, but not exclusively, on arable land, and the supply is by no means equal to the demand.

43. Water Supply.—Stratford is supplied with water by pumps and by rain. The pump water (with one or two exceptions) is too hard for washing: what is called the town pump yields water of 64° of hardness. It is plentiful, and the wells are not above 10 to 15 feet deep. The wells are usually very near to the cesspools and are occasionally tainted by them.

44. The rain-water, where the roof is good and the people thrifty, is collected by eaves gutters, and shoots, and stored sometimes in butts and tubs, sometimes in cisterns and underground tanks, fitted with a pump and costing from 10*l*. to 20*l*. When this source fails the people near the canal use its water, which though very dirty, is somewhat softer than the water of the river. It is of 16° of hardness.

45. From its distance from the greater part of the town and its inferiority to the canal water in softness, the river water is but little used. Its quality of course is variable, a sample taken during my visit is of 22° of hardness.

46. Paving.—The town can scarcely be said to be paved at all. It includes above 1800 yards run of carriage way, much of which is in very indifferent order. The unmetalled ways in wet weather are deep in mud and scarcely passable in a wheeled vehicle.

47. The paved or pitched roads are badly laid upon an insufficient bed, and, in consequence, are full of holes, and in a most discreditable state. The footways include about 21,550 yards run, of which 1830 yards are pitched very imperfectly, having a mere pebble edging; 11,400 yards are gravelled only; 3,500 yards are pebble pitched; and 4,820 yards are paved with Wilmcote lias flagging. Some of this flagging is of good quality and sufficiently durable, and may be supplied from the immediate neighbourhood at a moderate price, but

as each man is left to pave in front of his own house after any manner that pleases him best, a cheap and inferior flagstone has been much used. This contains clay, wears rapidly, splits up under weather, and forms a series of mud traps in the street.

48. Even those inhabitants of Stratford, who are least disposed to admit the want of an improved water supply, unite in condemning the present state of the highways of the town. The surveyor's account for the whole parish shows an annual expenditure of about 280*l.*, and of this about 180*l.* is calculated to be expended upon the town roads. The sums spent in paving the footways, being borne by individuals, are of course not known.

49. The cattle markets are held in the public streets, and after each market it is absolutely necessary to sweep the streets, and these appear to be the only occasions on which they are swept. These markets are well known to produce an injurious effect upon the surface of the road.

50. About 70*l.* per annum is paid by the Surveyors of the Highways in day labour, a part of which is employed in scavenging the main streets, but the bye-streets, being beyond the reach of the markets, do not appear to be cleansed at all. A small extent of street is watered inefficiently in the summer.

51. Gas.—There is a Gas Company here with works, but the town is very badly lighted, which may be accounted for by the fact that the charge for gas is 10*s.* per 1000 cubic feet. The Gas Company receive annually from the Corporation 156*l.* for lighting the public lamps. Of this sum 100*l.* is derived from the proceeds of some common land formerly sold to the Stratford Canal. The period of lighting is complained of as short, and the number of lighted lamps very scanty. The price charged is of course fatal to the general introduction of the gas into private houses. It is much to be regretted that the powers of the Act do not enable the local Board to establish gas works, and let them to proper contractors.

52. The Public Nuisances are numerous. They consist of piggeries, public cesspools and muck heaps, and slaughter-houses, of which there are seven within the town in regular use. Some of these are in a very bad state; connected with one was a large open pit, below the privy, and in a very offensive state, and close to it a large piggery, in which the animals were fed on blood and offal. The next house was a seat of fever.

53. One of these establishments was brought under my notice by a circular from the neighbours complaining "that the furnace for boiling putrid meat, blood-cistern, or pig-wash cesspool, slaughter house, piggery, and manure-hole, are at various times, and more particularly in the heat of the summer,

great annoyances, and very injurious to our healths." Another had recently been presented as a nuisance, and when I visited the spot, the premises were strewed with lime, and various temporary expedients had been adopted, no doubt in expectation of my visit.

54. There are eight cattle fairs annually held in the streets, at each of which are said to be collected an average of 1000 sheep and 100 head of cattle. These are no doubt a source of profit to the town, though they pay no tolls and injure the roads; but in their present position they are a nuisance, and most unnecessarily so. All that is necessary is to provide for these a proper paved market in the immediate verge of the town, instead of in its streets, an arrangement which would tend greatly to increase the profits derived from them.

55. Burial Grounds.—The Wesleyans have a small strip of ground attached to their chapel, in which they now and then bury. The Independents bury in vaults attached to their chapel. With these inconsiderable exceptions the people of Stratford bury in the parish churchyard, an old ground enclosing 2A. 0R. 5P. exclusive of the church. The insufficiency of this space is much complained of. It is very full, and the average of burials for the past seven years has been 121$\frac{4}{7}$. The officiating clergyman states most truly, that "If any epidemic were to rage in the parish, and increase the number of burials to between 200 and 300, there would be great difficulty in finding a sufficient space of ground in the churchyard, without encroaching upon newly made graves." It will be incumbent upon the local Board, at an early period after its constitution, to procure a proper site for a cemetery outside the town.

56. Boundaries.—The borough, the adjacent part of the parish of Old Stratford, and a cluster of houses called Bridge Town, in the parish of Alveston, should all be included in the proposed administrative area. This proposed boundary is shown in the general plan appended.

57. Remedies:—Water Supply.—The population of Stratford Town, including Bridge End, may be taken at 5,000 persons residing in 1,130 houses. The town contains but one steam-engine, no manufactories, and few great consumers, so that an average supply of 3 cubic feet, or 18$\frac{3}{4}$ gallons per head per diem, will be ample for all purposes within doors or without. This equals a daily supply of 15,000 cubic feet, or for 120 days, of 1,800,000 cubic feet.

58. There are three sources whence this supply could probably be drawn; the Ingon Lane Brook, the Avon, and the Shottery Brook.

59. The *Ingon Lane Brook* drains a moderate area, wholly of red marle, and falls into the Avon about two miles above Stratford. The disposition of the ground is such that it would be difficult to preserve the level so as to distribute it by natural pressure in the town. This source, however, requires further examination.

60. The *Avon Water* is reputed hard. It was of 22° of hardness at my visit, and is no doubt much harder in dry seasons. Nor is this evil counterbalanced by any remarkable cleanliness in the Avon water, or by any mechanical advantages attending its distribution.

61. The *Shottery Brook* drains the area which appears to me to hold out the greatest advantages as a gathering ground for the supply of soft water. It includes upwards of four square miles of country, partly red marle, but chiefly lias, and its present drainage passes by the village of Shottery to reach the Avon a mile below Stratford. The area is so arranged that it would be easy to select any division of it that might yield the softest water, and to pass the remainder into the river, and the waters, wholly or in part, admit of being led by natural fall, to a point, suited for a reservoir, below and on the verge of the town of Stratford.

62. The Shottery Brook at present, according to a sample taken below the village, is of 31° of hardness; this is a very objectionable quality, but the canal, fed wholly from surface water in the same quarter is of only 16°, and upon examining the various sources of the Shottery Brook it is evident that by cutting off some of the springs the water could be much improved, and probably brought down to a very fair soft water. The examination and analysis of the various tributaries to this brook must occupy the early attention of the local Board.

63. The estimate is constructed on the assumption that the Shottery water will be employed; that a reservoir will be formed below the town, near the Avon, and that the daily supply will thence be pumped up by steam power to a service reservoir upon the high ground, near the Union, so arranged as to command the town, which will be supplied directly from it.

64. Not only is the position below the town the most convenient for a storage reservoir, but the engine might there be employed in pumping up and distributing over the meadows below, the sewage manure brought down by the main outfalls, as pointed out under the next head.

65. The subsoil below and about the Church Farm is a deep and extensive bed of gravel excellently suited for the purposes of filtration.

66. Sewerage.—No provision is required for the drainage of other than the town area. The higher ground to the north

is drained by the canal into the river, and the western lands fall slightly from the town.

67. The town area, for the purposes of sewerage, may be divided into two parts: the upper north-western, or larger portion, which it is possible to drain by an easy slope into an outfall below the mill tail; and the lower portion, which falls naturally east, and at once into the river considerably above the weir, and the efficient drainage of which will require considerable management.

68. By thus dividing the sewers of the upper and lower town levels, the upper sewage which now floods the lower drains will be removed at once, and the lower will be relieved of everything save the drainage of their own immediate district.

69. With reference to a part of this lower drainage, the fall is quite sufficient; but in its lowest part, that of the street known as the "Water-side," facing the river, with cellars in many of the houses, and within reach of the river-floods, the difficulty of securing a proper fall is very considerable. It will be absolutely necessary, in draining this street, to lay the drain at one uniform fall from the bridge foot to the level of the tail-race below the mill, and this will involve, at one point, a deep cutting.

70. The whole of the main drains of the town would thus be brought together upon a point considerably below the mill, and not far from the river, into which the surplus sewage, not employed in agriculture, would flow. The advantages of this concentration will be found to be considerable.

71. By increasing the number of main sewers the chance of flooding any one will be diminished, and the dimensions of each will be so reduced as to bring the whole within the compass of ordinary clay-drain tubes.

72. A few of the best of the present drains may be used to remove surface waters; but these, as far as possible, must be led, not into the sewers, but direct into the river at each nearest point.

73. A system of subsoil drainage, to some considerable extent, will be necessary, and may be cheaply effected by drain-tiles, laid down in the usual way.

74. House Drainage.—When the main sewers are once settled and laid down, a proper house drainage will be an easy measure. The houses of the poor are of one story only; and a 2-inch tube in the ground-floor and yard, and a drain from each water-closet, will be all that will be required.

75. Sewage Distribution.—By the arrangements above pointed out the sewage will be delivered at a point below the town, near the river, and upon the water meadows. This is

the best possible place to which it could be brought, had the object of the whole arrangement been its distribution.

76. From hence, with a lift from the steam-engine of 20 to 30 feet, a pipe a mile in length will command the conflux of the Stour and the Avon, and a considerable tract of meadow land along its course and at its termination. Should the pipe be carried further down the course of the Avon, the same lift with the natural fall will be sufficient.

77. It will, however, probably be found more economical to give the nearer but higher lands the benefit of the manure, for which purpose the engine power must be employed to lift the sewage to a tank about 40 feet above the river, whence the pressure would be sufficient to ensure its convenient distribution, but not at all too great to prevent the use of a clay main.

78. There can be no doubt that this manure will be extensively taken advantage of, and will become a source of revenue to the town. At this very time the town refuse is sold by the inhabitants, and carted off by the farmers at an expense which, before it is spread upon the land, cannot amount to less than 3*s*. to 4*s*. per ton. It is to be observed also, that this refuse, with much soil and stable and other valuable manures, contains much dry and valueless rubbish.

79. The farmers have no experience in the use of these manures in a fluid state, for which reason I have taken no credit, in my estimate, for the sale of the sewage.

80. Income.—It appears from a return furnished to me by Mr. Hobbes, that the borough and parish contain 1,256 houses, whose gross estimated rental is 15,115*l*. When the hamlets are deducted from, and the houses of Bridge End added to these numbers, the result will leave about 1150 houses with a rental of about 13,800*l*.

81. General Observations.—I find that, upon an income stated as above, it will be perfectly possible, for a rate of 1*s*. in the pound, stopping at rentals of 40*l*., to lay down a system of main and branch sewers, including proper outfalls, and including also a branch-pipe-drain up each court into each house and to each privy: the whole to be properly trapped and fitted with proper sinks and gratings. Also, in the same sum is included a constant supply of water, always on, in each house and at each privy, including a proper storage reservoir, steam-engine, service reservoir, main and branch-pipes, and service pipes into each house, corresponding to the house-drains, in my estimate 2,400*l*. being allowed specially for sewers and house drainage. By these means alone will it be possible to keep in order the house-drains, the most important

parts of the system, and which it is clear cannot be reached by any general flushing arrangements, which must be confined to the main drains

82. Having stated fully what the 1*s.* rate will provide, I have also to state that, if it be thought more equitable by the local Board that the expenses of the house and court-drains and water-pipes be borne by the owners of houses, the general rate will be reduced to about 9*d.* in the pound. This sum is calculated to pay the whole outlay upon the works, principal and interest (at 5 per cent.), in equal annual payments, in 30 years. So soon as detailed plans and sections shall be prepared I believe I shall be able to prove that the works may be executed within this rate, but until these data are afforded I am of course unable to state more definitely the particulars of the outlay required.

83. The above, or any other expenses in repaving the courts, repairing privies, &c., borne by the owners of house property, it will be optional with them, upon consent of the General Board, either to pay off at once, or to convert into an annual rate, remaining for 30 years upon the property; so that, for example, should the cost of draining and repaving, &c., a court amount to 2*l.* per house, this may be paid off at once, or converted into a rate of one halfpenny per week or 2*s.* 5*d.* per annum, payable during 30 years.

84. The above estimated income upon the 9*d.* or the 1*s.* rate has been taken upon houses only. It should be borne in mind that the local Board, in the actual levying of the rate, will divide it between house property and land: the former being assessable for water, when supplied, and for sewage; the latter for sewage only, and that in the proportion of but one-fourth of the levy upon houses.

85. The water supply will extend to cleansing and watering the streets and footways, will be of a pressure to command the roofs of the houses, and will be available within reach of each house by a plug in case of fire.

86. The precise source of the water supply I regard, as already stated, as not finally decided upon. The estimate is calculated for what may be taken as the case of maximum expenditure, more expensive than if the water were taken from the river and filtered. Any alteration in the source or method of supply that may result from a more protracted examination, can only lead to a reduction in the cost or an improvement in the quality of the water supplied.

87. The Local Board will be composed of the Corporation.

88. In conclusion, I have to state:—

1. That the mortality in Stratford-upon-Avon is unusually

high for a town of its size and position, and above one-third higher than that of the registration district.

2. That this mortality and the sickness which it represents are the cause of heavy expense to the town; direct, in out-of-door relief, amounting in the past year to 1,592*l.*, great part of which is expended on local sickness; and indirect, in the increase of pauperism and the support of the families of many of those who die prematurely.

3. That this mortality occurs notwithstanding that the position of Stratford is good, its population neither very great nor very densely crowded, and its main streets admit a fair proportion of sun and wind. It may be distinctly traced in the worst case to that quarter of the town which, being like the rest, undrained, rests upon clay and is below the canal level; but throughout the town it is found in connexion with damp, want of drainage, imperfect water supply, roads ill-paved or unpaved, foul open cesspools, and a very insufficient number of necessaries, in no case any distinction for the two sexes being preserved.

4. That the town is insufficiently and expensively lighted.

5. That a proper burial-ground or cemetery is much needed.

6. That cesspools or open receptacles for filth and moisture may be filled up, the houses and yards drained, and a constant supply of water may be laid on to each house, for a public annual rate of 9*d.* and a private rate of 3*d.* in the pound, amounting altogether to about 1*d.* per week upon the lowest class of houses; and that if these remedies be applied, and a proper number of water-closets constructed, there is strong reason to believe that Stratford will become very nearly if not quite as healthy as other parts of the registration district.

7. That the expenditure recommended will be in reduction of existing charges.

8. That, although in this estimate no credit is taken for the use of the town sewage as liquid manure, the circumstances of the suburban lands are highly favourable to its employment in this way economically, and it may confidently be regarded as a future but by no means remote source of revenue.

I have the honour to be,
My Lords and Gentlemen,
Your obedient Servant,
GEO. T. CLARK,

The General Board of Health,
&c. &c. &c.

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STRATFORD UPON AVON.



---------- Proposed Administrative Area

30. p. 80
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