there is, of course, somewhat less of uncertainty in this matter. There was the case, already mentioned, of a man drinking the pump water only on Wednesday, 30th August, 1 p.m., who, although six persons were fatally seized on Thursday, August 31st, was not attacked till Friday, 1st September, 9 a.m. Thus we have, in one instance, an interval of 44 hours between the drinking of the water and the attack. I have reason to believe that this interval varied considerably in different cases. It is obvious that this varying interval renders it exceedingly difficult, if not impossible, to calculate either the time or the rate at which the water became free from pollution. The day of greatest pollution must have been August 31st.

I cannot help thinking that the decided diminution of fatal attacks on Sunday must have been owing to a partial purification (however effected) of the water on Saturday. Whether we are to infer from the above facts a returning impurity of the water acting on a diminished number of drinkers must remain an open question. Only I trust that no one will be for settling these questions by single instances. I myself drank a little of the pump water, with brandy (cold), with impunity on Sunday evening, at eleven o'clock. Whatever may have been the cause of the outburst, it will certainly be found that some, if not many, who were exposed to it did not suffer. If, for instance, it were atmospheric, it cannot be denied that we all breathed the air.
What then, after all, was the matter with the pump?

I did not consider that, so long as I was merely engaged in collecting facts, it was any business of mine to hazard even a conjecture upon this subject. But when the fact of a connection between the pump and the pestilence did appear to be established, I then thought it my duty no longer to keep that point in abeyance. The possibility of the water having been contaminated by matter thrown off from a Cholera patient who might, so to speak, have imported the disease from another locality, had often been discussed in committee, and it had been agreed that as yet no evidence had been discovered which would support such a supposition. There were, indeed, cases of Cholera, towards the latter end of August, in the upper part of Marshall Street, the sewer from which runs close by the pump well, but as it is a new sewer, built so recently as 1851, it was deemed very unlikely that it should be found to leak. Moreover, even if it did leak, and if one or two isolated cases had in this way polluted the pump water, why should the epidemic have so rapidly subsided when scores of subsequent cases, on the same line of sewer, must have added intensity to its cause? This was the objection which I had myself urged against such hypothesis. Neither was it thought at all probable, or possible, inasmuch as the house in Marshall Street is situated about fifty
yards from the pump, that percolation from a cess-pool at such a distance would have taken place through the intervening ground, without all noxious particles being eliminated in the process of filtration. Similar objections held against the likelihood of contamination of the pump-well from the first case in Broad Street, the house where it occurred being nearly thirty yards from the pump. As I could ascertain little about this case, I took extra pains to inquire into what I then supposed to have been the only other case in the street previous to the great outburst. It was the one dated, in the second table, as commencing on Monday, 28th August, 5 a.m. I have before stated that the patient came from Bayswater, on Wednesday, August 30th, and so may have brought the disease with him. He was sent back to Bayswater seven hours after he was attacked. Having already calculated that the probable time when the pump water became sufficiently injurious to produce fatal effects was early in the afternoon of Wednesday, I examined into this case with considerable interest. I could elicit nothing, however, to distinguish it from the other early cases upon the point immediately in question. The house in which it occurred is more than thirty yards distant from the pump. At this time I supposed myself to know for certain that throughout the whole street there had been no other case before twelve o'clock on Thursday, August 31st. One of the earliest
cases on that day did indeed occur in the house which is the very closest of all to the pump, but it was not actually the earliest. Moreover the three first cases, in Broad Street, on that day, were so nearly simultaneous as to preclude the notion of their being otherwise connected with each other than as obviously having a common origin. One day last week, however, I happened to be studying the Registrar's Returns for a purpose unconnected with this matter, when my eye suddenly fell upon the following entry, in page 340:—

"At 40, Broad Street, 2nd September, a daughter, aged five months, exhaustion, after an attack of Diarrhoea four days previous to death."

I knew the case, and had recorded the date of death, but somehow had neglected to inquire about the date of attack, having passed it by lightly, I suppose, because it was the case of an infant. Neither had it occurred to me that the child might have been ill all the week. I immediately went to the house and ascertained from the mother, who occupied the back parlour, that the child was attacked on Monday, 28th August, and that the dejections at first were abundant, but ceased on Wednesday, 30th August. In answer to further questions, she told me that the dejections were collected in napkins, which, on being removed, were immediately steeped in pails, the water from which was poured partly into a sink in the back-yard, and partly into a cesspool in the front area.

April 3rd.
Being struck with the dangerous proximity of the cesspool to the pump well, I lost no time in communicating the facts to the Committee*, who ordered an investigation to be made forthwith. This investigation, carried out by our Secretary and Surveyor, is described elsewhere. It clearly established the general fact of percolation of fluid from the cesspool into the well. I do not pretend to any practical knowledge of such matters, but, having been down the well and examined the places where the steining was removed for the purpose of inspection, I can at least say that I saw enough to convince me on this point. The importance of this investigation, even apart from any consideration of Cholera, cannot be overrated. The sooner all shallow pump wells are filled up, and all house drains rigorously examined, the better.

As to whether any light be here thrown upon the propagation of Cholera, let every one form his own opinion.

In the same house where the above-mentioned infant died there were several cases of cholera. For the convenience of the reader I have fully recorded all the deaths which happened in this house in the following Table:

* This was done on April 3rd, on which day also the substance of the preceding portion of this Report was for the first time laid before the Committee.
The last and first cases are of father and child. It will be observed that, whereas the child was attacked 78 hours before the commencement of the general outburst, the father was not attacked till the day the pump was locked up. Nothing has been elicited to throw light upon the cause of attack in either case. What is more important, however, in reference to our present inquiry is this; if matter thrown off from the child and poured into the cesspool in the front area, during the early days of the week, percolated the ground and contaminated the well, why did the number of attacks so sensibly and rapidly diminish on Sunday, September 3rd, when matter from two adult cholera patients had been poured down the same place during the later days of the week? And why, moreover, did the epidemic so nearly disappear from Broad Street on or after September 6th, when another person was attacked in the same house September 4th? I have already said enough to shew that I am not in a position to answer these
questions. I might make some plausible suggestions; as for instance, that the drinkers of the pump water were not so numerous when so many who habitually used it were already dead—an allowable supposition, seeing that several hundreds were attacked in the first three days within 210 yards of the pump, and I have shewn how few habitual drinkers of its water among the inhabitants of Broad Street escaped. Again, on and after September 4th the residents were quitting the street in great numbers. Or it might be urged that the unusual drain upon the well, caused by the intense thirst of the sufferers, who, as I have said, were generally supplied with the pump water, might in some measure account for the rapid change in its quality. But as these suggestions are not conclusive to myself, I do not desire they should be so to any one else. For my own part I cannot state, from the facts before me, whether the water did actually get continually purer, or whether it first became purer and then got worse again.

Of one thing I am certain, that the case against the pump is strong enough to render wholly unnecessary, on the part of those who state it, any impatience at objections, however formidable they may appear. And I cannot but feel that, whatever uncertainty there may be about the nature of infantile diarrhoea, the plain fact of this child's dejections being poured into a cesspool (the connection between which and the pump well has been clearly esta-
lished) for a period of three days immediately preceding a great outburst, the phenomena of which point so decidedly to the pump as its origin, is indeed a very remarkable coincidence.

May 8th.

Since the above has been written I have called on Dr. Rogers of Berners Street, who attended the infant in 40, Broad Street, during its illness. He has very kindly furnished me with the following particulars respecting the case.

56, BERNERS STREET,
May 30th, 1855.

Sir,

Being anxious to comply with your request, to give all the particulars I could remember of the illness of which Mrs. ——'s female infant died last September, and not having kept any notes of the case, I deemed it advisable, before doing so, to see the mother, and clear up some points of which my memory retained but an uncertain recollection.

The infant, the subject of your inquiry, was brought up by hand, or bottle, its mother, from ill health and want of milk, not being able to suckle it; it appeared to thrive better on its food (principally boiled ground rice and milk) than its brother who died two or three years ago, and whose history I will subsequently briefly refer to. It was born, I believe, in April '54; and was attacked with a Diarrhoea in the June following; its evacuations were pale and slimy, sour and offensive; it was under treatment for about five days; it continued pretty well till the 14th of August, when it had a similar attack, which however gave way to treatment in two or three days, but on the morning of Monday the 28th of August I was sent for to see the infant, and found it again
suffering from another attack of Diarrhoea, but now accompanied with sickness, so that but little medicine or food could be retained; its dejections were pale, slimy, and watery, smelt very offensive; the mother tells me they were now and then of a mixed greenish and cream colour; this state of purging and sickness continued till Wednesday (30th). I never saw, that I can remember, what might be taken for Cholera stools,—she never looked bluish, had no cramps, there was no cold stage or collapse, nor subsequent fever, and she always passed her urine which stained the napkins. From Wednesday (30th) till Saturday (2nd) there was no purging or sickness, she could take but little food, and appeared quite exhausted, and died very quietly on Saturday at 11 a.m., aged 5 months. The mother now tells me that the sickness was the only difference she observed between the last and former illnesses.

Mrs. ———, whose health was so bad while pregnant with this child, had equally bad health previous to the birth of a male infant, born about three years ago; it was likewise brought up by bottle; it lived only ten months; its lungs and mesentery were diseased; it had cough, and recurring attacks of Diarrhoea finally carried it off. I might really say, likewise, for I cannot separate these two children's cases,—they exhibit a close relationship to my mind, for we well know that many children are continually carried off, when brought up by hand, by similar disorders. I have been informed by Mrs. ——— that herself and niece were both attacked with severe Diarrhoea the week preceding the infant's last illness; they both recovered however without having taken any medicine, though this disease and Cholera was spreading, and had already become fatal in their neighbourhood. However, during my attendance on the infant, Mrs. ——— had a relapse, with spasms and cramps, and was then treated by me with immediate success. I learn from the mother that the infant's napkins were first soaked in cold water, which was thrown down the sink or privy; the napkins were then properly washed. Having been asked the history of the one infant's illness. I felt I was called on to allude to the
death of the previous one, and to make known the attack which
the mother and niece had suffered from before the infant's
illness. I doubt not but that the fatal cases of Cholera, which
subsequently occurred in the house, one of which was the father
of the infant, will be given and reported on by others. I will
not therefore further refer to them, and, having given the
information you required of me.

I remain, Sir,
Yours, &c.

W. R. ROGERS.

The Rev. H. Whitehead.

It is not for me to discuss the probable difference
of opinion which may arise among medical men
as to the nature of this child's illness. Whether
or not they may choose to decide that "the
"accompaniment of sickness" in its third attack
(August 28th), and "the relapse of its mother,
"with spasms and cramps" on that occasion,
indicate the presence of choleraic symptoms, it is
for me only to call attention to the coincidence.
Neither—although I am aware of two or three
pump-water drinkers in Broad Street who were
attacked rather sharply with Diarrhcea about a fort-
night before the outburst, one of whom afterwards
died of Cholera and another recovered from Cholera
during the great outburst, and notwithstanding I
have long since made mention in print of "one
"night in August, when the inhabitants of certain
"contiguous streets and courts (the very same
"which have just suffered so severely) were very
"generally attacked with Diarrhcea,"—can I speak
with sufficient positiveness to connect these attacks, in point of time, with "the previous illness of the infant on the 14th of August." Even if it should be that we really are on the right track, I know that at this late period it is impossible to unravel the matter in such a way as to meet all objections. I suppose that another epidemic—if unfortunately we should have one—will set all these points at rest. Meanwhile we must be content with securing a prospect of ready attention to one important subject of investigation.

It is worth while however to state that; by recent inquiry, I have ascertained that the dejections of the patients in the third floor of No. 40, owing to great hurry and confusion, were so disposed of that but little could have found its way into the cesspool at all.

My attention has also recently been called to the cross drain from the bottom of the stack pipe of No. 39 (see Mr. York’s diagram). There were three deaths from Cholera in No. 39, the attacks being on the 1st, 2nd and 4th September, two of 12 hours duration and one of 24 hours. The point of junction of the two drains will be apparent from the Surveyor’s diagram. Whether this fact be considered to increase the difficulty which I have raised will depend upon the precise place and manner of the supposed fatal communication. This is not easy to determine and, even if it could have been ascertained by scientific experiments at
the time of the excavation, cannot now be discovered, owing to the altered state of the drain.

HENRY WHITEHEAD, M.A.

June 5th, 1855.

I had fully intended to avoid making any mention whatever of other streets, being apprehensive, from my Broad Street experience, of being gradually drawn into an intricacy of investigation, to the complete statistical unravelling of which I should certainly have found myself unequal. Yet I feel it necessary to record my opinion, founded upon continuous inquiry, that a like investigation of any other street in the Cholera area would have elicited similar, and even more striking, evidence in favour of the pump hypothesis—more striking because abounding in more marked contrasts than were likely to be met with in the immediate vicinity of the pump.

Having already taken up so much space, I must omit the streets and courts intervening between the centre and the outskirts of this area, and briefly allude only to the outskirts.

Four deaths occurred in the corner house of Brewer Street and Little Windmill Street, and four more in a house towards the north of Poland Street. In each of these houses the use of the Broad Street water in August and September (1854) is beyond a doubt.

Three deaths also occurred in a house close to the dead wall in Noël Street, where the use of this water at that time is more than probable.

These facts, as well as the following, are interesting as tending to disprove the reiterated assertion that the outbreak extended beyond the reach of the pump.

St. Anne’s Court (Soho), although the most remote spot of the infected district from the centre of the area, is yet by actual measurement, throughout its whole length, nearer to the Broad