

1) "The Cholera near Golden Square, and at Deptford" [ltr. to editor, Medical Times and Gazette 9 (1854): 321-22; number of 23 September]

(2) "Cholera in Golden Square." [MTG 9 (1854): 629; mtg of Epi Soc on Monday 4 Dec]

Sir,-- As soon as I became acquainted with the situation and extent of the late outbreak of cholera in **Broad-street, Golden Square**, and the adjoining street, I suspected some contamination of the water of the much frequented street-pump in Broad-street, near the end of Cambridge-street: but on examining the water, on the evening of the 3rd inst., I found so

On the Mode of Communication of Cholera
(MCC2; 1855)

The most terrible outbreak of cholera which ever occurred in this kingdom, is probably that which took place in Broad Street, Golden Square, and the adjoining streets, a few weeks ago. Within two hundred and fifty yards of the spot where Cambridge Street joins Broad Street, there were upwards of five hundred fatal attacks of cholera in ten days. The mortality in this limited area probably equals any that was ever caused in this country, even by the plague; and it was much more sudden, as the greater number of cases terminated in a few hours. The mortality would undoubtedly have been much greater had it not been for the flight of the population. Persons in furnished lodgings left first, then other lodgers went away, leaving their furniture to be sent for when they could meet with a place to put it in. Many houses were closed altogether, owing to the death of the proprietors; and, in a great number of instances, the tradesmen who remained had sent away their families: so that in less than six days from the commencement of the outbreak, the most afflicted streets were deserted by more than three-quarters of their inhabitants.

There were a few cases of cholera in the neighbourhood of Broad Street, Golden Square, in the latter part of August; and the so-called outbreak, which commenced in the night between the 31st August and the 1st September, was, as in all similar instances, only a violent increase of the malady. As soon as I became acquainted with the [38/39] situation and extent of **this irruption** of cholera, I suspected some contamination of the water of the much-frequented street-pump in Broad **Street**, near the end of Cambridge **Street**; but on examining the water, on the evening of the 3rd **September**, I found so little impurity in it of an organic nature, that I

Dr. Snow's Report
in
Report on the Cholera Outbreak in the Parish of St. James, Westminster during the Autumn of 1854
by
The Cholera Inquiry Committee (CIC)
July 1855

Having been requested by this Committee to draw up a Report on the water used in the locality so severely visited by Cholera, I beg to lay the following statement before you:--

The water supply of the district consists of that of the water companies and that of the street pumps. The sub-district of Golden Square is supplied by the Grand Junction Company, with water from the Thames, facing Brentford, at Kew, which is almost entirely freed from animal and vegetable impurities before it is distributed. The sub-district of Berwick Street is supplied by the New River Company; the division between the companies being exactly that between the two sub-districts of the parish just named. The remaining districts supplied by the Grand Junction Company have been remarkably free from Cholera, both during the present year and in 1849; and most of the districts supplied by the New River Company have also been lightly visited by the malady on [97/98] both occasions; there is, therefore, in my opinion, no reason to suppose that the water of either of these companies contributed to the late outbreak of Cholera. One circumstance which remarkably confirms this view is, that the outbreak commenced on the same day, and almost at the same hour, in both sub-districts; and if it were possible that any pollution of the water supply of the two companies could have taken place, we cannot suppose that it would have occurred at the same time, and at two adjoining spots, in two systems of pipes in which the supply is derived from such very different sources.

little impurity in it of an organic nature, that I hesitated to come to a conclusion. Further inquiry, however, showed me that there was no other circumstance or thing common to the circumscribed locality in which this sudden increase of cholera occurred, and not extending beyond this locality, except the water of the above pump. I found, moreover, that the water varied, during the next two days, in the amount of organic impurity it contained; and I concluded that, at the commencement of the outbreak, it might have been still more impure.

hesitated to come to a conclusion. Further inquiry, however, showed me that there was no other circumstance or agent common to the circumscribed locality in which this sudden increase of cholera occurred, and not extending beyond it, except the water of the above **mentioned** pump. I found, moreover, that the water varied, during the next two days, in the amount of organic impurity, **visible to the naked eye, on close inspection, in the form of small white, flocculent particles**; and I concluded that, at the commencement of the outbreak, it might possibly have been still more impure. . . .

[Following paras. come later in MCC2:] The water at the time of the cholera contained impurities of an organic nature, in the form of minute whitish flocculi, visible on close inspection to the naked eye, as I before stated [52].

Dr. Hassall, **who** was good enough to examine some of this water with the microscope, informed me that these particles had no organised structure, and that he thought they probably resulted from decomposition of other matter.

He found a great number of very minute oval animalcules in the water, which are of no importance, except as an additional proof that the

With respect to the pump wells, I found some impurities in the water of each of those which I examined in the first week of September, in the Golden Square district, except the one in Vigo Street. The water of the pumps in Broad Street, Warwick Street, and Bridle Lane, all contained impurities visible to the naked eye on close inspection, in the form of minute, whitish, flocculent particles.

The water of the pump in Marlborough Street contained a still larger quantity of organic impurities than the others, and most of the people in its neighbourhood avoided using the water, and sent to Broad Street. In my opinion, mere impurity in the water would not cause Cholera, unless it were of a special kind--unless, in fact, the impurity had proceeded from a Cholera patient. Dr. Lankester has, I believe, particularly examined [98/99] the water of the pump in Broad Street, which is situated in the centre of the area in which the mortality from Cholera occurred; and he will, no doubt, inform the Committee of the result of his researches. Dr. Hassall was good enough to examine some of this water, **at my request**, with the microscope, and he informed me that **the particles I have mentioned above** had no organized structure, and that he thought they probably resulted from the decomposition of other matter. He found a great number of very minute, oval animalculæ in the water, which are of no importance, except as an additional proof that the water contained organic

water contained organic matter on which they lived. The water also contained a large quantity of chlorides, indicating, no doubt, the impure sources from which the spring is supplied. Mr. Eley, **the percussion-cap manufacturer of 37 Broad Street**, informed me that he had long noticed that the water became offensive, both to the smell and taste, after it had been kept about two days. This, as I noticed before, is a character of water contaminated with sewage. Another person had noticed for months that a film formed on the surface of the water when it had been kept a few hours.

I inquired of many persons whether they had observed [52/53] any change in the character of the water, about the time of the outbreak of cholera, and was answered in the negative. I afterwards, however, met with the following important information on this point. Mr. Gould, the eminent ornithologist, lives near the pump in Broad Street, and was in the habit of drinking the water. He was out of town at the commencement of the outbreak of cholera, but came home on Saturday morning, 2nd September, and sent for some of the water almost immediately, when he was much surprised to find that it had an offensive smell, although perfectly transparent and fresh from the pump. He did not drink any of it. Mr. Gould's assistant, Mr. Prince, had his attention drawn to the water, and perceived its offensive smell. **A servant of Mr. Gould who drank the pump water daily, and drank a good deal of it on August 31st, was seized with cholera at an early hour on September 1st. She ultimately recovered.**

Whether the impurities of the water were derived from the sewers, the drains, or the cesspools, of which latter there are a number in the neighbourhood, I cannot tell. I have been informed by an eminent engineer, that whilst a cesspool in a

matter on which they lived. **I found that** the water also contained a large quantity of chlorides-- indicating, no doubt, the impure sources from which the spring is supplied. Mr. Eley of 38, Broad Street, informed me that he had long noticed that the water became offensive, both to the smell and taste, after it had been kept about two days. **A person, at 6, Poland Street, also informed that he** had noticed, for months, that a film formed on the surface of the water after it had been kept a few hours. **These are** characters of water which is contaminated with sewage.

I inquired of many persons whether they had observed any change in the character of the water about the time of the outbreak of Cholera, and was answered in the negative. I afterwards, however, met with the following important information on [99/100] this point;--Mr. Gould, the eminent ornithologist, lives near the pump in Broad Street, and was in the habit of drinking the water. He was out of town at the commencement of the outbreak of Cholera, but came home on Saturday morning, **the 2nd of September**, and sent for some of the water almost immediately, when he was much surprised to find that it had an offensive smell, although perfectly transparent, and fresh from the pump. **He drank scarcely** any of it. Mr. Gould's assistant, Mr. Prince, had his attention directed to the water, and perceived its offensive smell.

Whether the impurities of the water were derived from the sewers, the drains, or the cesspools, of which latter there are, I believe, a number in the neighbourhood, I cannot tell. I have been informed, by an eminent engineer, that whilst a cesspool in a clay soil requires to be emptied every six or eight months, one sunk in the gravel will often go for

I requested permission, therefore, to take a list at the General Register Office of the deaths from cholera registered during the week ending September 2, in the sub-districts of Golden-square, Berwick-street, and St. Ann's, Soho. Eighty-nine deaths from cholera were registered during the week, in the three sub-districts. Of these, only six occurred in the four first days of the week, four occurred on Thursday, the 31st ult., and the remaining seventy-nine on Friday and Saturday. I considered, therefore, that the outbreak commenced on the Thursday; and I made an inquiry, in detail, respecting the eighty-three deaths registered as having taken place during the last three days of the week.

On proceeding to the spot, I found that nearly all the deaths had taken place within a short distance of the pump. There were only ten deaths in houses situated decidedly nearer to another street pump. In five of these cases the families of the deceased persons informed me that they always sent to the pump in Broad-street, as they preferred the water to that of the pumps which were nearer. In three other cases the deceased were children who went to school near the pump in Broad-street. Two of them were known to drink the water, and the parents of the third think it probable that it did so. The other two deaths, beyond the district which this pump supplies, represent only the amount of mortality from cholera that was occurring before the eruption took place.

With regard to the deaths occurring in the locality belonging to the pump, there were 61 instances in which I was informed that the deceased persons

clay soil requires to be emptied every six or eight months, one sunk in the gravel will often go for twenty years without being emptied, owing to the soluble matters passing away into the land-springs by percolation [53].

I requested permission, therefore, to take a list, at the General Register Office, of the deaths from cholera, registered during the week ending 2nd September, in the subdistricts of Golden **Square**, Berwick **Street**, and St. Ann's, Soho, **which was kindly granted**. Eighty-nine deaths from cholera were registered, during the week, in the three subdistricts. Of these, only six occurred in the four first days of the week; four occurred on Thursday, the 31st **August**; and the remaining seventy-nine on Friday and Saturday. I considered, therefore, that the outbreak commenced on the Thursday; and I made inquiry, in detail, respecting the eighty-three deaths registered as having taken place during the last three days of the week.

On proceeding to the spot, I found that nearly all the deaths had taken place within a short distance of the pump. There were only ten deaths in houses situated decidedly nearer to another street pump. In five of these cases the families of the deceased persons informed me [39/40] that they always sent to the pump in Broad **Street**, as they preferred the water to that of the pump which was nearer. In three other cases, the deceased were children who went to school near the pump in Broad **Street**. Two of them were known to drink the water; and the parents of the third think it probable that it did so. The other two deaths, beyond the district which this pump supplies, represent only the amount of mortality from cholera that was occurring before the **irruption** took place.

With regard to the deaths occurring in the locality belonging to the pump, there were **sixty-one**

twenty years without being emptied, owing to the soluble matters passing away into the land-springs by percolation.

I requested permission, **on the 5th of September**, to take a list, at the General Register Office, of the deaths from **Cholera** registered during the week ending **the 2nd of September**, in the sub-districts of Golden Square, Berwick Street, **St. James's**, and St. **Anne's**, Soho, which was kindly granted. Eighty-nine deaths from Cholera were registered during the week, in the three sub-districts. Of [100/101] these only six occurred **on** the four first days of the week; four occurred on Thursday, the 31st **of August**; and the remaining **79** on Friday and Saturday. I considered, therefore, that the outbreak commenced on the Thursday; and I made an inquiry in detail respecting the **83** deaths registered as having taken place during the last three days of the week.

On proceeding to the spot, I found that nearly all the deaths had taken place within a short distance of the pump. There were only ten deaths in houses situated decidedly nearer to another **street-pump**. In five of these cases, the families of the deceased persons informed me that they always sent to the pump in Broad Street, as they preferred the water to that of the pumps which were nearer. In three other cases, the deceased were children who went to school near the pump in Broad Street. Two of them were known to drink the water, and the parents of the third think it probable that it did so. The other two deaths, beyond the district which this pump supplies, represent only the amount of mortality from Cholera that was occurring before the **eruption** took place.

With regard to the **73** deaths occurring in the locality belonging to the pump, there were **61** instances in which I was informed that the deceased

used to drink the pump water from Broad-street, either constantly or occasionally. In 6 instances I could get no information, owing to the death or departure of every one connected with the deceased individuals; and in 6 cases I was informed that the deceased persons did not drink the pump water before their illness.

The result of this inquiry, then, is, that there has been no particular outbreak or prevalence of cholera in this part of London except among the persons who were in the habit of drinking the water of the above-mentioned pump-well.

I had an interview with the Board of Guardians of St. James's parish, on the evening of the 7th inst., and represented the above circumstances to them. In consequence of what I said, the handle of the pump was removed on the following day. . . .

I have not thought it necessary to inquire into the very large number of deaths that occurred in the week ending Sept. 9, as I deem the above inquiry sufficient to establish the cause of the outbreak (1).

[JS realizes after writing this letter in the third week of September that there were 197 deaths in the Broad Street pump "catchment" and that he would have to make additional inquiries. Some appear to have been made at the end of September for MCC2, then again at the end of October, and, perhaps, late November/early December before drafting the report for CIC.]

instances in which I was informed that the deceased persons used to drink the pump-water from Broad **Street**, either constantly or occasionally. In **six** instances I could get no information, owing to the death or departure of every one connected with the deceased individuals; and in **six** cases I was informed that the deceased persons did not drink the pump-water before their illness.

The result of **the** inquiry then **was**, that there **had** been no particular outbreak or **increase** of cholera, in this part of London, except among the persons who were in the habit of drinking the water of the above-mentioned pump-well.

I had an interview with the Board of Guardians of St. James's parish, on the evening of **Thursday, 7th September**, and represented the above circumstances to them. In consequence of what I said, the handle of the pump was removed on the following day.

Besides the eighty-three deaths mentioned above as occurring on the three last days of the week ending September 2nd, and being registered during that week in the sub-districts in which the attacks occurred, a number of persons died in Middlesex and other hospitals, and a great number of deaths which took place in the [40/41] locality during the last two days of the week, were not registered till the week following. The deaths altogether, on the 1st and 2nd of September, which have been ascertained to belong to this outbreak of cholera, were one hundred and ninety-seven; and many persons who were attacked about the same time as these, died afterwards. I should have been glad to inquire respecting the use of the water from Broad Street pump in all these instances, but was engaged at the time in an inquiry in the south districts of London, **which will be alluded to afterwards**; and when I began to make fresh inquiries in the neighbourhood

persons used to drink the pump water from Broad Street, either constantly or [101/102] occasionally. In six instances I could get no information, owing to the death or departure of every one connected with the deceased individuals; and in six cases I was informed that the deceased persons did not drink the pump water before their illness.

The result of this inquiry **consequently** was, that there had been no particular outbreak or increase of Cholera in this part of London except among the persons who were in the habit of drinking the water of the above-mentioned **pump well**.

I had an interview with the Board of Guardians of St. James's parish on the evening of Thursday, 7th September, and represented the above circumstances to them. In consequence of what I said, the handle of the pump was removed on the following day.

Besides the **83** deaths mentioned above, as occurring on the last three last days of the week ending September 2nd, and being registered during that week in the sub-districts in which the attacks occurred, **there was** a number of persons **who** died in **the** Middlesex and other hospitals, and a great number of deaths which took place in the locality during the last two last days of the week, were not registered till the week following. The deaths altogether on the 1st and 2nd of September, which have been ascertained to belong to this outbreak of Cholera, were **197**, and many persons who were attacked about the same time as these, [102/103] died afterwards. I should have been glad to inquire respecting the use of the water from Broad Street pump in all these instances; but **I** was engaged at the time in an inquiry in the south districts of London; and when I began to make fresh inquiries in the neighbourhood of Golden Square, after two or three week had elapsed, I found that there had been such a distribution of the remaining population, that it

I have, however, inquired respecting a few deaths in that week, which took place a little further from the pump than the others; and I found that, in all the cases but one, the persons had been drinking water from that pump.

of Golden Square, after two or three weeks had elapsed, I found that there had been such a distribution of the remaining population that it would be impossible to arrive at a complete account of the circumstances. There is no reason to suppose, however, that a more extended inquiry would have yielded a different result from that which was obtained respecting the eighty-three deaths which happened to be registered within the district of the outbreak before the end of the week in which it occurred.

The additional facts that I have been able to ascertain are in accordance with those above related; and as regards the small number of those attacked, who were believed not to have drunk the water from Broad Street pump, it must be obvious that there are various ways in which the deceased persons may have taken it without the knowledge of their friends. The water was used for mixing with spirits in all the public houses around. It was used likewise at dining-rooms and coffee-shops. The keeper of a coffee-shop in the neighbourhood, which was frequented by mechanics, and where the pump-water was supplied at dinner time, informed me (on 6th September) that she was already aware of nine of her customers who [41/42] were dead. The pump-water was also sold in various little shops, with a teaspoonful of effervescing powder in it, under the name of **sherbet**; and it may have been distributed in various other ways with which I am unacquainted. The pump was frequented much more than is usual, even for a London pump in a populous neighbourhood.

There are certain circumstances bearing on the subject of this outbreak of cholera which require to be mentioned. The Workhouse in Poland Street is more than three-fourths surrounded by houses in which deaths from cholera occurred, yet out of five hundred and thirty-five inmates only five died of cholera, the other deaths which took place being

would be impossible to arrive at a complete account of the circumstances. There is no reason to suppose, however, that a more extended inquiry would have yielded a different result from that which was obtained respecting the **83** deaths which happened to be registered within the district of the outbreak, before the end of the week in which it **commenced**.

The additional facts that I have been able to ascertain, are in accordance with those above related; and as regards the small number of those attacked, who were believed not to have drunk the water from Broad Street pump, it must be obvious that there are various ways in which the deceased persons may have taken it without the knowledge of their friends. The water was used for mixing with spirits in some of the public houses around. It was used, likewise, at dining rooms and coffee shops. The keeper of a coffee shop which was frequented by mechanics, and where the pump water was supplied at dinner time, informed me on the 6th of September, that she was already aware [103/104] of nine of her customers who were **dead!** The water of this pump was also sold in various little shops with a tea-spoonful of effervescing powder in it, under the name of **sherbet**, and it may have been distributed in various other ways with which I am unacquainted. The pump was frequented much more than is usual, even for a London pump in a populous neighbourhood.

There are certain circumstances bearing **on the question** which **deserve** to be mentioned. The workhouse in Poland Street is more than three-fourths surrounded by houses in which deaths from Cholera occurred; **yet**, out of **535** inmates, only five died of Cholera--the other deaths which took place being those of persons admitted after they were attacked. The workhouse has a **pump** on the premises in addition to the supply from the Grand

those of persons admitted after they were attacked. The workhouse has a pump-well on the premises, in addition to the supply from the Grand Junction Water Works, and the inmates never sent to Broad Street for water. If the mortality in the workhouse had been equal to that in the streets immediately surrounding it on three sides, upwards of one hundred persons would have died.

There is a Brewery in Broad Street, near to the pump, and on perceiving that no brewer's men were registered as having died of cholera, I called on Mr. Huggins, the proprietor. He informed me that there were above seventy workmen employed in the brewery, and that none of them had suffered from cholera,—at least in a severe form,—only two having been indisposed, and that not seriously, at the time the disease prevailed. The men are allowed a certain quantity of malt liquor, and Mr. Huggins believes they do not drink water at all; and he is quite certain that the workmen never obtained water from the pump in the street. There is a deep well in the brewery, in addition to the New River water. [42/43]

At the percussion-cap manufactory, 37 Broad Street, where, I understand, about two hundred workpeople were employed, two tubs were kept on the premises always supplied with water from the pump in the street, for those to drink who wished; and eighteen of these workpeople died of cholera at their own homes, sixteen men and two women.

Mr. Marshall, surgeon, of Greek Street, was kind enough to inquire respecting seven workmen who had been employed in the manufactory of dentists' materials, at Nos. 8 and 9 Broad Street, and who died at their own homes. He learned that they were all in the habit of drinking water from the pump, generally drinking about **half-a-pint** once or twice a day; while two persons who reside constantly on the premises, but do not drink the pump-water, only had diarrhoea. Mr.

Junction Water Works, and the inmates never sent to Broad Street for water. If the mortality in the workhouse had been equal to that in the streets immediately surrounding it on three sides, upwards of **50 inmates** would have died.

There is a **brewery** in Broad Street near to the pump, and on perceiving that no brewer's men were registered as **being dead** of Cholera, I called on Mr. Huggins the proprietor. He informed me that there were above **70** workmen employed in the brewery, and that none of them had suffered from Cholera, **at least** in a severe form, **only** two having been indisposed, and that not seriously, [104/105] at the time the disease prevailed. The men are allowed a certain quantity of malt liquor, and Mr. Huggins believes they do not drink water at all, and he is quite certain that they never obtained water from the pump in the street. There is a deep well in the brewery in addition to the New River water.

At the wire cartridge and percussion cap manufactory, **38**, Broad Street, where I understand about **200 work people** were employed, two tubs were kept on the premises always supplied with water from the pump in the street for those to drink who wished, and 18 of those work people died of Cholera at their own houses--**sixteen women and two men**.

Mr. Peter Marshall, surgeon, **No. 53**, Greek Street, was kind enough to inquire respecting seven workmen, who had been employed in the manufacture of dentists' materials at Nos. 8 and 9, Broad Street, and who died at their own homes. He learned that they were all in the habit of drinking water from the pump, generally drinking about **half a pint** once or twice a day, while two persons who reside constantly on the premises, but do not drink the pump water, had only diarrhoea. Mr. P. Marshall also informed me of the case of an officer in the army who lived at St. John's Wood but came to dine

Mr. Marshall, surgeon, of Greek-street, was kind enough to inquire respecting seven workmen, who had been employed in the manufacture of dentists' materials at Nos. 8 and 9, Broad-street, and who died at their own homes. He learned that they were all in the habit of drinking water from the pump, generally drinking about half a pint once or twice **a-day**, while two persons who reside constantly on the premises, but do not drink the pump water, have only had diarrhoea (1).

Marshall also informed me of the case of an officer in the army, who lived at St. John's Wood, but came to dine in Wardour Street, where he drank the water from Broad Street pump at his dinner. He was attacked with cholera, and died in a few hours.

I am indebted to Mr. Marshall for the following cases, which are interesting as showing the period of incubation, which in these three cases was from thirty-six to forty-eight hours. Mrs. —, of 13 Bentinck Street, Berwick Street, aged 28, in the eighth month of pregnancy, went herself (although they were not usually water drinkers), on Sunday, 3rd September, to Broad Street pump for water. The family removed to Gravesend on the following day; and she was attacked with cholera on Tuesday morning at seven o'clock, and died of consecutive fever on 15th September, having been delivered. Two of her children drank also of the water, and were attacked on the same day as the mother, but recovered.[43/44]

Dr. Fraser, of Oakley Square, kindly informed me of the following circumstance. A gentleman in delicate health was sent for from Brighton to see his brother at 6 Poland Street, who was attacked with cholera and died in twelve hours, on 1st September. The gentleman arrived after his brother's death, and did not see the body. He only stayed about twenty minutes in the house, where he took a hasty and scanty luncheon of rumpsteak, taking with it a small tumbler of brandy and water, the water being from Broad Street pump. He went to Pentonville, and was attacked with cholera on the evening of the following day, 2nd September, and died the next evening.

Dr. Fraser also first called my attention to the following circumstances, which are perhaps the most conclusive of all in proving the connexion between the Broad Street pump and the outbreak of cholera. In the "Weekly Return of Births and

in Wardour Street, where he drank the water from Broad Street pump **at dinner**. He was attacked with Cholera and died in a few hours. [105/106]

Dr. Fraser of Oakley Square, **St. Pancras**, kindly informed me of the following circumstance:-- A gentleman in delicate health was sent for from Brighton to see his brother at No. 6, Poland Street, who was attacked with Cholera and died in twelve hours on the 1st of September. The gentleman arrived after his brother's death and did not see the body. He only **staid** about twenty minutes in the house, where he took a hasty and scanty luncheon of **rump steak**, taking with it a small tumbler of **cold** brandy and water, the water being from Broad Street pump. He went to Pentonville, and was attacked with Cholera on the evening of the following day, September the 2nd, and died the next evening.

The deaths of Mrs. E----- and her niece, who drank the water from Broad Street at West End, Hampstead, deserve especially to be noticed.

Deaths" of September 9th, the following death is recorded as occurring in the Hampstead district: "At West End, on 2nd September, the widow of a percussion-cap maker, aged 59 years, diarrhœa two hours, cholera epidemica sixteen hours."

I was informed by this lady's son that she had not been in the neighbourhood of Broad Street for many months. A cart went from Broad Street to West End every day, and it was the custom to take out a large bottle of the water from the pump in Broad Street, as she preferred it. The water was taken on Thursday, 31st August, and she drank of it in the evening, and also on Friday. She was seized with cholera on the evening of the latter day, and died on Saturday, **as the above quotation from the register shows.** A niece, who was on a visit to this lady, also drank of the water; she returned to her residence, **in** a high and healthy part of Islington, was attacked with cholera, and died also. There was no cholera at the time, [44/45] either at West End or in the neighbourhood where the niece died. Besides these two persons, only one servant partook of the water at Hampstead West End, and she did not suffer, or, at least, not severely. There were **many** persons who drank the water from Broad Street pump about the time of the outbreak, without being attacked with cholera; but this does not diminish the evidence respecting the influence of the water, for reasons that will be fully stated in another part of this work.

The deaths which occurred during this fatal outbreak of cholera are indicated in the accompanying *map*, as far as I could ascertain them. There are necessarily some deficiencies, for in a few of the instances of persons who died in the hospitals after their removal from the neighbourhood of Broad Street, the number of the house from which they had been removed was not registered. The address of those who died after their removal to St. James's Workhouse was not registered; and I was only able

Dr. Snow exhibited a *map*, showing the deaths from cholera in the different houses in the neighbourhood of Golden-square . . . the great centre of Mortality Dr. Snow stated to be the neighbourhood of Broad-street pump (2).

I was informed by **Mrs. E---**'s son that his mother had not been in the neighbourhood of Broad Street for many months. A cart went from Broad Street to West End every day, and it was the custom to take out a large bottle of the water from the pump in Broad Street as she preferred it. The water was taken out on Thursday **the 31st of August**, and she drank of it in the evening, and also on Friday. She was seized with Cholera on the evening of the latter day, and died on Saturday. A niece who was on a visit to this lady also drank of the water; she returned to her residence, a high [106/107] and healthy part of Islington, was attacked with Cholera and died also. There was **not** Cholera at the time, either at West End or in the neighbourhood where the niece died. Besides these two persons only one servant partook of the water at **West End, Hampstead**, and she did not suffer, or, at least, not severely. **She had diarrhœa.**

There were **some** persons who drank the water from Broad Street pump about the time of the outbreak without being attacked with Cholera, but this does not diminish the evidence respecting the influence of the water, **for various reasons.**

The deaths which occurred during **the** fatal outbreak of Cholera are indicated in the accompanying *map*, as far as I could ascertain them. There are necessarily some deficiencies, for in a few of the instances of persons who died in the hospitals after their removal from the neighbourhood of Broad Street, the **numbers** of the **houses** from which they had been removed **were** not registered. The address of those who died after their removal to St. James's Workhouse was not registered, and I was only able to obtain it in a part of the cases, on application at the Master's Office, for many of the persons were too ill, when admitted, to give any account of

A great number of work-people who were employed in and near Broad-street died of cholera at their own homes in other parts of London.

to obtain it, in a part of the cases, on application at the Master's Office, for many of the persons were too ill, when admitted, to give any account of themselves. In the case also of some of the **workpeople** and others who contracted the cholera in this neighbourhood, and died in different parts of London, the precise house from which they **had** removed is not stated in the return of deaths. I have heard of some persons who died in the country shortly after removing from the neighbourhood of Broad Street; and there must, no doubt, be several cases of this kind that I have not heard of. **Indeed, the full extent of the calamity will probably never be known.** The deficiencies I have mentioned, however, probably do not detract from the correctness of the map as a diagram of the topography of the outbreak; for, if the locality of the **few** additional cases could be ascertained, they would probably be **distri-**[45/46]**tributed** [sic] over the district of the outbreak in the same proportion as the large number which are known.

The dotted line on the map surrounds the sub-districts of Golden Square, **St. James's**, and Berwick Street, St. James's, together with the adjoining portion of the subdistrict of St. Anne, Soho, extending from Wardour Street to Dean Street, and a small part of the sub-district of St. James's Square enclosed by Marylebone Street, Titchfield Street, Great Windmill Street, and Brewer Street. All the deaths from cholera which were registered in the six weeks from 19th August to 30th September within this locality, as well as those of persons removed into Middlesex Hospital, are shown **in the map*** by a **black line** in the situation of the house in which it occurred, or in which the fatal attack was contracted.

(* The particulars of each death connected with this outbreak were published in the "Weekly Returns" of the Registrar General to 16th September, and I procured the remainder through the kindness of the

themselves. In the case also of some of the **work people** and others who contracted the cholera in this neighbourhood, and died in different parts of London, the precise house from which they removed is not [107/108] stated in the return of deaths. I have heard of some persons who died in the country shortly after removing from the neighbourhood of Broad Street and there must no doubt be several cases of this kind that I have not heard of. The deficiencies I have mentioned, however, probably do not detract from the correctness of the map, as a diagram of the topography of the outbreak; for, if the locality of the additional cases could be ascertained, they would probably be distributed over the district of the outbreak in the same proportion as the large number which are known.

The **outerdotted** line on the map surrounds the sub-districts of Golden Square and Berwick Street, St. James's, together with the adjoining portion of the subdistrict of St. **Anne's**, Soho, extending from Wardour Street to Dean Street, and a small part of the sub-district of St. James's Square enclosed by Marylebone Street, **Titchborne** Street, Great Windmill Street, and Brewer Street. All the deaths from Cholera which were registered in the six weeks from **August the 19th to September the 30th** within this locality, as well as those of persons removed into Middlesex Hospital, are shown by **black lines** in the situation of the house in which it occurred, or in which the fatal attack was contracted.

In addition to these the deaths of persons removed to University College, **St. George's**, Charing Cross, and other hospitals, and to various parts of London,

Registrar-General and the District Registrars.)

In addition to these the deaths of persons removed to University College **Hospital**, to Charing Cross Hospital, and to various parts of London, are indicated in the map, where the exact address was given in the "Weekly Return of Deaths," or, when I could learn it by private inquiry.

The pump in Broad Street is indicated on the map, as well as all the surrounding pumps to which the public had access at the time. It requires to be stated that the water of the pump in Marlborough Street, at the end of Carnaby Street, was so impure that many people avoided using it. And I found that the persons who died near this pump in the beginning of September, had water from the Broad Street pump. With regard to the pump in Rupert Street, it will be noticed that some streets which are near to it on the map, are in fact a good way removed, on [46/47] account of the circuitous road to it. These circumstances being taken into account,

it will be observed that the deaths either very much diminished, or ceased altogether, at every point where it becomes decidedly nearer to send to another pump than to the one in Broad Street. It may also be noticed that the deaths are most numerous near to the pump where the water could be more readily obtained. The wide open street in which the pump is situated suffered most, and next the streets branching from it, and especially those parts of them which are nearest to Broad Street. If there have been fewer deaths in the south half of Poland Street than in some other streets leading from Broad Street, it is no doubt because this street is less densely inhabited.

In some of the instances, where the deaths are scattered a little further from the rest on the map,

are [108/109] indicated in the map, where the exact address was given in the "Weekly Return of Deaths," or when I could learn it by private inquiry.

The pump in Broad Street is indicated on the map, as well as all the surrounding pumps to which the public had access at the time of **Cholera**. It requires to be stated that the water of the pump in Marlborough Street, at the end of Carnaby Street, was so impure that many people avoided using it; **and I found that the persons who died near this pump in the beginning of September, had water from the Broad Street pump. The inner dotted line on the map shews the various points which have been found by careful measurement to be at an equal distance by the nearest road from the pump in Broad Street and the surrounding pumps; and, if allowance be made for the circumstance just mentioned respecting the pump in Marlborough Steet**, it will be observed that the deaths either very much **diminish**, or **cease** altogether, at every point where it becomes decidedly nearer to send to another pump than to the one in Broad Street. It may also be noticed that the deaths are most numerous near to the pump where the water could be more readily obtained. The wide open street in which the pump is situated suffered most, and next the streets branching from it, and especially those parts of them which are nearest to Broad Street. If there [109/110] have been fewer deaths in the south half of Poland Street than in some other streets leading from Broad Street, it is no doubt because this street is less densely inhabited.

I have made a distinct inquiry respecting the greater number of fatal cases of Cholera that occurred, at the time of the outbreak, within the outer boundary marked on the map, but in a situation very decidedly nearer to another public pump than to that in Broad Street, and the following are the results:--

the malady was probably contracted at a nearer point to the pump. . . [47]

The limited district in which this outbreak of cholera occurred, contains a great variety in the quality of the streets and houses; Poland Street and Great Pulteney Street consisting in a great measure of private houses occupied by one family, whilst Husband Street and Peter Street are occupied chiefly by the poor Irish. The remaining streets are intermediate in point of respectability. The mortality appears to have fallen pretty equally amongst all classes, in proportion to their numbers. Masters are not distinguished from journeymen in the registration returns of this district, but, judging from my own observation, I consider that out of rather more than six hundred deaths, there were about one hundred in the families of tradesmen and other resident householders. One hundred and five persons who had been removed from this district died in Middlesex, University College, and other hospitals, and two hundred and six persons were buried at the expense of St. James's parish; the latter number includes many of those who died in the hospitals, and a great number who were far from being paupers, and would on any other occasion have been buried by their friends, who, at this time, were either not aware of the calamity or were themselves overwhelmed by it. The greatest portion of the persons who died were tailors and other operatives, who worked for the shops about Bond Street and Regent Street, and the wives and children of these operatives. They were living chiefly in rooms which they rented by the week [48].

On the 4th of September, a female, aged 42, died at 32, Great Marlborough Street. I learned from the persons with whom she lived that she habitually drank pump water, but did not get it from the pump opposite. She had it principally from Broad Street, but occasionally from Vigo Street. There were three deaths at 7, Great Marlborough Street, on the 2nd, 3rd, and 5th of September. This house is rather nearer to

two other pumps than to the one in Broad Street, but water had been fetched from the latter pump, and had been drank at dinner for a fortnight previous to the attacks of Cholera.

On the 1st of September, a girl aged 8 years, died at 29, Carnaby Street. On calling a few days afterwards I was informed by other members of the family that they were in the habit of having water from Broad Street, and that deceased drank of it on the days preceding her illness. On the same day, [110/111] a female, aged 34, died at 31, Carnaby Street. I was informed, on making inquiry, that she used to send to Broad Street two or three times a-day for water to drink. On the 1st also, a female, aged 35, died at 40, Carnaby Street. I was informed that she sent nearly always to Broad Street for drinking water.

The houses in which the above three cases occurred are in that part of Carnaby Street which is near to the pump in Marlborough Street; and Tyler Street, in which the following cases occurred is also very near to the same pump.

Two widows who lived in the kitchen at No. 9, Tyler Street, were attacked with Cholera on the 2nd of September, and were taken to Middlesex Hospital, where they both died. The daughter of one of the deceased women, a girl aged 15, told me that she used to fetch water from Broad Street pump, as her mother did not like the water in Marlborough Street. Both the deceased persons used to drink the water up to the time of their illness. My informant also drank of it; she had a Diarrhœa, but was not seriously ill. On the 2nd of September, a man and his wife died of Cholera at 8, Tyler Street. The landlord of the house made an inquiry of the grown-up children of the deceased persons for me, and I learned that they used to have water from the pump in Broad Street, as they considered the water in Marlborough Street not fit to drink.

On the 1st of September, a tailor, aged 50,

and [111/112] his son, aged 12, died of Cholera, at 10, Cross Street, and within three days afterwards four more of his children died, two of them being grown up. This family were great drinkers of pump water, and used to send for it every day, but more especially to drink during the night, as they were thirsty in the warm weather, owing to the great number sleeping in one room. The children fetched the water from various pumps, but frequently from Broad Street. On the 2nd of September, a boy, aged 7 years, died at 4, Cross Street. This family sent frequently for pump water, both to Broad Street and Warwick Street.

On the 2nd of September, a carpenter, aged 30, died at 7, Upper John Street, Golden Square. He was a foreigner, and used to drink wine and water to his dinner. The water was procured by the people who kept the house, and they got it from Broad Street pump, as they thought the water better than that in Warwick Street, which is much nearer. Two other persons, who also drank the water, were taken ill at the same time as deceased, but recovered. One was the servant of the house, and the other was a young man in the family. My informants were the widow of the deceased man and the sister of the young man who recovered. It is worthy of notice, that the servant had an attack of Cholera a fortnight previous to the last one.

A girl, **aged 5 years, died at 42, Ham Yard, on the 8th of September, having been attacked with [112/113] Cholera on September the 2nd. Deceased went to school in Dufour's Place, and a brother, a little older than herself, told me in the presence of his mother that he had seen his sister drink the water from the ladle at the pump in Broad Street. A girl, aged 7 years, at 3, Angel Court, Great Windmill Street, was attacked with Cholera on the 1st of September, and died on the 8th. She also went to school in Dufour's Place, and her parents think it probable that she drank the**

A little girl, who died in Ham Yard, and another who died in Angel Court, Great Windmill Street, went to the school in Dufour's Place, Broad Street, and were in the habit of drinking the pump-water, as were also a child from Naylor's Yard, and several others, who went to this and other schools near the

pump in Broad Street [47–comes later in CIC].

A woman who died at 2, Great Chapel Street, Oxford Street, had been occupied for two days preceding her illness at the [47/48–comes later in CIC] public washhouses near the pump, and used to drink a good deal of water whilst at her work; the water drank there being sometimes from the pump and sometimes from the cistern.

water of Broad Street pump. A boy, aged 9 years, died on the 2nd of September, at 9, Great Crown Court. He went to school near the pump in Broad Street, and was in the habit of drinking a good deal of the water.

At 13, Wardour Street, near to Oxford Street, the wife of a tradesman died on the 2nd of September. Her husband informed me that they used to have pump water which deceased used to drink. The boy was always directed to fetch it from Broad Street. The son of a chemist at 115, Wardour Street, which is about a dozen doors from Oxford Street, was attacked with Cholera, and went to Willesden, where he died on the 2nd or 3rd of September. He dined on the days preceding his attack at some dining-rooms in Wardour Street, where the water from Broad Street pump always stood on the table. He drank malt liquor with his dinner, but frequently took some water with the pastry or sweet pudding with which he concluded it. His father was my informant. [113/114]

The wife of a tailor at 2, Great Chapel Street, Soho, was attacked with Cholera on the 4th, and died on the 8th of September. I was informed by the person with whom she lodged, that she was a great drinker of pump water, and that she used to drink a good deal of cold water at the Baths and Wash-houses in Dufour's Place, where she had been at work on the days preceding her illness. On going to the Wash-houses I learned that some persons drank the water of the cistern there, and others that of the Broad Street Pump. The child of this woman was attacked on the 7th and died on the 11th of September.

There were three deaths at 14, Noel Street; two on the 1st of September, after a few hours' illness, and one on the 6th, after an illness of four days. Pump water was constantly drunk in this house. I saw the boy who fetched it in the presence

of the family. He generally got it from Berner's Street, or Newman Street, but had occasionally obtained it from Broad Street, and had done so about two months before my inquiry, which was made at the end of October, but he could not remember the day or week when he last obtained it from Broad Street.

A young woman died at 39, Rupert Street, on the 5th of September, but she was taken ill in St. Anne's Court, where three other members of her family died. She was about to call in Rupert Street, but dropped down at the door; she was carried into the house, where she expired. [114/115]

On the 10th of September, a girl, aged eight years, died of Cholera after an illness of three days, at 7, Naylor's Yard, Silver Street; she went to the National School facing the end of Broad Street, and used to drink the water.

There were four fatal attacks of Cholera at No. 1, Brewer Street, in the beginning of September. One of the deceased persons was the master of the house, who used to send constantly to Broad Street for drinking water, and the others who were attacked were also in the habit of drinking it.

A cabinet-maker, who was removed from Philips' Court, Noel Street, to Middlesex Hospital, worked in Broad Street. A boy also who died in Noel Street went to the National School at the end of Broad Street, and having to pass the pump probably drank of the water.

A tailor who died at 6, Heddon Court, Regent Street, spent most of his time in Broad Street. A woman removed to the hospital from 10, Heddon Court, had been nursing a person who died of Cholera in Marshall Street.

There were eight fatal attacks at a considerable distance from the pump in Broad Street, but within the external boundary marked on the map, respecting which, I did not, on inquiry, trace any connection with the water of that pump.

A cabinet-maker, who was removed from Philip's Court, Noel Street, to Middlesex Hospital, worked in Broad Street. A boy also who died in Noel Street, went to the National school at the end of Broad Street, and having to pass the pump, probably drank of the water.

A tailor, who died at 6, Heddon Court, Regent Street, spent most of his time in Broad Street. A woman, removed to the hospital from 10, Heddon

Court, had been nursing a person who died of cholera in Marshall Street [47].

Of the above 48 persons, it will be observed that 28 were ascertained to have drunk the water of Broad Street pump shortly before they were at-[115/116]tacked, whilst there is a greater or less probability that 10 of the others also drank it, and 2 more had been exposed to the malady, by residing in the same room with a patient who died of it. As regards the 8 cases in which I could trace no connection with the water of the pump in Broad Street, it may be observed that they form but a slight mortality for the large area in which they happened; a mortality not greater than was occurring in surrounding parishes, and probably not greater than would have taken place in this district if the great outbreak had not occurred.

I ought to mention, that in all the cases I have alluded to throughout the Report, the water from Broad Street was drunk cold, without having been boiled. It is the custom in this district, as elsewhere, always to use the cistern water for making tea, and other purposes where heat is employed, and to send for pump water only for the purpose of drinking it cold.*

* I should like to mention here, a fact that I met with in making a part of the house-to-house inquiry, which the Committee undertook in the winter. Out of the 14 houses in Cambridge Street, there were four in which I was distinctly told that none of the inmates ever sent to Broad Street for water, and that they did not do so in August last. There was no case of Cholera in any of these houses. In the other 10 houses, the water from the pump in Broad Street was more or less used by the inmates last August, and there was Cholera in all of them but one, and in that house there was Diarrhœa-J.S., June 14, 1855.

The following Table exhibits the chronological features of this terrible outbreak of

Dr. Snow exhibited a *map*, together with a **statistical** table, showing the dates of attack, etc. It appeared that the greatest number of attacks were on the 1st of September (2).

The following table exhibits the chronological features of this terrible outbreak of cholera. [48/49]

Table I

[49/50] The deaths in the above table are compiled from the sources mentioned **above** in describing the map; but some deaths which were omitted from the map on account of the number of the house not being known, are included in the table. As regards the date of attack, I was able to obtain it with great precision, through the kindness of Mr. Sibley, in upwards of eighty deaths which occurred in Middlesex Hospital; for the hour of admission was entered in the hospital books, as well as the previous duration of the illness. In a few other cases also I had exact information of the hour of attack, and in the remainder I have calculated it by subtracting the duration of the illness from the date of death.

Where the illness did not exceed twelve hours, the attack was considered to have commenced the same day; where the illness exceeded twelve, and did not exceed thirty-six hours, the attack was put down to the previous day, and so on. Where the illness exceeded forty-eight hours, its duration is generally given in days, which were subtracted from the date of the attack. Although this plan does not always give the precise date of attack, it reaches within a few hours of it, and is as valuable perhaps as if the exact day were given, unless the hour as well as the day could be introduced into the table. Where premonitory diarrhoea is stated to have existed, the period of its duration is deducted from the date of death, and, in fact, the time of attack is fixed at the

Cholera:-- [116/117]

Table

[118] The deaths in the above **Table** are compiled from the sources mentioned in describing the map; but some deaths which were omitted from the map, on account of the **numbers** of the **houses** not being known, are included in the Table. As regards the date of attack, I was able to obtain it with great precision, through the kindness of Mr. Sibley, in upwards of **80** deaths which occurred in Middlesex Hospital; for the hour of admission was entered in the hospital books, as well as the previous duration of the illness. In a few other cases also I had exact information of the hour of attack; and in the remainder I have calculated it by subtracting the duration of the illness from the date of death.

There are **45** cases in which the duration of the illness was not certified **to the registrars, and where I had no [?] means of ascertaining it**. The time of attack in these cases is consequently

first commencement of indisposition, except in two or three instances in which the patient was labouring under another disease, as phthisis or typhus fever. There are forty-five cases in which the duration of the illness was not certified or entered in the books of the registrars, and the time of attack in these cases is consequently unknown. These persons nearly all died in the first days of September, in [50/51] the height of the calamity, and it is almost certain that they were cut off very quickly, like the others who died at this time.

It is pretty certain that very few of the fifty-six attacks placed in the table to the 31st August occurred till late in the evening of that day. The irruption was extremely sudden, as I learn from the medical men living in the midst of the district, and commenced in the night between the 31st August and 1st September. There was hardly any premonitory diarrhoea in the cases which occurred during the first three days of the outbreak; and I have been informed by several medical men, that very few of the cases which they attended on those days ended in recovery.

The greatest number of attacks in any one day occurred on the 1st of September, immediately after the outbreak commenced. The following day the attacks fell from one hundred and forty-three to one hundred and sixteen, and the day afterwards to fifty-four. A glance at the above table will show that the fresh attacks continued to become less numerous every day. On September the 8th—the day when the handle of the pump was removed—there were twelve attacks; on the 9th, eleven; on the 10th, five; on the 11th, five; on the 12th, only one; and after this time, there were never more than four attacks on one day. During the decline of the epidemic the deaths were more numerous than the attacks, owing to the decease of many persons who had lingered for several days in consecutive fever.

There is no doubt that the mortality was

unknown. These persons nearly all died in the first days of September, in the height of the calamity; and it is almost certain that they were cut off very quickly, like the others who died at this time.

It will be observed that the daily number of fatal attacks was already much diminished by September the 8th, the day when the handle of the pump in Broad Street was removed; and it is not improbable that the water had, from some cause or other, ceased to contain the cholera poison. At all events, the few attacks which took place after [118/119] September

The number of attacks of cholera had been diminished before this measure was adopted, but whether they had diminished in a greater proportion than might be accounted for by the flight of the great bulk of the population I am unable to say. In two or three days after the use of the water was discontinued the number of fresh attacks became very few (1).

The pump-well in Broad Street is from 28 to 30 feet in depth, and the sewer, which passes a few yards from it, is 22 feet below the surface. This sewer proceeds from Marshall-street, where some cases of cholera had occurred before the great outbreak (1).

I am of opinion that the contamination of the water

much diminished, as I said before, by the flight of the population, which commenced soon after the outbreak; but the attacks had so far diminished before the use of the water was stopped, that it is impossible to decide whether the well [51/52] still contained the cholera poison in an active state, or whether, from some cause, the water had become free from it. The pump-well has been opened, and I was informed by Mr. Farrell, the superintendent of the works, that there was no hole or crevice in the brickwork of the well, by which any impurity might enter; consequently in this respect the contamination of the water is not made out by the kind of physical evidence detailed in some of the instances previously related. I understand that the well is from **twenty-eight to thirty feet** in depth, and goes **through the gravel to the surface of the clay beneath**. The sewer, which passes **within** a few yards of the well, is **twenty-two** feet below the surface. . . [52].

As there had been deaths from cholera just before the great outbreak not far from this pump-well, and in a situation elevated a few feet above it, the evacuations from the patients might of course be amongst the impurities finding their way into the water, and judging the matter by the light derived from other facts and considerations previously detailed, we must conclude that such was the case. A very important point in respect to this pump-well is that the water passed with almost everybody as being [53/54] perfectly pure, and it did in fact contain a less quantity of impurity than the water of some other pumps in the same parish, which had no share in the propagation of cholera. We must conclude from this outbreak that the quantity of morbid matter which is sufficient to produce cholera is inconceivably small, and that the **shallow** pump-wells in a **town** cannot be looked on with too

the 10th or 12th must have been occasioned in the usual manner, and not through the medium of the water.

I wish it to be understood that I do not attribute every case of Cholera to the use of polluted water. It is my opinion that every case is caused by

of the pump-wells of large towns is a matter of vital importance. Most of the pumps in this neighbourhood yield water that is very impure and I believe that it is merely to the accident of the cholera evacuations not having passed along the sewers nearest to the wells that many localities in London near a favourite pump have escaped a catastrophe similar to that which has just occurred in this parish.

In the autumn of 1848, when cholera had just commenced in London, a number of cases

much suspicion, whatever their local reputation may be. . .

Whilst the presumed contamination of the water of the Broad Street pump with the evacuations of cholera patients, affords an exact explanation of the fearful outbreak of cholera in St. James's parish, there is no other circumstance which offers any explanation at all, whatever hypothesis of the nature and cause of the malady be adopted. Many persons were inclined to attribute the severity of the malady in this locality to the very circumstance to which some people attribute the comparative immunity of the city of London from the same disease, viz., to the drains in the neighbourhood having been disturbed and put in order about half a year previously. Mr. Bazelgette, however, pointed out, in a report to the commissioners, that the streets in which the new sewers had been made suffered less than the others; and a reference to the map will show that this is correct, for I recollect that the streets in which the sewers were repaired about February last, were Brewer Street, Little Pulteney Street, and Dean Street, Soho. Many of the non-medical public were disposed to attribute the outbreak of cholera to the supposed existence of a pit in which persons dying of the plague had been buried about two centuries ago; and, if the alleged plague-pit had been nearer to Broad Street, they would no doubt still cling to the idea. The situation of the supposed pit is, however, said to be Little Marlborough Street, just out of the area in which the chief mortality [54/55] occurred. With regard to effluvia from the sewers passing into the streets and houses, that is a fault common to most parts of London and other towns. There is nothing peculiar in the sewers or drainage of the limited spot in which this outbreak occurred; and Saffron Hill and other localities, which suffer much more from ill odours, have been very lightly visited by cholera.

swallowing the peculiar poison or morbid matter of Cholera, which has proceeded from a previous patient sick of the same malady; but this morbid matter need not be in water, and there are facilities for its being accidentally swallowed, and propagating the disease, without the aid of water. This is more especially the case in the crowded dwellings of the poor, where a number of persons live, sleep, cook, and eat in one room. I do not, therefore, attribute every case of Cholera in the parish to the water of the pump well in Broad Street, but certainly those which constitute the great outbreak which took place at the end of August, and which suddenly raised the mortality of this disease from about five in a week to nearly 500.

The reason why the water of this pump produced the great outbreak is, I feel confident, that the evacuations of one or more Cholera patients found their way, by some means, into the well. There were fatal cases of Cholera, a few days before the great outbreak, not far from the well, and there may have been other cases, not fatal, which are not recorded.

I published several instances, 1849, of sudden [119/120] and severe outbreaks of Cholera arising from the pollution of tanks, wells, and other local supplies of water, by the contents of cesspools and house-drains. In the outbreak at Albion Terrace,

occurred about Bridge Street, Blackfriars; and it was found by Mr. Hutchinson, Surgeon, of Farringdon Street, that the well of St. Bride's pump had a communication with the Fleet ditch, up which the tide flows. I have a strong impression that many a case of typhoid fever occurring in a respectable neighbourhood has its origin in the water of the neighbouring pump.

On the **12th instant**, I went to Deptford, to make inquiries respecting a most fatal outbreak of cholera which had taken place there, being confined to two streets, called New Street and French's Fields. I found that this outbreak of cholera was caused by an accidental contamination of the drinking water, occurring in an unusual manner. The people in these two streets, in which about ninety deaths from cholera occurred in a few days, have the water of the Kent Water-works;

but for three or four weeks before my inquiry, they told me that the water, when it first came in, had generally smelt highly offensive, and frothed like soap-suds. They had been in the habit of throwing away a few **pailsful** of what first came in, and retaining that which came afterwards, and was pretty clear. On inquiring in all the surrounding streets, viz., Wellington Street, Old King Street, and Hughes' Fields, I found that there had been no alteration in the water. I conclude, therefore, that some leakage had taken place into the pipes supplying these two streets, during the intervals

Just at the time when the great outbreak of cholera occurred in the neighbourhood of Broad Street, Golden Square, there was an equally violent irruption in Deptford, but of a more limited extent. About ninety deaths took place in a few days, amongst two or three score of small houses, in the north end of New Street and an adjoining row called French's Fields. Deptford is supplied with very good water from the river Ravensbourne by the Kent Water Works, and until this outbreak there was but little cholera in the town, except amongst some poor people, who had no water except what they got by pailsful from Deptford Creek—an inlet of the Thames. There had, however, been a few cases in and near New Street, just before the great outbreak. On going to the spot on **September 12th** and making inquiry, I found that the houses in which the deaths had occurred were supplied by the **Kent Water Works**, and the inhabitants never used any other water. The people informed me, however, that **for some few weeks the water had been extremely offensive when first turned on; they said it smelt like a cesspool**, and frothed like soap suds. They were in the habit of throwing away a few **pailsful** of that which first came in, **and collecting some for use after it became clear**. On inquiring in the surrounding streets, to which this outbreak of cholera did not extend, viz., Wellington Street, Old King Street, and Hughes's Fields, I found that there had been no alteration in the water. I con-[55/56]cluded, therefore, that a leakage had

Wandsworth Road, in that year, the night soil was from six to nine inches deep at the bottom of the tanks that were examined. In some instances, in Horsleydown and Rotherhithe, the contamination of the water was equally well proved. In these instances, the dejections of a patient ill of Cholera entered the water before the great outbreak.

when the water was not turned on.

There are no sewers in these streets, and the refuse of all kinds, consequently, saturates the ground in which the pipes are laid. There were a few cases of cholera in and near New Street just before the great outbreak.

I have very nearly concluded the inquiry respecting the comparative influence of the water of the Lambeth Water Company and that of the Southwark and Vauxhall Company, of which I gave some account in the Number of the Medical Times and Gazette of the 2nd inst. The result, which I shall communicate when completed, will show that among the population having the impure water of the Thames, from Battersea Fields, the mortality from cholera has been ten times as great as among the population having the improved water from Thames Ditton.

taken place into the pipes supplying **the places where the outbreak occurred**, during the intervals when the water was not turned on. **Gas is known to get into the water-pipes occasionally in this manner, when they are partially empty, and to impart its taste to the water.** There are no sewers in New Street or French's Fields, and the refuse of all kinds consequently saturates the ground in which the pipes are laid. I found that the water collected by the people, after throwing away the first portion, still contained more organic matter than that supplied to the adjoining streets. On adding nitrate of silver and exposing the specimens to the light, a deeper tint of brown was developed in the former than in the latter [sic].

All the instances of communication of cholera through the medium of water, above related, have resulted from the contamination of a pump-well, or some other limited supply of water; and the outbreaks of cholera connected with the contamination, though sudden and intense, have been limited also; but when the water of a river becomes infected with the cholera evacuations

I have been making inquiries during the autumn just passed, in the South districts of London, which shew that the dejections of Cholera can reproduce the disease after passing down the sewers into the Thames, and being afterwards distributed through some miles of the pipes of a water company. Under these circumstances, the cases of Cholera are scattered over the whole of the districts supplied by the company; and become gradually more numerous, as each set of cases, the dejections of which pass into the river, produces new ones. In the instances, on the other hand, in which a pump well, or some other local supply of water is thus contaminated, the outbreak is always sudden and violent.