Dr. Parson's report to the local government board on the prevalence of typhoid fever in the borough of Haverfordwest, and on the general sanitary condition of the borough.

Dr. Parsons's Report to the Local Government Board on the prevalence of Typhoid Fever in the borough of Haverfordwest, and on the general Sanitary Condition of the Borough.

George Buchanan,
Medical Department,
April 15, 1881.

Haverfordwest, the county town of Pembrokeshire, is situated on the West Cleddau river at the point where it commences to be tidal some 5 or 6 miles above its junction with the East Cleddau at the head of Milford Haven. A few coasting vessels of small tonnage ascend the river to Haverfordwest as far as the lower bridge. The river divides the town into two portions, connected however by two bridges. The portion on the north-east or left bank of the river, and comprising the suburbs of Cartlett and Prendergast, is comparatively small. The mainpart of the town lies to the south-west of the river, occupying a steep site, with a general slope to the N.E., but cut into at right angles by the valleys of two or three small streams. The castle stands on a bold projection between the main valley and two of the subsidiary valleys. The geological formation is the Lower Llandovery rock, a sandy shale or rubbly sandstone of Silurian age, locally termed "rab." The strata, which are highly inclined or vertical, are crossed by numerous joints and fissures, and abound in springs. At the sides and bottom of the valley the rock crops out on the surface, but on the plateau above the town it is covered by a bed of stiff clay, and a little further to the south-west is shown by the map of the Geological Survey to be capped by the millstone grit. The plan of the town is irregular, and in the central part the houses are very much crowded together, some having no open space whatever belonging to them, and many very little, and that surrounded by high buildings and capable of access only through the house. There are no manufactures: the inhabitants belong to the classes usually resident in the county and market town of an agricultural district. The population of the borough was 6,622 in 1871, and is not likely to have increased since then. The area of the borough is 1,700 acres; it comprises portions of 6 different parishes, other portions of which are outside the borough limits. It forms a part only of the Haverfordwest registration sub-district, in the district of the same name. Hence statistics of births and deaths in the borough cannot be obtained from the Registrar General's returns, and there are no local sources of information available.

Typhoid Fever.—It is stated that before the epidemic which forms the subject of the present report typhoid fever had not often been prevalent in Haverfordwest. The returns of the Registrar General show, however, that in the Haverfordwest sub-district, with a population of 11,408, 58 deaths from "fever" occurred in the 10 years 1870–9, and it is probable that the borough of Haverfordwest, in which more than half of the inhabitants of the sub-district reside, bore its share of this mortality. An outbreak of typhoid fever in the borough of Haverfordwest, causing 7 deaths, occurred in 1871 and 1872, and occasioned some correspondence between the Local Government Board and the Town Council. Little light however was thrown upon the causes of the outbreak. Another outbreak occurred in the winter of 1874–75. During the first three quarters of 1879 there were no deaths from fever in the sub-district, but in the last quarter of that year 4 deaths occurred, two of which were in the urban district, and in the first quarter of 1880, 3 deaths, one of them in the urban district. Altogether 7 cases of fever were heard of as having occurred in the urban district in the winter of 1879–80. The two earliest of these occurred in separate localities, and were apparently unconnected with any other cases, or with each other. One was a boy who had not long come into the district; another, a revenue officer, whose duties frequently took him to other towns and villages in the neighbourhood, in which fever had been prevalent for some time previously. Of the other cases 4 occurred at Albert Town, an outlying row of cottages in an elevated open situation about a mile and a half west of the town. The first of the cases at Albert Town had come home ill from a place in the rural district: the others had probably visited at the house when he was sick. These cottages are small and somewhat overcrowded. They have no drainage,

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stagnant water lying in pools around them, and there are heaps of refuse at hand on which excreta are thrown: water is obtained from a well at some little distance. The remaining case occurred in Bridge Street, in the lower part of the town. Two of the cases at Albert Town were fatal, and the last recovered about February or March 1880. From that time the town continued, so far as could be learned, free from fever for nearly 6 months.

In the beginning of August several cases of typhoid fever commenced nearly simultaneously in different parts of the town, and it soon attained a widespread prevalence. Of the origin of the outbreak I can give no explanation; the earliest of the cases, so far as dates could be obtained, lived in widely separated localities, in some instances unconnected with the town sewers or water service, and no direct communication between them or common cause can now be discovered. Sanitary defects indeed existed at the houses in which they occurred, but similar defects are to be found at only too many of the houses in Haverfordwest. To account satisfactorily for the occurrence of the earlier cases it should be shown how these particular patients came about the same time to be exposed to the specific poison of the disease. I am unable to do this, or to point out the means by which the typhoid poison (supposing the town to have been free from it before, which is by no means certain) may have been introduced. The first case was the son of a sergeant of militia, and several cases later on occurred in the families of the militia staff: but the militia, who assemble in Haverfordwest for drill, were disbanded in May, 3 months before the outbreak occurred. There are other occasions on which the town would be visited by persons from various parts of the county, *e.g.* the yeomanry drill in June, and the Assizes in July; but I have no evidence to show that fever was introduced by such persons. Inquiries were made as to whether manure from Albert Town, infected by the excreta of the cases which occurred there during the previous winter, could have been spread over fields of which the drainage might have entered water used for drinking, but nothing definite could be ascertained. At the time when the fever commenced the weather was very hot and dry, the rainfall for the 12 months, October 1879 to October 1880, having been, as I am informed by Mr. Phillips, Surgeon, of Haverfordwest, 2½ inches less than in any other period of 12 months during the past 32 years.

The first case, so far as could be ascertained, was a boy who was taken ill on August 2nd; he lived in a cottage on the south-west outskirts of the town, but attended the Board Schools in Haverfordwest. The cottage is unconnected with the town sewers or water-service. Rainwater is usually used for drinking purposes, but during the dry weather it failed, and water was obtained from wells at neighbouring houses, or purchased at the door from a watercart. The watercart is supposed to have been generally filled from a stream at Merlin's Bridge, at the margin of the district on the road to Milford. This stream receives sewage from houses and privies, but there are several houses at Merlin's Bridge the inmates of which drink the stream water, and no cases of fever are known to have occurred there. In whatever way the boy contracted his disease, it is hardly possible that this case could have been the starting point of the epidemic, both from the isolated position of the house, and the rapid succession in which it was followed by others in divers parts of the town. It is more probable that the cases owed their origin to a common and widespread cause in operation at an earlier date, such as the contamination of the town sewers or water-service by infectious matters from some previous case, the nature of which escaped recognition, or which was not reported. The approximate dates of commencement of the cases occurring in August are as follows:—

August.	2nd.	9th.	10th.	11th.	18th.	20th.	21st.	23rd.	26th.	27th.	28th.	30th.	Indef.	Total.
Cases - -	1	2	1	1	1	2	1	2	1	1	1	1	2	17

All these occurred in different households. All the persons attacked but four drank water supplied from the Portfield reservoir, to be mentioned further on. Of the exceptions, one was the first case already mentioned; another (August 10th) drank water from a brook, obtained probably sometimes below the place at which the brook receives the contents of a

sewer, at that time (and possibly earlier) infected with the discharges of fever patients; a third (August 20th) from a private well, considered good; and the fourth (August 21st) drank town's water from the Fountain source. Most of them lived in houses drained into the branches of one trunk sewer which enters the river at the new bridge.

The number of cases which had come to the knowledge of the Medical Officer of Health up to the middle of December, when this inspection was made, is given in the following table:

Month.	New cases.	Fresh households attacked.
August	17	17
September	23	17
October	24	18
November	7	5
December	5	2
Not ascertained	12	1
Total	88	60

Seven cases had proved fatal, one of them after the patient's removal to her home in the Milford sub-district. The cause of death in the fatal cases was certified as "typhoid," or "enteric fever."

A noteworthy feature of the epidemic is the large number of female domestic servants attacked, 20 out of the 88 cases being persons belonging to this class. Female servants, from the nature of their duties, are especially exposed to exhalations from sinks and waterclosets, and the Medical Officer of Health considers that at Haverfordwest they are mostly in the habit of using water as a beverage.

Although it is not possible to say in what way typhoid fever came to be in Haverfordwest, it is not difficult to account for the disease spreading widely, if once it were introduced, since opportunities for the dissemination of the infection by the agency of sewer air and sewage-tainted water abound throughout the town. Badly made and foul sewers, defective and untrapped house drains, ill contrived waterclosets, large privy middens, and other depositories of filth poison the air in and around the dwelling-houses. The public water supply is, or has been till lately, liable to dangerous pollution, both at its source and in the course of its distribution, and has been shown, both by obvious physical characters, and by the results of chemical analysis to be seriously contaminated; and the shallow wells and other subsidiary sources are in no better case.

The several conditions above-mentioned will have to be spoken of more in detail.

Sewerage.—There are sewers in the principal streets; they are square in section or arched over with brick, the side walls are of rubble stone, and the bottom of bare earth or native rock. Some, which have plenty of fall, are nearly free from sediment, others of flatter gradient are said to contain much deposit. A few pipe sewers have lately been constructed. Some of the sewers have streams of water running through them, others can be flushed by valves from the water mains; others again have no special means of flushing. The only provision for ventilation is the roadside gullies, which are large, of rough construction, and untrapped. The sewers discharge into the tidal river, or into brooks which join it.

The principal outlet is at the new bridge, and is tidelocked for about an hour at each tide; the lowest reach of the sewer which discharges here (*i.e.*, that in Victoria Place) is said to have very little fall; offensive smells arising from it were complained of, and there have been cases of fever in the adjacent houses. Complaints are also made of the bad odours proceeding from street gullies in the higher parts of the town. The air of a sewer in Market Street, which the Surveyor had opened for me to see, was extremely offensive; the sewer had abundance of fall, and there was no deposit of any depth at the bottom, but the rough surface of the interior was coated with filth. Much refuse passes into the brooks from houses and privies on their banks, and they are in fact converted into sewers—in parts of their course open, in other parts covered in, but, except in the case of one culvert recently constructed, with bottoms merely of bare earth.

The house drains are in many cases constructed of rubble stone, and they commonly pass under the houses. Scullery sinks, and yard gullies close to the back doors, were in many instances found to be untrapped or inefficiently trapped. In few instances had ventilating shafts been provided for the house drains.

Excrement disposal is effected by waterclosets or privies. The houses of the better class have commonly waterclosets indoors. These are flushed from a cistern filled either by rainwater off the roof, or from the town service. Last summer, when the town water ran short and no rain fell, the waterclosets in some cases became offensive for want of sufficient flushing. In one house bad smells proceeded from the cistern, probably in consequence of the drying up of the water in the trap of the overflow pipe which passed direct to the drains; the first cases of fever were persons who slept in the bedroom next the cistern. Of the privies, some discharge into streams, others are placed directly over a sewer, so that the soil falls at once into the current of sewage, and the sewer air streams up through the seat. Several of the privies thus acting as sewer ventilators were in very close confined situations, and extremely offensive, and cases of fever (in one instance as many as six, one fatal) had occurred in the households using them.

Most of the privies, however, are in connexion with covered cesspits, or open middensteads; generally the latter. The middensteads are of very large size, and deeply excavated; the roof water is often directed into them, but they were rarely found wet owing to the readiness with which water soaks away into the porous "rab." The large size of the ashpits is said to be a matter of necessity, owing to the nature of the fuel in common use. This is a mixture of small coal and clay worked up into balls; it leaves a bulky red ash like burnt ballast, which accumulates in large quantities, and renders the contents of the middens of little manurial value. The privies and middens are commonly very close to dwelling-houses; many indeed abut on houses, some on the house to which they belong, others on a neighbour's. To many of the privies there are no means of access for removing the contents except through the house; indeed I have not met with any place in which a similar mode of excrement disposal is in vogue, where so many of the premises are thus circumstanced as Haverfordwest. To avoid the nuisance occasioned by carrying privy stuff through the house, it is a common practice, where there is any garden ground at the back, to bury it there. The Town Council do not undertake the removal of house refuse, and there is often a difficulty in getting farmers to take it, owing to its small value as manure; hence large accumulations are frequent.

As an extreme instance of the defects above mentioned, I cannot forbear quoting the case of a house with a corner shop in Market Street. The back yard is 10 feet square, surrounded by high buildings on all sides. The greater portion of its area is occupied by the privy and open middenstead, leaving only a passage to reach the former, which is situated at the farther corner of the yard abutting on a neighbour's house. The middenstead is of triangular form, 6 feet in length; it is close to the back door, being indeed partly under a projecting porch; it is very deep, and the rainwater from a large area of roof falls into it. When emptied, the contents have to be carried through the house and out at the front door. There is also in the yard an untrapped opening from which a current of offensive drain air streams up. Two cases of typhoid fever had occurred in this house.

Water Supply.—The public water supply of Haverfordwest is derived from two sources, the Fountain reservoir in the upper part of the town, and the Portfield reservoir about half a mile out of the town to the south-west. These two supplies are kept in great measure distinct, the lower part of the town being supplied chiefly with Fountain water, and the upper part, above the level to which the Fountain water will rise, wholly with Portfield water. The inhabitants know from which of the sources the water supplied to them comes, since the Fountain water is considerably harder than the Portfield water.

The present Fountain reservoir was constructed in 1869–70; it is of brick, arched over, and fed by springs in the Llandovery rock, or "rab." Near it is an old reservoir, now disused. Though these two reservoirs are not connected by pipes, it is stated that the water in them rises and falls together. The old reservoir is fed by a spring which issues from one side, and within a few feet of it, on the same side, runs an old square stone sewer, formerly draining a row of

cottages above. The sewage has lately been diverted into a new sewer constructed for the purpose, and the old one is to be done away with. Close to the Fountain reservoir is a row of cottages, Fountain Cottages, and abutting on the nearest of these, within 10 feet of the present reservoir, and above its level, there were until recently two privies. These have now been removed and re-erected about 30 feet from the reservoir on lower ground, where they discharge into an open ditch, through which a stream of water runs. On the other side of the new reservoir, on higher ground, is another row of cottages, Fountain Row, the nearest of which is 15 feet from the reservoir. With almost incredible carelessness, the drainage of 8 of these cottages has been taken by the Town Council into a cesspool under the floor of the house nearest the reservoir, and an overflow drain from it actually runs within 5 feet of the reservoir. A stream of dirty surface water from the yard in front of Fountain Row was observed by me to soak away into the ground close above the reservoir. The man who lives in the house next the reservoir, states that there was formerly a great nuisance from the cesspool under it, and that six years ago he lost two children in that house from diphtheria. After this the cover of the cesspool was securely cemented down, which prevented the bad smell coming up through the floor, though it still rises up from an untrapped grid in the yard behind, close to the back door. It was stated that the drainage was about to be diverted.

Dangerous as are the surroundings of the Fountain reservoir, there has been no special incidence of fever upon the parts of the town supplied by it. On the contrary, there have been more cases of fever in the parts of the town supplied with the Portfield water than in the lower parts which are supplied chiefly from the Fountain. Fortunately no cases of fever occurred in the houses near the Fountain reservoir; had the excreta of a fever case entered the privies and drains in such close proximity to it, the result might probably have been otherwise.

The Portfield reservoir, which was constructed in 1872, is situated in a small hollow about half a mile to the south-west of the town; it is dug out of the Llandovery rock, and is open, but surrounded by a low wall. Until lately it has been supplied with water from two sources, (*a*) springs at the bottom, and (*b*) land drainage, received through subsoil drains from pasture fields on two sides of the reservoir; but by the advice of the Medical Officer of Health the water from the latter source, which Professor Wanklyn's analyses had shown to be largely contaminated with organic matter, has been cut off from the reservoir, and diverted into a side channel. The water is not filtered before delivery.

The following table gives the results of Professor Wanklyn's analyses of several samples of the Haverfordwest town water:—

Date. 1880.	Source.	Grs. per gallon.		Pts. per million.		Remarks of Analyst.
		Solids.	Chlorine.	Free Ammonia.	Albuminoid Ammonia.	
Oct. 30	Town service (Portfield water from a tap in the town.)	6·0	2·2	·01	·16	Contaminated water.
Nov. 6	Dipped out of Portfield reservoir near principal spring.	8·5	2·1	·01	·08	Of fair average organic purity.
Nov. 18	Subsoil water from three principal inlets to Portfield reservoir, equal proportions from each.	—	2·2	·06	·40	These waters are bad. The organic matter is probably to a great extent vegetable, but it is far too much in amount.
Nov. 18	Portfield water from service pipe.	—	2·0	·01	·20	

It is evident, both from these analyses and from the numerous complaints which were met with during the inspection, that the Portfield water, as supplied to the town up to November, was of very unsatisfactory quality. I have not, however, been able to obtain any evidence that typhoid excreta had had access to it. At the time of my visit the fields draining into the reservoir on the north-west side were heavily manured with stable dung, among which was some house refuse; this had only recently been spread abroad, but had been lying on the ground in heaps for some months. The occupier of the ground, however, who lives in the lower part of the town, stated that the manure came only off his own premises, that no human excrement was mixed with it, as his privy discharged into the river, and that he had had no fever among his household. With reference to the fields on the other side, the Medical Officer of Health writes: "You asked me to let you know whether Thomas, who has fields adjoining the reservoir, ever manured his fields with human excreta. He did so in the middle of July last with the contents of his own closet only, mixed with 75 loads of ashes, but I think little if any water went into the reservoir from the inlet from his land except on one particular day in October, long after the fever had commenced. Green and John (other occupiers of land draining into the reservoir) manured their fields last winter with 300 loads, stable manure only, they say." The subsoil of these fields being clay, the drains are of necessity near the surface, and the water which passes into them is consequently the washings of the ground, only imperfectly filtered by its passage through the earth. A considerable proportion of the total supply seems to have been derived from these sub-soil drains. The Medical Officer of Health says, "The output of the springs at the bottom of the Portfield reservoir is about $2\frac{1}{2}$ inches per diem (30,000 gallons), but during a storm in November, from observations of mine, the water level in the reservoir rose from 2ft. 10in. on Saturday to 4ft. 4in. on Monday."

No cases of fever had occurred in Thomas's household for some years previously. It may be mentioned, however, that in the autumn of 1871, the present Medical Officer of Health attended three members of his family with typhoid, and in the spring of 1872, as before mentioned, an outbreak of typhoid fever occurred in the town. The fields adjoining the reservoir on one side were then, as now, in Thomas's occupation and much drainage water from them went into the reservoir, which at that time had only just been opened. Thomas states that he usually manures his fields about Christmas, but cannot remember when he did so that particular year.

The service of water from the Fountain reservoir is intermittent; that from the Portfield reservoir is in ordinary seasons constant, but during the dry summer of 1880 (from April 12th) the supply was intermittent, the water being turned on about 7 or 8 a.m. and shut off about 10-11 a.m. At the time of my inspection in December the supply was still intermittent, pending alteration to the reservoirs. The town being built on the side of a hill, the drawing off of water, or leakage from the lower part of the service, when the supply from above is shut off, must cause a vacuum in the upper part of the pipes, and an indraught of air through any orifice that may be open. The existence of this indraught was shown many times during the inspection. It is possible, nay almost certain, that during the intermission foul air will be sucked into the water pipes. In some instances, as I am informed, the water-mains intersect the sewers; the service pipes also to many houses are laid through the drain which runs beneath the house. No waterclosets, so far as is known, are flushed direct from the water-pipes, but there may be accidental openings at which sewer air or foul water may gain access to the pipes, and there is a serious danger that this may happen by means of the flushing valves. It has been previously mentioned that there are valves for flushing the sewers from the water mains; at these points the water-pipes are directly connected with the sewers, the valve being the only barrier between the two systems. The valves are underground, and access for the purpose of examining their condition can only be obtained by breaking up the street and opening the sewer. There are eight of these valves in different parts of the town; four of them were uncovered for me by the surveyor, and two out of the four, both connected with the Portfield supply, were found to be chronically leaky, and incapable of being effectually closed. On opening one of them, the first flow of water was thick and rusty, and air escaped with it; this air apparently must have been

drawn into the pipes from the sewer. The water, which first flows from taps when they are turned on after an intermission, is commonly thick and accompanied by a rush of air. In one case I noticed that the first water was clear, being that contained in the branch pipe; then followed an escape of air with a loud gurgling sound, and then water turbid with a brown sediment, which the microscope showed to consist of oxide of iron, carbonate of lime, and decaying vegetable matter; it contained also a small worm (Anguillula fluviatilis) which commonly inhabits damp moss. These matters, with the exception of the iron rust, probably came from the reservoir (Portfield). The fact of clear water escaping at first shows that the air in the pipes had probably been drawn into them by a different opening from that at which it made its exit. Some complaints were made that the first water after an intermission had an offensive smell, in one case compared to tar. I myself fancied that on one occasion I detected a slight flavour of carbolic acid.

The other sources of water in use in Haverfordwest are wells, springs, streams, &c. These are in use mostly in the highest parts of the town, above the level to which the Portfield water will rise, and in outlying places; there are, however, some wells in use even in the most densely populated parts of the town. The wells are mostly shallow excavations in the porous "rab" rock, and as there are commonly privies, defective drains, and other accumulations of filth within a short distance of them, the water which they yield cannot fail in many instances to be dangerously contaminated. The following are examples. The Lady Well is a shallow dipping well or spring by the side of a brook which has received the sewage of the Infirmary and Fever Wards; the water in the well is lower than that in the brook, from which it is separated only by a bed of gravel 3 feet wide. In Market Street, in the centre of the town, in a house were fever has occurred, water is obtained from a dipping well in the cellar; the water in this well was found by the medical officer of health to contain 14·3 grains of chlorine per gallon, the average proportion in wells in Haverfordwest being about 2·2 grains. The explanation of the excess in this particular well is that about 50 feet distant, on a higher level, is a cellar in which bacon is cured: this cellar is not drained, and any brine that may be spilled sinks into the rocky floor. There are large middens about the same distance from the well as this cellar, and it is likely enough that the soakings from them may also reach it. At a house in Bridge Street, the well, a shallow dipping well, is on a lower level than a large open privy midden, only 9 feet distant; both are excavated in the bare surface of the vertically-bedded rock; the partings of the beds running direct from one to the other. A young woman residing in this house was taken ill of fever in September, a fortnight after her return from Fishguard, whither she had been to see her sister who was ill, and two other cases subsequently occurred among persons in another house who drank the water of this well.

The water of the river and brooks is used by some persons who have no other sources available; it is obviously so polluted with sewage as to be unfit for dietetic purposes.

Classifying the cases of fever according to the source whence drinking water was obtained, I find that about 42 used the Portfield water. About 19 residing below the level of the Fountain reservoir were supplied chiefly from that source. Ten drew their supply sometimes from the town service, and sometimes from wells; 9 wholly from wells; 7 from brooks, the river, &c.; while one patient was said never to have drunk water in the raw state.

It is to be remarked that while the water supplied to the parts of the town above the level of the Fountain comes wholly from the Portfield reservoir, that supplied to the lower part of the town is not wholly from the Fountain. There are indeed distinct mains, but the two sets communicate by valves by means of which the Fountain mains can be, and occasionally are filled with Portfield water, and through which there is, as I am informed, a constant leakage.

It is not known how many of the houses in the town are supplied respectively from the Portfield and Fountain sources, but the numbers are probably not very unequal.

From the greater number of cases of fever which occurred among the consumers of the Portfield water, more especially at the commencement of the outbreak, it seems likely that the origin of the epidemic was in some way

connected with the condition of that water service, but what the nature of the connexion may have been, I am unable to say. There can be no doubt that the various unsanitary conditions existing in the town have conduced to the spreading of the disease, but how much of the result may be attributable to each of those conditions there are no means of ascertaining.

General Sanitary Condition.—Some streets on the borders of the town are unsewered, waste water being drained into cesspools, or running down the road gutters. The old cottages are small and ill-ventilated, the bedrooms in some cases being low garrets lighted only by skylights, which will not open. Some are very dilapidated and others are overcrowded. Thus in one case a family of 8 persons had but a single room of 1,188 cubic feet capacity for all purposes; at the time of my visit one of the children had suffered from typhoid fever for three weeks, and another was just taken ill, apparently with the same disease.

The yards and back premises are frequently ill-paved, ill-drained, and in a foul condition, from accumulation of animal manure and house refuse. Some houses are without privy accommodation.

There are twelve slaughter-houses in the town, most of which were visited by me. All were found very unsatisfactory as regards position, and most of them also as regards construction and cleanliness. They are in confined situations, abutting upon houses, and with no means of access for driving-in animals or removing garbage, except through the house or shop. The floor in several is rough and irregular, and some were found in a very dirty state. One, in other respects one of the best, served also as a privy, there being in one corner a seat with a hole leading directly into the sewer which ran underneath. In one, meat was hanging of a description which the owner would probably not have dared to expose in a public market where it would be likely to come under inspection. The question of providing a public slaughter-house has been several times brought before the Town Council, but has been on each occasion successfully opposed; it is still under consideration. Many pigs are kept in the town in connexion with the slaughter-houses and elsewhere. They are commonly kept in a very filthy state, and in close proximity to houses; in some cases almost indoors.

Sanitary Administration.—Sanitary business is transacted by the whole Town Council, who, as Urban Sanitary Authority, meet once a month.

The powers of the Commissioners under the Haverfordwest Improvement Act of 1835, are now vested in the Town Council. This Act includes certain provisions with respect to scavenging, emptying of privies, and cleansing of footways, and gives the Commissioners power to order the removal of any slaughter-house, hogstye, or other erection, if deemed a nuisance. No bye-laws have been made under the Public Health Act, 1875, or other general Act, except as regards common lodging houses, for the ordering of which a series of regulations received the sanction of the Home Secretary in 1861. Special Acts relating among other matters to the supply of water to the town were obtained by the Corporation in 1833 and 1868, the latter of which contains provisions for the protection of the water from waste or contamination.

The Town Council some years ago appointed Mr. William John, of Haverfordwest, their Medical Officer of Health, at a salary of £30. per annum, of which no part is repaid from the Parliamentary grant. His appointment is annual, and he was re-elected last in November 1880. He has not hitherto made an annual report. No returns of deaths have hitherto been furnished to him, although he has applied to the Town Council for them. He considers, however, that most of the cases of fever which have occurred in the town have come sooner or later to his knowledge. He makes frequent visits in his district, and has devoted much time and attention to following out the present outbreak of fever. I have to thank him for much valuable information and assistance.

The Superintendent of the borough police has hitherto acted as Inspector of Nuisances at an annual salary of £10. At the time of my visit his term of office had expired, and no new appointment had been made. Except that some new privies have been erected, the measures carried out for the removal of nuisances have been merely of a temporary character. No legal proceedings have been taken; the Town Clerk states that none have been necessary, as

the persons upon whom notices for the abatement of nuisances have been served have always attended to them. It is evident that the requirements of the Sanitary Authority in this respect have not been very stringent.

Recent Action of the Town Council.—On September 17th the Local Government Board wrote to the then Town Clerk asking for a report from the Medical Officer of Health respecting the number of cases which had occurred, which should also give information with reference to the purity of the water used for drinking, the drainage, and the method of excrement disposal. This request, although repeated, was not complied with until November 13th, when copies of the Medical Officer of Health's reports for the two previous quarters (*i.e.* before the outbreak of the fever) were sent, although he had on November 9th made a full report on the causes and extension of the fever.

The measures taken to check the epidemic fever have been as follows:—

On October 25th it was ordered by the Town Council that the water in both reservoirs should be run off, and the bottoms of the reservoirs cleaned. The surveyor states that he "found nothing offensive whatever in them, with the exception of about four inches of mud and a little gravel." The Portfield reservoir was emptied on October 27th for the purpose of being cleansed. After the cleansing of the reservoir, the water was again supplied to the town on November 8th. Subsequently, on November 30th, in consequence of the results of the analyses of the water, and by the advice of the Medical Officer of Health, the surface drainage was entirely diverted from the reservoir, which is now fed only by the springs at the bottom. The Fountain reservoir was also cleansed, and a sewer and privies in its neighbourhood removed. Another sewer near it is about to be diverted.

The sewer gratings, where offensive, have been flushed with water containing carbolic acid. Disinfection of the excreta and soiled clothes of the sick does not appear to have been often carried out, and no disinfectants were furnished for the purpose; it was stated, however, that it was the intention of the Sanitary Authority that disinfectants should be furnished to poor persons in cases where fever had occurred, and that it was through a misunderstanding that this had not been done.

There is at the Pembrokeshire Infirmary, at Haverfordwest, a detached building for infectious cases, containing two wards, one with three and the other with two beds; this, although in existence two years or more, has not been made use of until the present epidemic, since the commencement of which five cases have been admitted. Seeing that many of the persons who have suffered from fever have been servants and shop assistants, several of whom have been removed to other localities, it might have been thought that the accommodation at the Infirmary would have been more largely used.

At the request of the Town Clerk, and with the sanction of the Local Government Board, I attended the meeting of the Haverfordwest Town Council on December 17th. I pointed out to them the state of matters conducing to the spread of fever which I found existing in the town. I recommended—

That free use should be made of the fever wards at the Infirmary, for the isolation of such cases as had not proper lodging or accommodation where they resided.

That the evacuations and soiled linen of fever patients, and the drains of infected houses, should be disinfected under the directions of the medical officer of health, and that disinfectants should be furnished free of cost to persons who were unable to procure them.

That, where necessary, houses in which fever had occurred should be cleansed and fumigated when the illness was over, in the manner provided by Section 120 of the Public Health Act, 1875.

That children from infected households should not attend school except on medical advice to the effect that they might safely do so.

That returns of deaths in the district should be supplied to the medical officer of health for the purpose both of giving him information of fatal cases of infectious disease and of enabling him to fill up the tables in the annual report which, as having been re-appointed subsequently to March 1880, it will be his duty to make, and to transmit to the Local Government Board.

That a better system of excrement disposal should be adopted; that in the meantime, existing accumulations should be cleared away, and that the Town Council should either make byelaws for the frequent removal of excrement, or, preferably, should themselves undertake the duty. That the abatement of nuisances, pig-keeping and other, should receive due attention.

That the state of the town sewers and house drains should receive the consideration of the Town Council with a view to remedy existing defects, and that engineering advice should be obtained with a view of increasing the supply of water.

February 5th, 1881. H. FRANKLIN PARSONS.

Recommendations.

1. Existing sewers which are defective should be replaced by new ones of proper construction. Proper sewers should also be made where required in the parts of the district where none at present exist. The sewers should be provided with means of flushing, and with suitable means of ventilation by openings or shafts in safe positions.

2. House drains which are of defective construction should be taken up, and relaid with glazed socket pipes, or other suitable materials. They should be disconnected from the sewer by a trap, and furnished with openings for ventilation, according to the principles embodied in the Model Byelaws issued by the Local Government Board. The soil pipes of waterclosets should be ventilated by pipes of adequate diameter. Other pipes conveying waste water from a house should not pass directly into the house drain, but should end in the open air, so as to discharge towards a trapped gully.

3. The existing offensive midden-and cesspit-privies should be replaced by a better system. In view of the local circumstances, either waterclosets or some form of privy with movable receptacle in which the excreta are collected apart from the bulk of the dry ashes, will probably be found to answer best. For information as to the various systems which have been found to succeed in other places, the Sanitary Authority should consult the Report to the Local Government Board "On certain means of abating Excrement Nuisances in Towns and Villages"; they may also find it advantageous to visit places in which improved systems are in operation. The Sanitary Authority should themselves undertake or contract for the removal at regular and frequent intervals of privy contents and house refuse from premises in the town.

4. The Sanitary Authority should consider the advisability of making byelaws for the prevention of nuisances, and for the regulation of new streets and buildings, and of slaughter-houses, and in this connexion should consult the Model Byelaws issued by the Local Government Board.

5. The Authority should give earnest attention to the abatement and repression of the many grave nuisances existing in their district. To this end an Inspector of Nuisances should be appointed forthwith on such terms as will permit of his making frequent and systematic inspection of his district. Notices should be issued for the abatement of all nuisances that may be found to exist, and failing compliance, legal proceedings should be taken against the persons in default. The temporary abatement of a nuisance of a nature liable to recur should not be deemed sufficient, but the Authority should require such structural works to be executed as may be necessary

to prevent the recurrence of the nuisance. Houses that are unfit for habitation should be closed until they have been rendered fit for that purpose. Overcrowding should be repressed. The yards about houses should be paved and drained so as to allow the surface to be kept clean. Pigs or other animals should not be suffered to be kept so as to become a nuisance, and all manure should be frequently removed from the neighbourhood of houses.

6. The purity and sufficiency of the public water supply should continue to receive the attention of the Sanitary Authority. No direct communication between the water mains and the sewers should be permitted to remain. Additional sources of water should, if practicable, be secured, so as to enable a constant supply to be given. To this end the Sanitary Authority will do well to consult a competent engineer. Wells and other sources that may be found polluted should be closed, and a wholesome supply substituted.

7. The Sanitary Authority should diligently exercise, under the advice of their medical officer of health, the powers which they possess under the Public Health Act, 1875, for the prevention of infectious diseases.

8. The Sanitary Authority should make arrangements with the Registrar for the regular transmission to the Medical Officer of Health of returns of all deaths occurring within their district, and for furnishing immediate notice of all deaths from infectious disease.