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Bill of Complaint.

IN CHANCERY OF NEW JERSEY.

Between THE MAYOR AND ALDERMEN OF JERSEY CITY, Complainant, and PATRICK H. FLYNN and THE JERSEY CITY WATER SUPPLY CO., Defendants.	On Bill for Relief.

To His Honor, William J. Magie, Chancellor of the State of New Jersey:

Humbly complaining, showeth unto your Honor your orator the Mayor and Aldermen of Jersey City, as follows:

I. That your orator is a municipal corporation of the State of New Jersey. That Patrick H. Flynn is a citizen of the State of New York; and that the Jersey City Water Supply Company is a corporation organized under the General Corporation Act of the State of New Jersey.

II. That for many years prior to the year eighteen hundred and ninety-five, the water used for domestic purposes by the inhabitants of Jersey City was obtained solely from the Passaic River at Belleville, through its plant located there. That your orator had spent, in the erection of said plant, prior to that date, many millions of dollars. At that date the increased diversion of the waters of the river, and its pollution by the cities and boroughs above that plant, compelled your orator to procure a new water supply for said city. The Act entitled "An Act to authorize any of the municipal corporations of this State to provide for a supply or further supply of water therefor" approved April second, eighteen hundred and eighty-eight, was the only legislation authorizing your orator to procure such new water supply. In September, eighteen hundred and ninety-five, it entered into a contract with the Jersey City Water Company for the purchase of a new supply from the waters of the Passac River, which contract was set aside by the Supreme Court of this State in the year eighteen hundred and ninety-six, on the application of the Morris Canal and Banking Company and others, on the ground that the Act of eighteen hundred and ninety-five did not authorize the rights of said Canal Company, in the waters of the Passaic River, to be condemned for the use of Jersey City. Your orator again advertised for bids for a new water supply and as the result thereof a contract was entered into between your orator and said Flynn; a true copy of which is hereto annexed and hereby referred to as "Schedule A." That said Flynn was then and still is a non-resident of this State, and, on the date of said contract, owned no land or water or water rights therein. That the said Jersey City Water Supply Company was organized by said Flynn for the sole object of carrying out said contract, which he assigned to it.

III. That on October twelfth, eighteen hundred and ninety-five, your orator entered into a contract with the East Jersey Water Company for a temporary supply of water, and on the twenty-second day of April, eighteen hundred and ninety-seven, made a supplemental contract with that Company by which that Company was to supply your orator with all the water needed by the inhabitants of Jersey City from a plant located on the Passaic River near the City of Paterson, which supply was to continue until your orator should terminate such contract by giving one year's notice, or that Company should terminate the contract by giving your orator one year's notice. This contract with the East Jersey Water Company remained in full force until it was modified by the contract of May thirty-first, nineteen hundred and two, between the East Jersey Water Company, the New Jersey General Security Company, Patrick H. Flynn, the Jersey City Water Supply Company, and your orator, annexed hereto and hereby referred to, marked "Schedule D."

IV. The contract "Schedule A" provides for the procuring and construction of a water supply for your orator for the sum of seven million five hundred and ninety-five thousand dollars, in the form required by the Act of eighteen hundred and eighty-eight. Thereafter the question of the purchase of this water supply in accordance with the terms of the contract and as required by the Act entitled, "An Act to submit to popular vote the purchase of a supply of pure and wholesome water in cities of the first class in this State," approved April first, eighteen hundred and ninety-five, was submitted to the voters of Jersey City. This election was had on the thirteenth day of February in the year nineteen hundred, and the voters of Jersey City then voted to accept the purchase of the new water supply, and notice of the result of such election was thereupon served within a year from the date of the contract, upon said Flynn and the said Water Supply Company, and they were also notified at the same time that your orator accepted the option in said contract to purchase said water plant and supply for the said sum of seven million five hundred and ninety-five thousand dollars, in accordance with the said terms of said contract; that by said vote and said notice the acquiring by purchase of the said new water supply became binding upon your orator.

V. That by the contract of July eighth, nineteen hundred and one, hereto annexed and hereby referred to, marked "Schedule B," said Flynn and the Water Supply Company admit that your orator had exercised the option to purchase the water supply for the sum of seven million five hundred and ninety-five thousand dollars, and that your orator was entitled to divert from the flow of the Rockaway River, water to the extent of seventy millions of gallons daily, forever, and that the modification of the contract of February twenty-eighth, eighteen hundred and ninety-nine, being "Schedule A," as herein provided, was needed to insure the construction of the works for such new water supply and the delivery thereof to your orator; and in consideration thereof your orator consented to such modification of said contract "Schedule A"; that thereafter a large part of the lands forming part of the said water works and water supply, was acquired by condemnation under and by force of an act entitled "An Act to empower cities to acquire lands and other property for public use by condemnation," approved April first, eighteen hundred and ninety-five, in the name of your orator.

VI. That by the terms of said contract "Schedule A," said water-works were to be completed by the twenty-eighth day of August, nineteen hundred and one. By said contract said Flynn agreed with your orator that if said works were not completed by that date, he would pay your orator for every day's delay to complete said works, the sum of five hundred dollars, as liquidated damages and not by way of penalty; and your orator says that the said works were not completed by the twenty-eighth day of August, nineteen hundred and one. That on the thirty-first day of March, nineteen hundred and two, the said works were not yet completed, and it was then apparent that the same could not be completed for a long time still to come; that there was then due from the defendants to your orator as liquidated damages the sum of over one hundred thousand dollars; thereupon the defendants applied to your orator for an extension of time for the completion of the water-works and a waiver of such liquidated damages, until the expiration of such extended time, alleging that they had come to an agreement with the East Jersey Water Company, who were then supplying your orator with water under the contracts hereinbefore mentioned; thereupon the agreements bearing date that day, and being Schedules "C" and "D," hereto annexed, and hereby referred to, were executed, by which the time for the completion of the said works was extended until the twenty-fifth day of December, nineteen hundred and three, and the payment of five hundred dollars per day as liquidated damages for delay under said contracts and specifications, was to be incurred and reckoned only from and after December twenty-fifth, nineteen hundred and three.

VII. That at the time of the making of said contract Schedule "A," the damages to be sustained by your orator by reason of the failure of said Flynn to complete said water supply within the time mentioned in said contracts, were uncertain in amount and not readily susceptible to proof under the rules of evidence; that therefore the said Flynn and your orator agreed upon and stipulated as liquidated damages and the measure of compensation due from said Flynn to your orator, the sum of five hundred dollars per day for each and every day during which the water supply should remain uncompleted. That the delay in the completion of the water supply by the said Flynn and the said ing customers for said water, which it otherwise would have obtained, and prevented it from selling a portion of the water which it otherwise would have sold, and caused it to lose many customers for the water, which, if said plant had been completed in accordance with said contract, it would have retained; and your orator says that the sum of five hundred dollars per day is not disproportionate to the loss suffered by your orator by reason of the failure of the defendants to complete the water-works within the time mentioned in the said contract. That the water from the new source was not turned on, on or before March first, nineteen hundred and four, and the East Jersey Water Company continued to deliver the temporary supply of water after March first, nineteen hundred and four, and charged and was paid therefor at the rate of three hundred and fifty-three thousand eight hundred dollars per annum, until the twenty-fourth day of May, nineteen hundred and four. That said sum of three hundred and fifty-three thousand eight hundred dollars per annum was so fixed by the defendants and the East Jersey Water Company and your orator, because it was the interest on the said consideration of seven million five hundred and ninety-five thousand dollars at four per cent., and fifty thousand dollars as representing the amount which it was assumed your orator might have to pay to its employees and others, if it were in possession of the said water plant and operating the same, including the expense of keeping the said plant in repair.

VIII. On the twenty-third day of May, nineteen hundred and four, by some arrangement unknown to your orator, between the East Jersey Water Company and the defendants, that Company ceased to furnish water to Jersey City and turned over to the defendants the supply-mains and gates through which water was furnished to your orator under said temporary contract Schedule "D," and thereafter, notwithstanding the protest of your orator, the defendants turned on water from this new supply, although said works were not completed, and claimed the right to charge, and rendered bills for, the water so furnished to Jersey City, thereafter, at the rate fixed by the contract Schedule "A" for water supplied by the million gallons, at which rate the amount to be paid by your orator exceeded the amount which would have been paid to the East Jersey Water Company, if it had supplied the water, by about eighty thousand dollars a year. That your orator could obtain a sufficient supply of water at that time, for the use of the inhabitants of Jersey City, only through said water-mains and gates, and from either the East Jersey Water Company or the defendants. That on the fifteenth day of November, nineteen hundred and four, in a letter bearing that date, the said Water Supply Company wrote to the Board of Street and Water Commissioners of Jersey City, to the effect that the water-works designed for the City of Jersey City were completed and in use and ready for the City to purchase the same, if desired. That on November twenty-fourth, nineteen hundred and four, the depth of the water in the reservoir was for the first time eight feet below the full water level throughout seventy-five per cent. of the entire area of the reservoir, that being the elevation required by the contract.

IX. That on the twelfth day of April, nineteen hundred and five, the defendants, the Water Supply Company, commenced a suit against your orator, alleging that it had supplied water to your orator under said contract Schedule "A" to the extent of thirty-three hundred and twenty-seven and seven-tenths millions of gallons, for which they had not been paid; and that there was due them from Jersey City therefor the sum of one hundred and fifteen thousand seven hundred and forty-four dollars and eighty cents, and praying judgment against your orator for that sum; and that your orator has pleaded thereto several pleas, to one of which the said Company has demurred, and to the others has replied, concluding to the country. That on the twenty-third day of June last, the said Company commenced a second suit against your orator to recover the sum of one hundred and five thousand seven hundred and thirty-two dollars for water supplied from February twenty-fifth, nineteen hundred and five, to May twenty-third, nineteen hundred and five; to which suit your orator has filed similar pleas to those filed in the first suit.

X. That the inhabitants of Jersey City at the present time require about thirty-three millions of gallons of water a day, and that the population of Jersey City is growing rapidly, and that the amount of water required by your orator daily, increases at the rate of about three per cent. per annum. That the only supply of water now available for the use of your orator in this State is from the watershed of the Passaic Valley; that the City of Newark and the East Jersey Water Company control such supply. That your orator cannot obtain a supply of water from the City of Newark or from the East Jersey Water Company, and it is therefore compelled to use the water from the works constructed by the defendants, notwithstanding the said plant has not been completed in accordance with the said contracts. That the voters of Jersey City having voted to purchase said water-works, and the water-works having thereafter been constructed for your orator under said contract, your orator became, and is the owner thereof in equity, and entitled to the possession thereof. That your orator is compelled for the reasons aforesaid to accept said water-works, notwithstanding they are not completed in accordance with the contract. That it desires to pay therefor, but it should not be compelled to pay to the defendants the said sum of seven million five hundred and ninety-five thousand dollars, for the following reasons:

That the defendants cannot convey the whole of said water-works to your orators, because,

(a) The defendants are not the owners of the land overflowed by the reservoir. That one William J. Righter has lately recovered a judgment in the Supreme Court of the State of New Jersey, against the defendants, for the damage to his land up to the commencement of his said suit, from water, resulting from the dam of the said reservoir at Boonton, and that said damage is a continuing damage.

(b) Because the defendants have not acquired the rights of the Morris Canal and Banking Company to divert water from the water supply about the reservoir at Boonton—that Company claiming to have a right to divert such water to such an extent as will prevent the defendants from furnishing to your orator the amount of water required by said contract.

(c) Because the defendants have not acquired the rights of riparian owners on the Rockaway River and its branches above said reservoir at Boonton, to so use their lands as to deposit in the waters of that stream matter which will pollute the water supply, and as a consequence prevent the delivery to your orator, of the said plant as a completed operating plant, free from pollution.

(d) Because the defendants have not obtained the consent of the riparian owners below said reservoir, to the diversion from said reservoir, by the defendants or by your orator, of the amount of water required by said contract to be delivered to your orator, except from the following riparian owners:

The Society for the Establishment of Useful Manufactures; The Dundee Water Power and Land Company; the East Jersey Water Company; the Acquackannock Water Company; the Passaic Water Company; and the Montclair Water Company.

There are many riparian owners on the Rockaway River, between the said reservoir and the Passaic River, whose consent to the diversion of the waters of the Rockaway River by the defendants or by your orator, is necessary, among whom are the following owners, namely:

Abram Vreeland, owning thirteen hundred and eighty-six feet along said river; the Estate of John P. Peer, owning twenty-eight hundred and seventy-five feet on said river; the Cullen Estate, owning twenty-nine hundred feet on said river; the Estate of Benjamin Starkey, owning thirty-one hundred feet on said river; Joseph H. Bastedo, owning twenty-nine hundred and sixty-one feet on said river; and Phineas Farrand, owning six thousand and fifty feet on said river.

That the defendants insist that they are not required by the terms of the contract to obtain the consents of any such owners to such diversion; whereas, your orator insists that the defendants are required by said contract to obtain such consents.

2. That the defendants cannot convey and deliver to your orator a completed operating plant, free from pollution, because polluted matter passes into this water supply from the following places, viz:

(a) From the lands known as the Cooper-Lord Estate.

(b) From the manufactories and mills at Boonton and Powerville.

(c) From the Lyondale Print Works.

(d) From the Hibernian Mines.

(e) From the Hibernian Village.

(f) From the Wharton Mines.

(g) From the Mount Hope Mines.

(h) From the Rockaway Village.

(i) From Mount Tabor, a camp in which, during the summer months, there are several hundred residents.

(j) From the Town of Dover, a growing town of several thousand inhabitants.

3. That the defendants cannot convey the works as provided for by the said contract Schedule "A," and the supplements thereto, because the same have not been constructed as required by said contract.

(a) The Parsippanny Dike, as now constructed, shows a seepage under the core wall, and in that respect is not in accordance with the contract.

(b) By the contract, the dam at Boonton was to be so built as to enable the City to divert and use seventy million gallons of water daily therefrom, by increasing the old Boonton Reservoir described in said contract, by raising the dam and thereby increasing the capacity thereof to the amount required. That in fact said dam has been so built that it cannot be raised in the manner specified in the contract; but, to enable your orator to divert seventy millions of gallons of water daily from this reservoir, a much larger sum must be expended by your orator than if said dam had been constructed as required by the contract.

(c) Because in constructing a tunnel through the Watchung Mountain, the defendants adopted a method of construction which was cheaper than that required by the contract. That your orator is entitled to an abatement of the consideration of the contract to the extent of the amount saved by the defendants in constructing their tunnel in a manner different from that required by the contract.

(d) Because the concrete conduits have not been demonstrated to be sufficient in size to deliver seventy millions of gallons of water daily under the head required by the contract.

(e) Because the fence has not been built around the reservoir.

4. That your orator cannot pay to the defendants the said consideration of seven million five hundred and ninety-five thousand dollars, because it is entitled to recoup the damages suffered by it by reason of the failure of the defendants to complete their contract by the twenty-fifth day of December, nineteen hundred and three.

5. Because, under the said contract, your orator, on the completion of the said works, is entitled to an opportunity to test the same, and it is incumbent upon your orator, before accepting the same, to make such test. That your orator, in order to make such test, requires, either that the defendants shall deliver over the said works to the representatives of your orator, for a reasonable period of time, not less than three months, or that the defendants shall place their agents, representatives and servants in charge of said works, under the direction, orders and control of the proper officials of your orator. That your orator has made demand upon the defendants, that the said works be delivered over to your orator for the purpose of making such test, which demand has been refused. And

further, that, in order to make such test, it is necessary that the full amount of water, to wit, fifty million gallons per day (which the plant, under the contract, must be sufficient to supply) should be delivered through the conduit and pipes for a reasonable period of time. That your orator has made demand that such amount of water be delivered in this manner and for this time, which defendants have refused. And defendants have also declined and refused to deliver any amount of water in excess of the present needs of the inhabitants of Jersey City, to wit, about thirty-three million gallons per day, unless your orator will agree to pay for such excess at the rate per million gallons provided for in the contract; whereas, your orator insists that, by the terms of said contract, your orator is not required to pay for any water supply after the completion of the works and during the test thereof preparatory to the acceptance of the same, and certainly it is not required to pay for any water in excess of the needs of your orator, which is used simply for the purpose of testing the capacity and quality of the works.

XI. That your orator is amply responsible for the payment to the defendants of the consideration for said water supply. That it cannot pay for the plant as completed in accordance with the contract, for the reasons heretofore stated. That it ought not to be compelled to raise the sum of seven million five hundred and ninety-five thousand dollars in order to make a tender to the defendants. That if the defendants can compel your orator to pay for the water by the million gallons, before said works are completed, they will obtain greater compensation for the plant than the seven million five hundred and ninety-five thousand dollars agreed by your orator to be paid said Flynn for said plant.

XII. That your orator tenders itself ready and willing to pay to the said defendants, on account of said plant and water supply, such part of said consideration as this Court shall determine, under the circumstances herein before set forth, it ought to pay therefor.

XIII. That the defendants insist that they are entitled to be paid, not only the sum of seven million five hundred and ninety-five thousand dollars, but also for the price of the water supplied to your orator since the twenty-first day of May, nineteen hundred and four, at the rate provided for by the contract if Jersey City had not voted to purchase the same; and they claim and insist that unless your orator pays said sum of seven million five hundred and ninety-five thousand dollars on or before the first day of October, nineteen hundred and five, that, under the terms of said contract, the defendants will continue to have and enjoy the exclusive right and privilege of maintaining said water-works for the term of twenty-five years as aforesaid, or that your orator pay them an additional sum of four hundred thousand dollars, notwithstanding the vote of said City to purchase the said water-works, and in violation of the conditions of said contract.

XIV. That the manufactory known as the Rag Mill or Factory at Powerville has not been eliminated; that no intercepting sewer has been built at Boonton, and that no sewage disposal plant has been built at Dover.

To the end, therefore, that the Jersey City Water Supply Company and Patrick H. Flynn, who are the defendants in this suit, may answer all and singular the premises and that particularly and in detail as if the same were here again rehearsed and they interrogated thereto, but without oath. And that it may be ascertained by reference to a Master or in such other manner as the court may deem proper how much and what part of said

Water Work system the said defendants can convey to your orator, what part of the said consideration of seven million five hundred and ninety-five thousand dollars should be paid by your orator to the said Jersey City Water Supply Company therefor, and that the said Patrick H. Flynn and the Jersey City Water Supply Company may be ordered by decree of this court to convey to your orator said water works or so much thereof as they are able to convey, upon payment by your orator of such part of said consideration as may be so ascertained, which part or price your orator is ready and willing and offers to pay and that the said Jersey City Water Supply Company may be enjoined from further prosecuting said suits at law against your orator, and that the said defendants deliver to your orator the possession of said water supply system, or that your orator may have possession of said works for making such tests, and that the defendants may furnish to your orator water free of charge for making such tests, and that your orator may have such other or further relief in the premises as the nature of the case may require and to this Honorable Court shall seem meet.

May it please Your Honor, the premises considered, to grant to your orator not only the State's writ of injunction issuing out of and under the seal of this court to be directed to the said defendant, the Jersey City Water Supply Company, enjoining and restraining it in manner or form aforesaid, but also the State's writ of subpoena to be addressed to the said defendants, commanding them on a certain day and under a certain penalty, therein to be expressed, to be and appear before your Honor in this Honorable Court to answer all and singular the premises and to stand to, abide by, and perform such order and decree as your Honor shall make therein, and that your orator may have such other and further relief as shall be agreeable to equity.

And your orator as in duty bound will ever pray, &c.

Robert Carey,
Solicitor for and of Counsel with Complt.

George L. Record, of Counsel.

James B. Vredenburgh, of Counsel.

Contract of February 28th, 1899.

THIS AGREEMENT, made this twenty-eighth day of February, eighteen hundred and ninety-nine, BETWEEN THE MAYOR AND ALDERMEN OF JERSEY CITY, a municipal corporation of the State of New Jersey, party of the first part, hereinafter called Jersey City, and PATRICK H. FLYNN, of the Borough of Brooklyn, in the City and State of New York, party of the second part, hereinafter called the Contractor, WITNESSETH:

WHEREAS, On the eighth day of July, eighteen hundred and ninety-eight, the Board of Street and Water Commissioners of Jersey City adopted specifications for a new water supply, which specifications are hereunto annexed, and made a part of this contract, and advertised for proposals for a supply of pure and wholesome water, based on such specifications to be received by said Board on the eighteenth day of August, eighteen hundred and ninety-eight; and

WHEREAS, After due advertisement said Board of Street and Water Commissioners did, on said eighteenth day of August, eighteen hundred and ninety-eight, receive such proposals; and

WHEREAS, The said Contractor in answer to such advertisement did present to said Board on said last mentioned day proposals for a new water supply under said specifications upon three plans, known as Plan No. 1, Plan No. 2 and Plan No. 3, a copy of which proposal under Plan No. 1 is hereunto annexed and made a part hereof; and

WHEREAS, On the eighth day of December, eighteen hundred and ninety-eight, the said Board of Street and Water Commissioners accepted the proposal of said Contractor under said Plan No. 1, and awarded a contract to him in accordance therewith and with said specifications, which award was on the twenty-first day of December, eighteen hundred and ninety-eight, concurred in by the Board of Finance of such City, and was on the first day of February, 1899, approved by the Mayor of such City;

NOW THEREFORE, In consideration of the premises and of One Dollar each to the other paid, it is hereby covenanted and agreed by and between the parties hereto as follows:

FIRST.—The said Contractor agrees to construct a new system of water works for Jersey City and to supply said City therefrom with pure and wholesome water, in strict conformity with said specifications and his proposal under Plan No. 1, and to enlarge said works if required by Jersey City, in the manner provided in said specifications and proposal. Such works shall be so constructed and maintained by the Contractor that the water delivered therefrom shall be pure and wholesome and free from pollution deleterious for drinking and domestic purposes during the time that Jersey City shall take water by the million gallons. If such works and supply are purchased by Jersey City they shall be delivered to said City as a completed operating plant free from pollution as aforesaid.

SECOND.—Jersey City agrees to take the water aforesaid, and use the same for its water supply, when said works are completed in accordance with said specifications, and Plan No. 1, as soon as the said Contractor is ready to deliver pure and wholesome water from such supply.

THIRD.—Jersey City agrees to pay for such water when delivered to it under said specifications and plan as follows:

For each million gallons of water furnished up to twenty-five (25) million gallons daily, thirty-six dollars ($36.00) per million gallons.

For each million gallons in excess of twenty-five (25) million gallons daily up to thirty (30) million gallons daily, thirty-four dollars ($34.00) per million gallons.

For each million gallons in excess of thirty (30) million gallons daily up to thirty-five (35) million gallons daily, thirty-two dollars ($32.00) per million gallons.

For each million gallons in excess of thirty-five (35) million gallons daily up to forty-five (45) million gallons daily, twenty-four dollars ($24.00) per million gallons.

For each million gallons in excess of forty-five (45) million gallons daily up to the limit of capacity of the water works, twenty dollars ($20.00) per million gallons.

FOURTH.—Said specifications and accepted proposal under Plan No. 1 which are hereto annexed, are hereby made a part of this contract.

FIFTH.—The said Contractor hereby covenants and agrees that he will, upon the receipt of notice as provided in the specifications and the payment of the purchase price, sell and convey said water supply with the appurtenances to Jersey City upon any of the following options:

For the water works and all appurtenances thereof necessary to fulfill the requirements of the specifications to the extent of fifty (50) million gallons of water daily, together with the water supply, water rights, lands, reservoir sites, rights of way and all easements necessary to fulfill the requirements of the specifications and to the extent of seventy (70) million gallons of water daily forever, which purchase can be made by the City when the water works are completed and accepted hereunder; provided that the City shall give notice of its intention to purchase within one year after the date of contract, the sum of seven million five hundred and ninety-five thousand dollars ($7,595,-000.00).

For the water works and all appurtenances thereof necessary to fulfill the requirements of the specifications to the extent of fifty (50) million gallons of water daily, together with the water supply, water rights, lands, reservoir sites, rights of way and all easements necessary to fulfill the requirements of the specifications and to the extent of seventy (70) million gallons of water daily forever, which purchase can be made by the City at the expiration of five (5), ten (10) or fifteen (15) years from the date of contract; provided, that the City shall give notice of its intention to purchase at least one year in advance of such purchase, the sum of seven million nine hundred and ninety-five thousand dollars ($7,995,000.00).

For the water works, water supply, water rights, lands, reservoir sites, rights of way and all appurtenances and easements necessary to fulfill the requirements of the specifications and to the extent of seventy (70) million gallons of water daily forever, which purchase can be made by the City when the water works are completed and accepted hereunder; provided, that the City shall give notice of its intention to purchase within one year from the date of contact, the sum of eight million seven hundred and forty-five thousand dollars ($8,745,-000.00).

For the water works, water supply, water rights, lands, reservoir sites, rights of way and all appurtenances and easements necessary to fulfill the requirements of the specifications and to the extent of seventy (70) million gallons of water daily forever, which purchase can be made by the City at the expiration of five (5), ten (10) or fifteen (15) years from the date of contract; provided, that the City shall give notice of its intention to purchase one year in advance of such purchase, the sum of nine million two hundred and forty-five thousand dollars ($9,245,000.00).

SIXTH.—It is understood and agreed that in case the City shall give notice within one year from the date of this contract of its intention to purchase said water supply and water works under said specifications, when the water works are completed and accepted, that then the City shall have such reasonable time to test said works and the water supply after completion, and before the acceptance thereof for purchase, as Jersey City may deem necessary and reasonable for that purpose; provided such test shall not extend beyond a period of four years and eleven months from the date of this contract.

SEVENTH.—Upon the purchase of the works and water supply by the City under any of the options aforesaid, the said Contractor shall turn over and deliver to the City, Searches, Abstracts and Guarantees of Title, for all the lands, water rights and easements obtained for such works made by the New Jersey Title Guarantee and Trust Company of Jersey City, or by approved counsel, which Abstracts and Guarantees of Title shall be continued and guaranteed down to the date of the transfer of the water works to the City without cost or expense to such City.

EIGHTH.—It is further understood and agreed that all sewers and sewage disposal works constructed or arranged for by the contractor to prevent pollution or to carry off pollution existing in the watershed shall, under said specifications and plans, be so constructed and arranged for by him that in the event of the purchase of the water supply and plant by Jersey City under any of the options aforesaid the operation and maintenance of such sewers and sewage disposal works for the purposes aforesaid, shall not be a charge upon or expense to Jersey City.

NINTH.—It is further understood and agreed that so long as Jersey City shall continue to take water by the million gallons without purchasing the water supply and works under the options aforesaid, no water shall be sold or furnished by said Contractor to any other person or municipality from any point on the main pipe line or lines between the intake at Old Boonton and the Bergen Reservoir in Jersey City, said pipe line or lines being intended for the exclusive use of Jersey City; nor shall any water be furnished from said water works by said Contractor to any consumer of Jersey City water.

TENTH.—Nothing in this contract contained shall be construed as an abandonment by Jersey City of its rights in the Passaic River at Belleville, New Jersey, or elsewhere, as vested in it by Legislative grant, Riparian ownership or otherwise.

ELEVENTH.—The provisions of this contract shall apply to and bind the successors and assigns of Jersey City, and the heirs, executors, administrators and assigns of the said contractor.

IN WITNESS WHEREOF, The said party of the first part hath caused its corporate seal to be hereto annexed and these presents (executed in triplicate) signed by its Mayor, the President of the Board of Street and Water Commissioners and the President of the Board of Finance, and attested by the City Clerk; and the said party of the second part hath hereunto affixed his hand and seal the day and year first above written.

In presence of

EDWARD HOOS,
Mayor.

Attest:
M. J. O'DONNELL,
City Clerk.

Corporation of
Jersey City
Seal.

ANTHONY HAUCK,
President of Board of S. and W. Commissioners.

Attest:
GEO. T. BOUTON,
Clerk.

WM. C. HEPPENHEIMER,
President Board of Finance.

Attest:
MARTIN FINCK,
Clerk.

PATRICK H. FLYNN, (Seal)

In presence of
HENRY BELDEN.

KNOW ALL MEN BY THESE PRESENTS, That we, PATRICK H. FLYNN, of the Borough of Brooklyn, in the City and State of New York, as principal, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, a corporation organized under the laws of the State of Maryland and authorized to transact business in the State of New Jersey, as surety, are held and firmly bound unto the Mayor and Aldermen of Jersey City, a municipal corporation of the State of New Jersey, in the sum of five hundred thousand dollars, lawful money of the United States of America, to be paid to the said The Mayor and Aldermen of Jersey City, its successors or assigns, for which payment well and truly to be made, we bind ourselves, our and each of our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

Sealed with our seals and dated this twenty-eighth day of February, eighteen hundred and ninety-nine.

WHEREAS, The said The Mayor and Aldermen of Jersey City and the said Patrick H. Flynn, have this day entered into a contract for the construction of water works and the furnishing of a new water supply to said City by said Flynn, which contract is hereunto annexed;

NOW THEREFORE, The condition of this obligation is such that if the said Patrick H. Flynn, his heirs, executors, administrators or assigns, shall well and faithfully keep and perform the covenants, agreements and conditions of said contract in accordance therewith and with the specifications and proposals thereunto annexed, then this bond or obligation shall be void, but otherwise to remain in full force and virtue.

THIS Bond shall remain in effect up to the date of the acceptance of a water supply under said contract by Jersey City, and the furnishing by the said Contractor of a new bond satisfactory to the City for the sum of five hundred thousand dollars for the faithful performance of the above mentioned contract throughout its period, which last mentioned bond shall remain in force so long as Jersey City shall purchase water of the Contractor by the million gallons under said contract above recited.

Upon the acceptance of such water supply and the approval of such new bond this bond shall be cancelled.

In presence of
HENRY BELDEN,

PATRICK H. FLYNN, (Seal)

FIDELITY AND DEPOSIT CO., OF MARYLAND,
By Henry V. Platt,
Vice-President.
Attest, John W. Wooten.
Attorney.

Fidelity and
Deposit Company
of Maryland.
Incorporated 1890.

U. S. Revenue Stamps, $12.50.

Approved as to form,
ALLAN L. McDERMOTT, C. C.

Specifications for a New Water Supply for Jersey City, N. J. Approved July 9, 1898.

The Mayor and Aldermen of Jersey City, by the Board of Street and Water Commissioners, will receive proposals for a supply of pure and wholesome water based on this specification, at the meeting room of the Board, at the City Hall, Jersey City, New Jersey, on the 18th day of August, 1898, at 10 o'clock A. M.

Bidders must submit proposals under the following plan:

PLAN.

The water must be delivered by gravity at Bergen Reservoirs. The first works must be constructed with storage and intake reservoirs of sufficient capacity and so located as to be capable of collecting and delivering fifty (50) million gallons daily at all times, and a single conduit having a capacity to deliver seventy (70) million gallons daily if of masonry or in tunnel, or fifty (50) million gallons daily if of steel pipe; delivery of said conduit to be at Bergen Reservoirs, with a pressure equivalent to an elevation of 210 feet above mean high tide. All gatehouses at intakes and points of delivery, and all points of connection of steel with masonry conduits shall be provided with connections for a second steel pipe of thirty (30) million gallons daily capacity. The lands, reservoir sites, water rights and easements necessary to enable the city to divert and use seventy (70) million gallons daily must be acquired.

Whenever during the term of contract, but prior to the exercise of the City's option to purchase, the City shall notify the contractor to increase the capacity of his water works, then the contractor shall immediately proceed to construct such additional storage and intake reservoirs as may be necessary, so located and of such capacity as to be capable, together with those previously constructed, of collecting and delivering seventy (70) million gallons daily at all times, and he shall likewise proceed to construct a second steel pipe where such pipe may be necessary to enable him to deliver thirty (30) million gallons daily additional into Bergen Reservoirs at an elevation of 127 feet above mean high tide, and shall so perfect and complete his water works in all details as to make them capable of collecting and delivering to the City seventy (70) million gallons daily at all times. Such additional works shall be completed within two years after the service of the aforesaid notice, and when so completed, on demand of the City, the City will agree to take and pay for at least fifty (50) million gallons of water daily. But the contractor shall in no case be compelled to complete these additional works earlier than the first works are to be completed hereunder.

If the conduit or conduits shall pass within one thousand feet of Belleville Reservoir, connections must be provided therewith, and the City may require delivery of a part of the supply into said reservoir.

GENERAL CONDITIONS.

The City reserves the right to reject any or all bids made by virtue of this specification.

Proposals will not be received after the time fixed by the advertisement.

Proposals must be made on blank forms, to be obtained at the office of the Clerk of the Board of

Street and Water Commissioners, and must be delivered in open meeting, and when called for, to that officer, in a sealed envelope, to be endorsed "Proposals for New Water Supply for Jersey City, N. J."

Prices must be stated in figures and writing.

Any proposal under this specification which does not comply with all of its requirements will be deemed informal and rejected.

Bidders must submit and annex as a requisite to their proposals such descriptions, plans and drawings as may be necessary to make clear the essential features of the works proposed to be built, and must show the location, area, depth and capacity of all reservoirs, the location of intakes, the route, profile and hydraulic gradient of conduits, with all necessary data for determining their carrying capacity, and the location, area and extent of the gathering grounds.

In case future exploration and boring shall demonstrate that the subsoil of any of the storage reservoirs offered is unfit for the construction of safe and practicable dams, the contractor will be allowed to furnish other reservoirs of equal value and efficiency and acceptable to the Engineer.

CERTIFIED CHEQUE TO ACCOMPANY BID.

As an evidence of good faith, each bidder will deposit one hundred thousand dollars in one of the national banks of Jersey City, or the New Jersey Title Guarantee and Trust Company, and attach to his proposal a certified cheque for the amount, payable to the order of the Treasurer of Jersey City. On award of the contract, such cheque will be returned to unsuccessful bidders, and returned to the successful bidder on signing and delivery of the contract; but will be forfeited by the successful bidder, to the use of the City, in case the contract is not signed within ten days after it is ready for execution on part of said contractor. Said cheque shall be in lieu of freeholder security.

Any bidder may, on one certified cheque, make one or more bids upon the plan hereby presented by the City, and said cheque shall stand as security for each bid so made.

BONDS.

The contractor must furnish a bond of five hundred thousand dollars, the security to be subject to approval according to law, for the performance of the contract up to the date of acceptance of water supply thereunder, at which time and upon the delivery to the City of the bond hereinafter provided for, this bond is to be cancelled. Upon the acceptance of water under this contract, the contractor must furnish a new bond for five hundred thousand dollars for the faithful performance of the contract throughout its period, which bond is to be in force so long as the City shall purchase water of the contractor by the million gallons, but will be cancelled on completion of a purchase of the plant by the City.

FORM OF BOND.

The form of all bonds mentioned in this specification shall be approved by the Corporation Counsel.

DRAWING OF CONTRACT.

The contract to carry into effect this specification shall be prepared by the Corporation Attorney with the approval of the Corporation Counsel.

TERM OF CONTRACT.

If a contract is entered into it will run for twenty-five years from the date of contract, unless sooner terminated by a purchase of the water works by the City as herein provided for.

IN CASE CONTRACT IS CONTESTED.

In case an award of contract shall be made, and the legality of such award and the carrying out the provisions of the specifications or any portion thereof shall be legally contested, due diligence must be used in effecting a speedy settlement of such contest to a conclusion, and to the attainment of that end no postponement or delay in the hearing of such case or in its prosecution or process of settlement shall be consented to or requested by the successful bidder or by any one representing him, unless the same shall have been first agreed to by the Mayor or Corporation Counsel of Jersey City.

AMOUNT THE CITY AGREES TO TAKE.

The City will agree to take at least twenty-five (25) million gallons of water per day and to take its whole supply of water from the contractor during the term of contract.

QUALITY OF WATER.

The water to be furnished must be pure and wholesome for drinking and domestic purposes.

If the villages, boroughs or cities of Port Oram, Dover, Rockaway, Boonton, Butler, Bloomingdale or Pompton, or any other municipality in New Jersey, or Suffern, Hillburn or Tuxedo Park, or any other municipality in New York, or any citizen thereof, or any manufacturing establishment therein or on the streams below said villages, boroughs or cities shall, in the judgment of the Hudson County Board of Health, seriously pollute the water supply at any time prior to a purchase of the works of the City, the Contractor, upon notice by the City of the existence of such pollution, shall forthwith prevent such pollution.

All powers possessed by the City shall be exercised in aiding such prevention. The City shall not be bound to accept any plant or water therefrom, until the supply is free from pollution.

HOW TO BID.

Bidders must state a price per million gallons for a supply of twenty-five million gallons daily; a price per million gallons for all in excess of twenty-five million gallons daily up to thirty million gallons daily; a price per million gallons for all in excess of thirty million gallons daily up to thirty-five million gallons; a price per million gallons for all in excess of thirty-five million gallons daily up to forty-five million gallons daily, and a price per million gallons for all in excess of forty-five million gallons daily up to the limit of capacity of the works.

Bidders must also state a price for which the City can buy and own the water works of a capacity of fifty (50) million gallons daily, together with the water supply, water rights, lands, reservoir sites, rights of way and all easements necessary to fulfill the requirements of this specification and to the extent of seventy (70) million gallons of water daily; said purchase to take effect on completion and acceptance of the works, if the City shall give notice of its intention to purchase within one year after the date of contract.

Bidders must also state a price for which the City can buy and own the water works of a capacity of fifty (50) million gallons daily, together with the water supply, water rights, lands, reservoir sites, rights of way and all easements necessary to fulfill the requirements of this specification and to the extent of seventy (70) million gallons of water daily; said purchase to take effect at the expiration of five, ten or fifteen years from the date of contract, but the City shall give notice of its intention to purchase one year in advance of said purchase.

Bidders must also state a price for which the City can buy and own the water works, water supply, water rights, lands, reservoir sites, rights of way and all appurtenances and easements necessary to fulfill the requirements of this specification and to the extent of seventy (70) million gallons of water daily forever; said purchase to take effect on completion and acceptance of the works if the City shall give notice of its intention to purchase within one year after the date of contract.

Bidders must also state a price for which the City can buy and own the water works, water supply, water rights, lands, reservoir sites, rights of way and all appurtenances and easements necessary to fulfill the requirements of this specification and to the extent of seventy (70) million gallons of water daily forever; said purchase to take effect at the expiration of five, ten or fifteen years from the date of contract, but the City shall give notice of its intention to purchase one year in advance of such purchase.

HOW PAYMENT WILL BE MADE.

The City will pay quarterly the sum due to the Contractor at such depositories as the Contractor may designate, and at such times as are agreed upon in the contract.

Prices will be computed and payments made on the average daily supply for each quarter of the calendar year.

CONTRACTOR TO MEASURE WATER.

The contractor shall measure the water delivered to the City at his own expense, under the supervision of the representatives of the City, who shall have free access to the meters at all times. In case of a dispute as to the amount delivered, the City shall pay the same amount paid in the corresponding quarter of the previous year, and the disputed amount shall be settled by arbitration—one arbitrator to be named by the City, one by the contractor, and the third to be selected by the two so chosen, the decision of a majority of the three to be final. If the amount so determined shall the greater than that already paid, the City will pay the excess; but if it shall be less, the difference shall be deducted from some quarterly payment following the decision of the arbitrators. The water shall be measured upon the City's property, as near as may be to the points at which the City receives the water into its reservoirs or pipes. The meter shall be of a kind acceptable to the City, and if found inaccurate at any time shall be changed on demand.

HOW BIDS WILL BE COMPARED.

As a basis for comparing the prices per million gallons an initial consumption of twenty-five million gallons daily, increasing at the rate of three per cent. per annum will be assumed.

LOCATION OF PLANT.

The intakes and the conduits leading therefrom to the City must be wholly within the State of New Jersey.

WORK MUST BE INDEPENDENT.

The water works must be so constructed that they may be used and operated to supply Jersey City exclusively, and the contractor must agree to furnish no water therefrom to any consumer of Jersey City water.

TIME TO COMPLETE.

The contractor will be allowed two years and six months from the date of contract to complete the work and furnish the water specified.

For every day's delay beyond the term of contract, the contractor shall pay the City of Jersey City the sum of five hundred (500) dollars per day as liquidated damages, and not by way of penalty.

All the time lost by reason of strikes, accidents or other delays unavoidable or beyond the control of the contractor, shall not be computed as part of the time herein specified, if the unavoidability of such delays is certified to by the Engineer appointed by the City to superintend said work.

RIGHT OF EMINENT DOMAIN.

The City will agree to exert or exercise such powers or rights in the matter of condemnation or otherwise as it now has or may hereafter acquire, and which may be advantageously used or exercised for the purposes of the contract, in order to enable the use or acquisition of such water and water rights and lands or other property, for the right of way, storage reservoirs and other works or plants, as may be necessary to the proper and convenient construction and maintenance of said system of water works to supply Jersey City as aforesaid, said rights of condemnation to be exercised in the name of the City, but at the cost and expense of the contractor; and the contractor shall pay and hold the City harmless of and from all cost, expenses, claims, and demands of all persons by reason of the taking and acquiring for the purpose of the proposed contract of all lands, water, water rights and other property. The City will also agree to exercise, on demand of the contractors, all its legal powers to prevent pollution of waters tributary to the proposed works, but all expenses attendant upon the prevention of such pollution shall be borne by the contractor.

USE OF CITY LAND AND STREETS.

The City will, so far as it has legal power, permit the contractor to use such lands as it may now own or control as may be necessary for the purpose of laying and maintaining the proposed conduit from Passaic River to the reservoirs at Jersey City Heights.

The contractor, in constructing the works required and necessary to be built under the contract, shall have the right to lay pipes through the streets, avenues and lands of the City, public parks excepted; provided, however, that such construction through such streets, avenues and lands shall be made under the direction of the Board of Street and Water Commissioners, and shall not interfere with or injure other constructions or works made therein; and that the contractor shall, at his own cost and expense, immediately fill up all excavations and relay any pavement or sidewalk removed and leave such streets, avenues and lands in as good condition after such pipes are laid therein as they were before such work was commenced.

INSPECTION.

The Engineer shall have the right to inspect and test the character of the work performed and the material used in constructing the water works, and the contractor shall afford said Engineer reasonable facility for making such tests and inspection. Defective work and material may be condemned by the Engineer at any time before the final acceptance of the work; and when such work has been condemned it shall be immediately taken down and rebuilt in accordance with the plans and specifications. When defective material has been condemned it shall be at once removed from the work and disposed of to the satisfaction of the Engineer.

Copies of all plans and working drawings prepared by the contractor for use on the work shall be filed with the Engineer before such plans and drawings shall be used in construction. If such plans and drawings do not conform to the specifications they may be rejected by the engineer, and after such rejection they shall not be used on construction.

The contractor shall be served with a written notice from the Engineer to replace or remove any rejected work or material or any work or material which may prove defective on the final test of the water works or in their use and operation prior to the purchase thereof by the City, which notice shall designate a reasonable time for the completion of such replacement or removal, and if the contractor shall neglect or refuse to obey such notice then the City will replace or remove the same at the expense of the contractor.

The final tests of the works will be the turning on of the water and its delivery in the specified amount to the City. Under this test the works must be free from leaks and imperfections and must prove themselves efficient, serviceable and durable for the purpose intended.

All parts of the work exposed to the eye shall be of neat and workmanlike appearance, without unnecessary ornamentation, and shall be of thorough, proper, and workmanlike construction, sound, solid and sufficient.

The specifications are intended to secure first-class material and workmanship throughout. Any workmanship or material not mentioned or described, which may be necessary to make the works to be constructed complete, and in all respects of the best quality and efficiency, shall be furnished and performed by the contractor as fully and thoroughly as if the full details and specifications therefor had been given herein.

MAINTENANCE.

The contractor shall maintain the water works in good condition and thorough repair so long as the City shall purchase water hereunder.

ABANDONMENT OF CONTRACT.

If the Engineer shall certify that the contractor has abandoned the work to be done under the contract, or that said work is being unnecessarily or unreasonably delayed, or that the contractor is wilfully violating any of the terms, covenants and agreements of the contract, or is not executing this contract in good faith, or is not making such progress as to indicate its completion within the required time, then the Board of Street and Water Commissioners shall have the power and right to notify the contractor to discontinue all work or any part thereof under this contract, and upon such notification said contractor shall discontinue said work or such parts thereof as said Board may designate; and said Board shall thereupon have the power to relet the work, or any part thereof, and to complete the same at the cost and expense of the contractor; and the expense so charged shall be deducted and paid by said Board out of such money as may be due, or become due at any time thereafter, to said contractor under this contract or any part thereof. In case such expense is less than the sum which would have been payable under this contract, if the same had been completed by said contractor, it is agreed that said contractor shall be entitled to receive the difference; and in case such expense shall exceed the sum which would have been payable under this contract if the same had been completed by said contractor, then said contractor shall pay the amount of such excess to said City, on notice from said Board of the excess so due.

UNPAID CLAIMS.

The contractor shall pay punctually all the workmen who shall be employed in constructing the water works, and the persons who shall furnish material therefor, and shall furnish the Board of Street and Water Commissioners with evidence satisfactory to said Board that all persons who have done work or furnished materials under this contract and have filed any account of such claims with said Board, have been fully paid, or are not entitled to any lien under the laws of this State. In case such evidence be not furnished, said Board may withhold such amount as it may deem necessary to meet the lawful claims of the persons aforesaid, from the monies due the contractor under this contract until such liabilities have been discharged, and until evidence thereof is furnished said Board. If such evidence is not furnished when the final payment under the contract shall become due then the Board may pay such claims to the persons claiming the same and charge the amount thus paid to the contractor, who shall accept the same as payment to the amount thereof upon this contract.

LIABILITIES FOR DAMAGES.

The contractor shall put up and maintain such barriers and red lights as will effectually prevent any accident in consequence of his work, for which the City might be liable, and he shall be liable for all damages occasioned in any way by his acts or neglect, or that of his agents, employees or workmen.

USE OF PATENTED DEVICES.

All fees for any patented invention, article or arrangements that may be used upon or in any manner connected with the construction, erection or maintenance of the work, or any part thereof, embraced in these specifications, shall be included in the price mentioned in the contract, and the contractor shall protect and hold harmless the City against any and all demands for such fees or claims, and before the final payment or settlement is made on account of the contract, the contractor must furnish acceptable proof of a proper and satisfactory release from all such claims.

THE BIDDER MUST INFORM HIMSELF.

Each bidder must fully and carefully examine the specifications. Each bidder hereunder hereby admits that he has read and fully understands the meaning of each and every clause of the specifications, and that he will comply with all the terms of the same.

WHAT CONSTITUTES THE CONTRACT.

The advertisement, the specifications, the accepted proposals and all maps, plans and drawings accompanied, attached to or described therein, the specific contract and the contractor's bond are to be considered essential portions of the complete contract.

MEANING OF CITY.

Whenever the word City is used herein reference is made to the Mayor and Aldermen of Jersey City, in the State of New Jersey.

MEANING OF ENGINEER.

Whenever the word Engineer is used reference is made to an Engineer to be appointed by the Board of Street and Water Commissioners of the City of Jersey City, New Jersey, to superintend the construction of the water works, or to his authorized assistants.

MEANING OF CONTRACTOR.

Whenever the word contractor is used reference is made to the person or persons or corporation contracting to perform the work or furnish the materials provided for under these specifications.

SPECIFICATIONS.

GATHERING GROUNDS.

The drainage area or catchment from which the supply is derived must have such an area that the maximum quantity of water called for may be obtained without exceeding a draft of 666,000 gallons for each square mile of catchment.

STORAGE CAPACITY.

The available storage capacity of the reservoirs will be taken to be the capacity between the level of the waste-weir and the lowest level to which the reservoir can be drawn through its effluent pipes; but if this storage capacity shall exceed 175 million gallons for each square mile of drainage area tributary to said reservoir, then the available or effective capacity of said reservoir will be taken at 175 million gallons for each square mile of said drainage area. The amount of effective storage so determined must be equal to that given in the following table. In this table the area of catchment or drainage area being given in the first column, the corresponding storage capacity to be required for a draft of 50,000,000 gallons daily will be found on the same line in the second column, and for a draft of 70,000,000 gallons daily in the third column of the table. In case the area of catchment is not given in the table, then the required storage capacity must be determined by interpolation:

TABLE.

	Storage Required in Million Gallons for the Given Daily Draught.	
Number of Square Miles of Catchment.	Draught 50 Million Gallons Daily.	Draught 70 Million Gallons Daily.
76	9,880	
80	9,448	
90	8,838	
100	8,300	
105	8,022	13,650
125	7,000	12,450
150	5,580	11,070
200	3,770	8,360
300	1,800	4,740
400	500	2,440

STORAGE RESERVOIRS.

The reservoir sites must be thoroughly cleared and prepared, to the end that the water flowing therefrom shall at all times be pure and wholesome, and free from harmful or deleterious matter or substance. All trees dead and fallen timber, logs, saplings, underbrush, vegetation, stumps, posts and other material must be thoroughly grubbed and removed, and the whole of the material stacked and burned or otherwise disposed of outside of the reservoir limits, and the total area must be raked clear of all refuse, dead leaves, vegetation and other rubbish, and thoroughly cleaned and prepared in every way, and all slopes properly protected, so as to be fit for the purpose intended before water is let in the reservoirs.

It is not hereby intended that healthy upland sod or soil must be removed, but the removal of mud or swamp soil containing decomposing vegetable matter may be required by the Engineer.

If any artificial lakes or ponds where the water surface has been extended by the flooding of adjoining lands, shall be used as reservoirs they shall first be drawn down and their beds properly prepared, in accordance with these specifications, before being put in service, if the Engineer shall so direct.

There shall be a clear space around the water-line of the reservoirs, and not less than sixty feet in width, and additional space where it may be needed, which is to be included in the conveyance of the reservoir sites to the City. This requirement will not be enforced for the entire water-line in case Lake Hopatcong or Greenwood Lake are offered as reservoirs, provided that the bidder specifies in his bid what portions of the margins of those lakes he wishes excepted therefrom, and provided further that he succeeds in preventing harmful pollution of the water by a proper exercise of the powers herein placed at his disposal, or by other means.

The depth of reservoirs shall in all cases exceed eight feet below the full water-level throughout seventy-five per cent. of the entire area of the reservoir.

The reservoir dams may be either of masonry or earth embankments, as may be best suited to the different localities. They shall be of sufficient height and strength, of the best adapted shape, and built in the most substantial and thorough manner, on properly prepared foundations, with the necessary effluent pipes, gate-houses, with the gate-chambers and vaults, gates, valves, screens and all other appliances and appurtenances proper for the purpose intended, with the necessary slope walls, bywash, waste-weirs, blow-offs, drains and waste-pipes, and they shall be provided with such sufficient space or area of land along the foot and side as may be necessary to protect the same, and shall be fenced where required. In case there should not exist a public road, or roads leading to and permitting access to the reservoirs, where located, necessary lands and right of way shall be acquired and furnished to give such access.

CONDUIT CAPACITY.

The carrying capacity of all riveted steel conduits will be determines by the Kutter formula, taking the coefficient N to equal .016 (sixteen-thousandths). The smallest interior diameter of the shell as constructed shall be considered to be the diameter of the pipe.

The carrying capacity of all masonry conduits or tunnels will be determined by the Kutter formula, taking the coefficient N to equal .014 (fourteen-thousandths) for brick-work, concrete or ashlar masonry lining, and .018 (eighteen-thousandths) for rubble lining. All such masonry tunnels or conduits shall be capable of delivering the full supply called for when discharging with a free upper surface the water surface not to be higher than one foot below the top of the arch.

The head to be used for computing the capacity of the conduits shall be the difference between the low-water level, or the bottom elevation of the available capacity of the reservoir or reservoirs at the points of intake, and the height or elevation of delivery at the points of delivery designated in these specifications.

RIGHT OF WAY.

The right of way for conduits shall in no case be less than forty feet in width, and shall be sufficient to enable the City in case of purchase fully to protect the pipe or pipes laid therein, and to maintain and repair the same. The right of way shall extend from the reservoir or reservoirs at the point or points of intake to the points of delivery. Each conduit shall be constructed on one and the same side thereof throughout, and so as not to occupy more thereof than is necessary. Where the City furnishes right of way over lands which it now owns, the conduits shall be laid on that part thereof designated by the Engineer.

LAYING OF CONDUITS.

The conduits shall be laid in the best and most thorough manner on true grade lines on a bed or foundation properly prepared, and where necessary to procure such foundation on piling. The curvature of the pipe shall in no case be sharper than ten degrees. Cast-iron pipe with flexible joints or other devices acceptable to the Engineer may be used at stream crossings. If steel pipe is used where the stream exceeds 25 feet in width, it must have a thickness one-quarter of an inch greater than that required for the same pressure elsewhere.

Where pipes are laid in excavation the top of the pipe shall be covered by at least three feet of earth, and the pipes shall be so placed as to bring all the longitudinal seams on the upper quarter of the circumference.

Where the pipe is to be laid across rock, swamp, or meadow it may be above the surface of the ground, but must be covered with satisfactory earth, sand or gravel, so that it shall everywhere have at least three feet of such covering. In all such cases, and on all embankments the contractor must sow grass seed, or sod, or otherwise protect said embankments. Necessary culverts and other constructions must be made to secure the proper drainage of the adjoining land.

CONNECTIONS.

If two steel pipes are laid they are to be connected at proper points and in such manner that any section of either pipe between such connections may be shut off or emptied in order to be cleaned, inspected and repaired without interfering with the flow of water in any of the other sections. If but one pipe is laid, proper provisions must be made for such connections with a second pipe, so that said connections can be made without interfering with the flow of water in the first pipe. Such a connection shall be made or provided for immediately below any intake dams, also on the river bank nearest the intake at each point of crossing of the Passaic and Hackensack Rivers. On the opposite bank at such crossings a single gate must be placed on each conduit. Other like connections must also be made or provided for, so that there shall nowhere be a stretch exceeding five miles in length without such connections or provision for such a connection.

GATES.

Gates or stop-valves are to be furnished and so placed as to divide each pipe into approximately one and one-half mile sections, and preferably are to be located on summits. All gates are to be iron-bodied, bronze-mounted double gates, tested to 300 pounds pressure per square inch, and are to be united to the pipe-lines by flanged joints. All such gates or stop-valves and all other fittings used on the conduits shall be equally capable with the conduit adjacent thereto to resist any pressures or strains to which they may be subjected.

All the composition metal used, excepting the valve-stem, shall be composed of eighty-five per cent. copper, ten per cent. tin and five per cent. spelter, and shall have a tensile strength of not less than 22,000 pounds per square inch, with five per cent. elongation in eight diameters and five per cent. reduction of area at breaking point. The valve-guides must be straight and smooth. All face joints must be plain, true and smooth, so as to make perfectly watertight joints, with a very thin layer of pure lead cement. Valve-stems shall be made of bronze, having a tensile strength of not less than 30,000 pounds per square inch, and the screw-threads thereon shall be cut accurately to work true and smooth throughout the entire lift of the valve. On the upstream side of each main stop-valve a blow-off shall be placed and interlocked with the stop-valve by proper device, so that the blow-off must be open before the main valve can be closed.

AIR-VALVES.

Every summit on the pipe-line shall be provided with an air-valve of the most approved pattern and of size properly proportioned to the duty it has to perform, and shall be provided with a stop-valve bolted to a flanged casting or forging riveted upon the top of the pipe. Similar air-valves shall also be placed on each side of every gate. They shall be properly encased and protected from possibility of damage from frost or mischief, but so arranged as to be readily accessible for inspection or testing.

BLOW-OFFS.

In all depressions blow-offs shall be located for emptying the pipe, They shall be provided with two 8-inch valves bolted together and to a flanged casting or forging riveted upon the pipe. Particular care must be taken to have the foundation for both pipe and blow-off secure from risk of unequal settlement. An iron pipe shall be provided to carry the water from the blow-off to a natural water-course or ditch.

STEEL PIPES.

The plates used in the construction of the conduits shall in no case be less than one-quarter of an inch in thickness, and the working strain due to the static head of water to which they will be subjected shall, under no circumstances, exceed nine thousand pounds per square inch section.

The steel for the plates of the conduit shall be of the class called "soft," and shall be made by the basic or acid open-hearth process. If by the basic open-hearth process the steel shall contain not more than three one-hundredths per cent. of phosphorus and four one-hundredths per cent. of sulphur. If by the acid open-hearth process, the steel shall contain not more than seven and one-half one-hundredths per cent. of phosphorus and four one-hundredths per cent. of sulphur. The amount of manganese and carbon to be in such quantities as shall produce the best results. The tensile strength of the steel shall be between the limits of (52,000) fifty-two thousand and (62,000) sixty-two thousand pounds per square inch, the test specimens to be 8 inches long and 1½ inches wide between measuring points.

The elastic limit shall not be less than one-half the tensile strength required. The elongation to be not less than twenty-five per cent., and with a reduction of cross-sectional area at the point of fracture of not less than 50 per cent.

Bending-test specimens cut lengthwise or crosswise from the sheets or plates to be six inches long and one inch wide, to be bent 180 degrees upon itself when cold, and hammered down flat without sign of fracture on the outside of the bent portion.

Punching-test specimens of the sheets or plates to be $1\frac{3}{4}$ inches wide and not less than ten inches long, in the middle of which a row of not less than eight holes, three-quarters of an inch in diameter, spaced one and one-quarter inches between centres, shall be punched without causing cracks; such punching to be made when the steel is cold.

Drifting-test specimens of the sheets or plates to be sheared three inches wide and not less than five inches long, in which not less than two holes, three-quarters of an inch in diameter, spaced two inches between centres, and one and one-half inches from the edges, shall be punched, and then enlarged by blows from a sledge-hammer upon a drifting-pin, until said holes are at least one and one-quarter inches in diameter, without causing any cracks; such enlargements to be made when the steel is cold.

The sheets or plates must also admit of cold hammering or scarfing to a fine edge at the laps without cracking, and the test pieces must, furthermore, stand such quenching, forging and other tests as may suffice to exhibit fully the temper, soundness and fitness for use of the material. The failure of said test specimens, when taken at random as aforesaid from the finished product of any "heat" or "melt," to conform to the above requirements, will be sufficient cause for the rejection of the entire product of such "heat" or "melt." The sheets or plates shall be free from lamination and surface defects, and be fully up to the required gauge for thickness on the edges.

Rivet steel shall be soft and have a tensile strength between the limits of 50,000 and 58,000 pounds per square inch, with an elastic limit of not less than 30,000 pounds per square inch, and with an elongation of not less than 28 per cent. in a test-bar eight inches long between measuring points and full diameter of rivet, and with a reduction of cross-sectional area at the point of fracture of not less than 50 per cent.

The material shall also be of such quality as will stand bending double and flat before and after heating to a light yellow heat, and quenching in cold water, without sign of fracture on the convex surface of the bend. The quality of material of rivet rods and subsequent manufacture into rivets shall be such that the edges of heads of properly heated and driven rivets shall be free from checks or cracks. All steel rivets not conforming to the above requirements will be rejected.

All riveting in the shop must be done with hot steel rivets by steam, compressed air or hydraulic machinery, exerting a slow pressure and retaining it sufficiently to perfectly form the rivet heads before the metal loses its red color.

All rivets when driven must fit the holes completely, and have heads of such form and size as will be directed by the Engineer.

Care must be taken to have the rivets at the right heat to produce the best and most solid work, and any rivet that may at any time or place be found defective or appear to have been overheated, shall be cut out and replaced at the Contractor's expense by one which is sound and acceptable. All rivet heads must be perfect in form and truly concentric with the shank or shaft.

The rivets used to connect the cylinders in the field, for attaching castings, etc., to the pipe, and for all work in the shop, shall be of the quality described above, and they shall be driven in the best and most workmanlike manner in every respect. All provisions herein contained relating to riveting done in the shop shall also apply as far as practicable to rivets driven in the field or along the line of conduit.

All plates and rivets must be free from rust and kept under cover from the time of manufacture of the sheets or plates until the completed pipe is dipped and coated.

At the factory the plates must be under cover at the pipe shops and must be kept under roof and cover until ready for shipment and in no way exposed to the weather or to moisture. In cases of accidental rusting the rust must be removed from the plates before proceeding with the manufacture of the pipe.

Where angles or curves occur in the alignment and grade of the conduit, the plates must be cut and punched to the required lines for forming a slight oblique angle at the circular seams of as many courses as may be needed to produce the given total deflection or curvature in each locality. Curves shall in no case exceed ten degrees of curvature.

All other special pieces required for the conduit, such as closing pieces, sections containing openings for manholes, blow-offs and air-valves, and pieces involving any other kind of boiler-maker's work, shall be manufactured in the best and most approved manner. All openings for manholes, blow-offs, air-valves, etc., must be provided with suitable reinforcement rings or plates, cut, punched and rolled to the proper form in each case, not less than five-sixteenths of an inch in thickness, and made of the same material as the plates for the conduit.

Said rings must fit closely between the exterior of the pipe and the flange of the castings or forgings, and be held in place by the rivets which pass through said flange and the conduit.

Openings for manholes, blow-offs, air-valves, etc., will be cut and rivet holes punched in the pipe shop and the riveting of the same done in the shop.

All riveted seams and joints of every description shall be thoroughly caulked, both on the inside and outside of the pipe in the best and most workmanlike manner for first-class boiler work, while for the necessary distance from all laps the seams shall be both chipped and caulked.

During the manufacture of the pipe, sample lengths, to be selected by the Engineer as frequently as he may deem necessary, shall be tested before or after coating under a water pressure of two hundred pounds to the square inch, and shall be absolutely tight under that pressure. If tested before the coating is applied the pipe must be thoroughly oiled with a coat of linseed oil.

The pipe when laid shall also be tested under a pressure of 50 per cent. greater than that to which it will be subjected in normal operation, and shall be absolutely tight under that pressure. All such tests shall be made at the expense of the Contractor, and he shall furnish all the necessary appliances and labor for their performance to the satisfaction of the Engineer. The pipes are to be thoroughly coated by dipping twice in a bath of refined asphaltum heated to a temperature of 300 degrees Fahrenheit. The metal must reach the same temperature as the bath at its first dipping and may be heated to this temperature before dipping. The coating must be durable, smooth, glossy, hard, tough, perfectly water-proof and strongly adhesive to the metal, and must show no tendency to flow when exposed to the sun in summer or become so brittle as to scale in winter. All pipe must be thoroughly covered and protected by the coating. All possible care must be exercised not to injure the coating in handling the pipe. Whenever the coating is injured in transportation or by handling, asphaltum paint acceptable to the Engineer must be immediately applied to the injured portion. Such paint must also be applied to all field rivets.

Other processes of coating or protecting the pipe may be adopted, provided that they are in all respects equal in efficiency to the asphaltum coating herein specified and are acceptable to the Engineer.

The pipe shall be constructed with taper joints, the end of each section at each transverse riveted joint to be inserted within the end of the next section toward the point of delivery of water. All longitudinal seams are to be double riveted.

There shall be suitable manholes located at intervals of about one thousand feet on each pipe.

No pipe shall be covered in until the same shall have passed inspection within and without and all defects have been remedied.

CONNECTIONS AT POINTS OF DELIVERY.

Proper connections must be made to enable the Contractor to deliver the water into Bergen Reservoirs, also directly into the high and low service-pipe systems of the City. Such connections shall be made in the most thorough and substantial manner. Plans for this work must be approved by the Engineer and the work must be performed under his supervision and to his entire satisfaction.

GATEHOUSES.

A gatehouse of brick or stone, with slate or tile roof, possessing two separate water passages, each provided with proper screens, together with all necessary gates or other appurtenances, must be placed to control the flow from the reservoir supplying any steel pipe or masonry conduit. Gatehouses of like material shall also be furnished at each point where two parallel steel pipes are connected, or where provision is made for such connection, also at each gate or stop-valve on the main conduit.

Suitable gatehouses of stone masonry, with slate or tile roofs, of attractive architecture and appropriate to their surroundings shall be built at the points of delivery at Belleville and Bergen Reservoirs, with proper appurtenances for measuring, regulating the pressure of and delivering the water.

TELEPHONE.

A telephone line shall be built connecting the points of delivery with the intake or intakes of the conduits, and equipped with all necessary instruments and appurtenances.

TUNNELS.

The sidewalls and arches of all tunnels shall consist of brickwork sixteen inches in thickness where the tunnel is in earth or very loose rock, twelve inches where in intermediate rock, and eight inches in sound rock, laid in Portland-cement mortar, and the entire space between the sidewalls and the sides of the excavation shall be filled with Rosendale cement concrete up to the level of the top of the arch. Above this the space must be filled with suitable material, carefully packed or rammed so as to completely fill the space. Where the tunnel is in rock, if the bottom consists of sound and solid rock, it may be levelled up and smoothed and made uniform throughout with Rosendale cement concrete, surfaced with a layer two inches thick of Portland-cement mortar. Where the tunnel is in earth or unsound rock a brick invert, sixteen inches thick, shall be laid at the bottom. If it shall be necessary, in order to secure firm foundation the invert shall be laid upon a bed of concrete. Care shall be taken to leave the interior surface of the tunnel smooth and free from projections.

CAST IRON.

If iron castings are used for effluent pipe, manholes, blow-offs, air-valves and other connections, the metal must be remelted in a cupola or air-furnace, and must be of pig iron, without any admixture of cinder iron or other inferior metal, and shall be of a strong, tough character, of an even grain, entirely free from uncombined carbon when seen under the microscope, and such as will bear satisfactory drilling and cutting.

The iron for the castings shall have a tensile strength of at least seventeen thousand pounds to the square inch. Test-bars, twenty-six (26) inches long, two (2) inches wide and one (1) inch thick, placed flatwise and horizontal, upon supports twenty-four (24) inches apart shall bear a steadily increased centre load up to nineteen hundred (1900) pounds before breaking, and shall exhibit a deflection of not less than five-sixteenths of an inch.

The castings shall be perfectly free from scoria, sandholes, air bubbles and other defects and imperfections.

The castings shall be perfectly cleaned and no lumps shall be left on the inner or on the outer surface.

Every casting must be thoroughly dressed and made clean and free from earth, sand and dust which adheres to the iron in the moulds; iron wire brushes must be used as well as softer brushes, to remove the loose dust. No acid or other liquid shall be used in cleaning the castings.

All castings, after being perfectly cleaned, according to the specifications and the directions of the Engineer, shall be subjected to a careful and thorough hammer inspection.

Every pipe or casting shall be carefully coated inside and out with coal-tar pitch and oil. Before the coating is applied the casting must be entirely freed from all rust.

In case the casting cannot be dipped immediately after being cleaned, the surface must be oiled to preserve it until it is ready for dipping; no casting to be dipped after rust has set in.

The coal-tar pitch to be made from coal-tar, distilled until the naphtha is entirely removed and the material deodorized with a mixture of 5 to 6 per cent. of linseed oil. Pitch, which becomes hard and brittle when cold, will not answer for this use.

Pitch of the proper quality having been obtained, it must be carefully heated in a suitable vessel to a temperature of 300 degrees Fahrenheit, and must be maintained at not less than this temperature during the time of dipping.

The material will thicken and deteriorate after a number of pieces have been dipped; fresh pitch must therefore be frequently added, and occasionally the vessel must be entirely emptied of its old contents and refilled with fresh pitch.

Every casting must attain a temperature of 300 degrees Fahrenheit before being removed from the vessel of hot pitch.

It may then be slowly removed and allowed to drip.

But no casting shall be dipped until the Inspector pronounces it passed, as to rust, hammer test, etc., when it may then be dipped. The proper coating must be tough and tenacious, when cold on castings, and not brittle, or with any tendency to scale off.

Every length of cast-iron pipe shall be tested to a pressure of 300 pounds per square inch, and under such pressure the pipe shall be subjected to a series of blows at various points with a three-pound hammer.

WROUGHT IRON.

All wrought iron used must be tough, ductile and fibrous, of uniform quality, free from crystalline structure, cinders, flaws or cracks. In bars it must have an ultimate strength of 50,000 pounds per square inch, with 26,000 pounds elastic limit, and an elongation of twenty-five per cent. in eight inches.

Angle iron must have an ultimate strength of 48,000 pounds per square inch, 24,000 pounds elastic limit, with twenty per cent. elongation in eight inches.

STONE MASONRY.

Unless otherwise specified, all stone masonry is to be built of sound, clean quarry stone, of a quality and size satisfactory to the Engineer; all joints to be full of mortar.

Rubble-stone masonry shall be made of stone of suitable size, quality and shape for the work in hand, and presenting good beds for material of that class. Especial care must be taken to have the beds and joints full of mortar, and no grouting or filling of joints after the stones are in place will be allowed. The work must be thoroughly bonded.

Where rubble-stone masonry is used in dams the stones must have roughly rectangular forms, and all irregular projections and feather edges must be hammered off. Their beds especially must be good and present even surfaces. When a stone is lowered on the surface prepared to receive it there must be no doubt that the mortar will fill all spaces. No spawls shall be inserted beneath a stone so placed; a moderate quantity may be used in preparing suitable surfaces for receiving other stones, if they are entirely embedded in mortar. Various sizes of stone must be used and regular coursing be avoided in order to attain vertical as well as horizontal bonding. Spaces of six inches or more in width between the stones may be occasionally filled with concrete carefully rammed.

Masonry which is to receive the shock of water and ice, such as on the aprons of spillways, is to be composed of large blocks and is to be especially sound, hard and compact and of durable character. No joint shall be more than one inch wide. The exposed faces of all masonry dams and gate chambers shall be equal in appearance and quality to that of the Macopin intake dam of the Newark water works. The facing-stone masonry shall have all beds, builds and joints true to a depth of not less than three inches, or more than four inches from facings, and the joints shall not exceed one-half inch in width. The rise of the courses may vary from bottom to top from thirty inches to fifteen inches, decreasing gradually toward the top of the wall, and the width of the bed of the stretchers is not to be at any point less than twenty-eight inches. The headers are to be not less than four feet in length, each course to be composed of two stretchers and one header alternately.

All faced joints shall be raked out to a depth of one and one-half inches and carefully pointed with Portland-cement mortar mixed clear.

Granite dimension stone masonry is to be used for copings of dams and for the gate openings in the gate chambers. It must be made of first-class granite, free from seams and other defects. The stones shall be cut to exact dimensions and all angles and arrises shall be true, well defined and sharp. All beds, builds and joints are to be dressed for the full depth of the stone to surfaces, allowing of one-quarter inch joint at most. The stone shall be laid with quarter inch joints, and all face joints shall be pointed with mortar made of clear Portland cement, applied before its first setting. All joints to be raked out to a depth of one and one-half inches before pointing.

It is not intended to compel the use of quarry-stone masonry laid in cement where dry-stone masonry is sufficient, in the judgment of the Engineer.

MORTAR.

The contractor shall submit samples of the ingredients and the proportions thereof to be used in mixing mortar for the work to the Engineer, a sufficient time in advance of their use, to permit of suitable tests being made to determine whether the mortar so made conforms to the specifications. If for any cause the Engineer finds it impossible to make such tests, then only such ingredients and proportions shall be used as in the opinion of the Engineer will produce mortar conforming to the specifications.

All sands used shall be clean and sharp, free from pebbles.

Mortar used in concrete core-walls of earth dams, in the foundation and main body of masonry dams, in the concrete backing of tunnels, etc., shall show a tensile strength of at least twenty-five pounds per square inch of section at the end of one week, fifty pounds per square inch of section at the end of one month, and 125 pounds at the end of six months, and may be composed of one part Rosendale cement and two parts sand, of such other ingredients or proportions as will produce a mortar of the above strength.

Mortars used in the brick lining of tunnels, the walls of gate-chambers, in dimension stone masonry or concrete in unusually exposed situations, shall show a tensile strength of at least 100 pounds per square inch of section at the end of one week, 150 pounds per square inch at the end of one month, and 250 pounds at the end of six months, and may be composed of one part Portland cement to two parts of sand, or such other ingredients or proportions as will produce a mortar of the above strength.

Mortars used in pointing shall be composed of neat Portland cement, moderately slow setting, and shall show in one week, after setting two hours in air and the remainder of the time in water, a tensile strength of at least 350 pounds per square inch of section.

When tested in cakes all cement shall be free from cracking at the edges.

No mortar shall be mixed in advance of its immediate use, and none shall be used which has begun to set.

Cement and sand shall be thoroughly mixed dry, by repeated turns and until the mass has become homogeneous and of uniform color. A proper proportion of water shall then be added and the whole quickly mixed.

CONCRETE.

The stone shall be broken so that the greater diameter shall not exceed three inches. It shall be sound and clean. The stone shall be wet with water and then thoroughly mixed with the mortar in such proportions and manner that all surfaces are covered and all voids filled with mortar, but not more than three parts of stone shall be added to one part of mortar. All material must be actually measured in bulk.

Concrete must be immediately deposited in the work after mixing and placed carefully. It must not be dropped from a height. It shall be laid in horizontal layers, not exceeding nine (9) inches thick, and thoroughly rammed until the stone is covered with mortar, and until a film of water appears on the surface. All surfaces upon which concrete is laid must be wet before depositing the concrete. Plank or timber forms must be employed where necessary to confine the concrete to the shape and dimensions shown in the plans.

BRICKWORK.

The best quality of whole, new brick, burned hard entirely through, free from injurious cracks, and with even, true and smooth faces, with a crushing strength of 4,000 pounds per square inch, must be used. Every brick must be wet by immersion before laying, and must be laid in full mortar joints on bottom, sides and ends, not exceeding three-eighths of an inch thick. All brickwork shall be properly bonded.

EARTH DAMS.

The top soil and all vegetable matter shall be removed from the area to be covered by earth dams. This area shall be cleared to the satisfaction of the Engineer, and the material removed therefrom, which is sufficiently free from vegetable matter, may afterwards be used for building the outer toe of the dam.

A concrete core-wall of a proper thickness shall extend the entire length of the dam, and from the high-water level down into the material underlying the embankment to sound rock or some other impervious material.

The earth used in the embankment shall be carefully selected of the best materials, mixed, if necessary, to secure imperviousness to water. The earth shall be spread upon the embankment in level layers not exceeding six inches in thickness, and harrowed, wet down and rolled so as to be thoroughly compact.

The slopes of embankment shall not be steeper than one foot rise to two foot base; they shall be finished true and smooth, and protected on the water side with suitable paving, and on the other side either by paving or by dressing, with six inches of soil, and sodding or seeding with grass seed acceptable to the Engineer.

CLEARING UP.

When the work is completed, all gate-chambers, gate-houses, effluent pipes or culverts, conduits and tunnels shall be carefully cleaned out. The surrounding grounds, the reservoir lands and rights of way shall be cleared of all rubbish and temporary structures and left in a neat and presentable condition.

PROPOSAL FOR A NEW WATER SUPPLY FOR JERSEY CITY, N. J.

PLAN No. 1.

Made by Patrick H. Flynn.

Residence or Office: 189 Montague Street, Borough of Brooklyn, New York City, N. Y.

Date, August 18, 1898.

To the Board of Street and Water Commissioners of Jersey City, New Jersey:

Gentlemen—I hereby propose to provide a new supply of water to Jersey City, New Jersey, and produce the results required in the plan and specifications preceding, attached to and made a part of this proposal, for the following prices:

For each million gallons of water furnished up to twenty-five (25) million gallons daily, thirty-six ($36.00) per million gallons.

For each million gallons in excess of twenty-five (25) million gallons daily up to thirty (30) million gallons daily, thirty-four dollars ($34.00) per million gallons.

For each million gallons in excess of thirty (30) million gallons daily up to thirty-five (35) million gallons daily, thirty-two dollars ($32.00) per million gallons.

For each million gallons in excess of thirty-five (35) million gallons daily up to forty-five (45) million gallons daily, twenty-four dollars ($24.00) per million gallons.

For each million gallons in excess of forty-five (45) million gallons daily up to the limit of capacity of the water works, twenty-dollars ($20.00) per million gallons.

For the water works and all appurtenances thereof necessary to fulfill the requirements of these specifications to the extent of fifty (50) million gallons of water daily, together with the water supply, water rights, lands, reservoir sites, rights of way and all easements necessary to fulfill the requirements of these specifications and to the extent of seventy (70) million gallons of water daily forever, which purchase can be made by the City when the water works are completed and accepted hereunder; provided, that the City shall give notice of its intention to purchase within one year after the date of contract, the sum of seven million five hundred and ninety-five thousand dollars ($7,595,000.00).

For the water works and all appurtenances thereof necessary to fulfill the requirements of these specifications to the extent of fifty (50) million gallons of water daily, together with the water supply, water rights, lands, reservoir sites, rights of way and all easements necessary to fulfill the requirements of these specifications and to the extent of seventy (70) million gallons of water daily forever, which purchase can be made by the City at the expiration of five (5), ten (10) or fifteen (15) years from the date of contract; provided, that the City shall give notice of its intention to purchase at least one year in advance of such purchase, the sum of seven million nine hundred and ninety-five thousand dollars ($7,995,000.00).

For the water works, water supply, water rights, lands, reservoir sites, rights of way and all appurtenances and easements necessary to fulfill the requirements of these specifications and to the extent of seventy (70) million gallons of water daily forever, which purchase can be made by the City when the water works are completed and accepted hereunder; provided, that the City shall give notice of its intention to purchase within one year from the date of contract, the sum of eight million seven hundred and forty-five thousand dollars ($8,745,000.00).

For the water works, water supply, water rights, lands, reservoir sites, rights of way and all appurtenances and easements necessary to fulfill the requirements of these specifications and to the extent of seventy (70) million gallons of water daily forever, which purchase can be made by the City at the expiration of five (5), ten (10) or fifteen (15) years from the date of contract; provided, that the City shall give notice of its intention to purchase one year in advance of such purchase, the sum of nine million two hundred and forty-five thousand dollars ($9,245,000.00).

I herewith offer a certified cheque for one hundred thousand dollars ($100,000.00) on The New Jersey Title Guarantee and Trust Company, payable to the order of the Treasurer of Jersey City, as an evidence of good faith, which cheque is in lieu of freeholder security.

I herewith submit and annex to this proposal the plans, general drawings, etc., enumerated below, and in addition thereto furnish the following description of the works proposed to be built and the sources of the supply proposed to be furnished.

Note—Following any written matter hereto annexed the bidder must sign name in full and post-office address. In case an individual sign for a corporation, proper authority must accompany the proposal.

PATRICK H. FLYNN,
189 Montague Street,
Borough of Brooklyn,
New York City, N. Y.

PLAN No. I.

The following is the general description of the plan and essential features for a water supply proposed by me at the foregoing prices for Jersey City, on Plan No. 1, under the specifications of the City, hereto annexed and in strict conformity thereto.

This plan provides for the immediate supply of fifty million gallons of pure and wholesome water daily, with the lands, reservoir sites, water rights and easements necessary to enable the City to divert and use seventy million gallons of water daily.

It is to be taken from the Rockaway River watershed, with the main intake located on the Rockaway River at Old Boonton, as shown on Maps Nos. 1 and 2 accompanying this bid. This intake reservoir, which will also serve the purpose of a storage reservoir, will have an area, as improved for the fifty million gallons delivery, of nine hundred and forty-nine (949) acres; a maximum depth of one hundred and two (102) feet at the dam, and more than seventy-five per cent. (75%) of the area thereof will exceed eight (8) feet in depth at the full-water level. It will have a capacity above the effluent pipes of 7,362 million gallons; an elevation at the flow-line of two hundred and ninety-two (292) feet above mean high tide, and the elevation of the effluent pipes will be 256.5 feet. The dam will be of masonry, one hundred and five (105) feet in height, exclusive of foundation, and will be constructed and equipped as required by the specifications. It is marked Dam No. 1 and shown on Maps Nos. 1 and 2.

There will be tributary to this intake and storage reservoir, the whole flow of the Rockaway River, having a watershed and gathering grounds of one hundred and twenty-two and one-half (122½) square miles, including the waters of the Longwood Valley, Green Pond, Denmark Lake, Beach Glen, Split Rock Lake, Dixon's Pond, Shongum Lake and other tributary streams.

The location, area and extent of the gathering grounds are shown on Maps Nos. 1 and 2.

Under this plan for a supply of fifty million gallons of water per day at the outset no additional storage reservoirs will be required.

From this intake at the Old Boonton reservoir, above described, the water will be conveyed by gravity along the route shown generally upon Map. No. 1, upon the right of way as required by the specifications, by a single steel conduit of seventy-six (76) inches inside diameter, to Hook Mountain; thence through Hook Mountain by a tunnel, brick lined, having an inside diameter equal to 6.85 feet; thence by a single steel conduit of seventy-six (76) inches inside diameter to Watchung Mountain; thence through Watchung Mountain by a tunnel, brick lined, having an inside diameter equal to 6.85 feet: thence by a single steel conduit of seventy-six (76) inches inside diameter into Bergen reservoir, where the water to the extent of fifty million gallons daily, if required, will be delivered with a pressure equal to a head of two hundred and ten (210) feet above mean high tide. All of the above conduits and tunnels are shown on Map No. 1 annexed. The profile and hydraulic gradients of said conduits and tunnels are shown on Profile No. 1 annexed.

The water proposed to be furnished is pure and wholesome; the plan has been prepared so as to prevent all contamination thereof from any source, in accordance with the specifications.

This plan contemplates the acquirement of lands, reservoir sites, water rights and easements necessary to enable the City to divert and use seventy million gallons of water daily.

In order to provide for the increase of the Old Boonton reservoir, as hereinafter provided, the plan includes the acquirement of the additional lands required for such reservoir sites, making a total of 1,242 acres therein.

Whenever during the term of the contract, as provided in the specifications, the City shall notify the contractor to increase the capacity of his water works, then it is proposed to increase the Old Boonton reservoir, above described, by raising the dam and increasing the capacity thereof as follows:

The dam will be raised so that the flow-line thereof will be at an elevation of three hundred and seven and one-half (307½) feet; the area of said reservoir at the flow-line, as increased, will be 1,177 acres; the maximum depth thereof will be one hundred and seventeen and one-half (117½) feet, and seventy-five (75) per cent. of the area thereof will exceed eight (8) feet in depth at the full-water level. It will then have a capacity above the effluent pipes of 12,683 million gallons; an elevation at the flow-line of 307.5 feet above mean high tide, and the elevation of the effluent pipes will be 256.5 feet. The dam will be of masonry one hundred and twenty-two (122) feet high, exclusive of foundation. It will be constructed and equipped as required by the specifications, and is marked Dam No. 1, and shown on Maps Nos. 1 and 2.

From the intake at Old Boonton reservoir, above described, there will be constructed an additional steel-pipe conduit along the route, as shown generally on Map No. 1, upon the right of way theretofore required, capable of delivering thirty million gallons daily into the Bergen reservoir, at an elevation of one hundred and twenty-seven (127) feet above mean high tide. This pipe, and the pipe first above described, in connection with the tunnels will enable the contractor to deliver seventy million gallons of water daily into the Bergen reservoir. This steel-pipe conduit will be sixty-three (63) inches inside diameter from Old Boonton to Hook Mountain, where it will connect with the tunnel hereinbefore mentioned; from the tunnel at Hook Mountain to the tunnel at Watchung Mountain it will be of sixty-three (63) inches inside diameter, connecting with the tunnel hereinbefore mentioned through Watchung Mountain; from the tunnel at Watchung Mountain this steel conduit will be of forty-seven (47) inches diameter to Bergen reservoir, where it will deliver the water with a pressure equal to a head of one hundred and twenty-seven (127) feet above mean high tide.

All of the above conduits and tunnels will be constructed and equipped as required by the specifications.

The route of the last above conduit is shown on Map No. 1 annexed.

The profile and hydraulic gradients of said conduits and tunnels are shown on Profile No. 1.

The right is reserved, subject to the approval of the Engineer of the City, to substitute at the crossing of the Hackensack, Passaic and Rockaway Rivers for each single steel pipe two or more cast-iron pipes of approved strength and material, having a combined capacity equal to the steel conduits for which they may be substituted.

In the foregoing description the phrase "elevation" means height above mean high tide.

I herewith submit and annex the following preliminary plans, maps and profiles necessary to make clear the essential features of the works proposed to be built.

Map No. 1.

Map No. 2.

Profile No. 1.

PATRICK H. FLYNN,
189 Montague Street,
Borough of Brooklyn,
New York City, N. Y.

BOARD OF STREET AND WATER COMMISSIONERS,

Clerk's Office,

Jersey City, February 2, 1899.

To Mr. John Wahl Queen, Corporation Attorney:—

The following is a copy of a resolution adopted by the Board of Street and Water Commissioners, at its meeting held December 8, 1898; concurred in by the Board of Finance, December 21, 1898, and approved by His Honor, the Mayor, February 1, 1899.

GEORGE T. BOUTON,
Clerk.

RESOLVED, That by and with the concurrence of the Board of Finance, the proposal of Patrick H. Flynn to provide a new water supply for Jersey City and to produce the results required in the specifications heretofore adopted by this Board on July 8th, 1898, in accordance with his Plan No. 1 set forth in said proposal and submitted to this Board in answer to public advertisement on August 18th, 1898, be and the same is hereby accepted, this Board being of opinion that said proposal under said Plan No. 1 is the proposal of that responsible bidder which offers the terms most advantageous to the City.

The prices proposed and accepted under said plan and conformably with said specifications are as follows:—

For each million gallons of water furnished up to twenty-five (25) million gallons daily, thirty-six dollars ($36.00) per million gallons.

For each million gallons in excess of twenty-five (25) million gallons daily up to thirty (30) million gallons daily, thirty-four dollars ($34.00) per million gallons.

For each million gallons in excess of thirty (30) million gallons daily up to thirty-five (35) million gallons daily, thirty-two dollars ($32.00) per million gallons.

For each million gallons in excess of thirty-five (35) million gallons daily up to forty-five (45) million gallons daily, twenty-four dollars ($24.00) per million gallons.

For each million gallons in excess of forty-five (45) million gallons daily up to the limit of the capacity of the water works, twenty dollars ($20.00) per million gallons.

Said proposal also contains the following options to the City for the purchase of the works and water supply by the City; any of which said options may be hereafter exercised by the City conformably with said specifications and proposals heretofore referred to.

For the water works and all appurtenances thereof necessary to fulfill the requirements of said specifications to the extent of fifty (50) million gallons of water daily, together with the water supply, water rights, lands, reservoir sites, rights of way and all easements necessary to fulfill the requirements of said specifications and to the extent of seventy (70) million gallons of water daily forever, which purchase can be made by the City when the water works are completed and accepted hereunder; provided, that the City shall give notice of its intention to purchase within one year after the date of contract, the sum of seven million five hundred and ninety-five thousand dollars ($7,595,000.00).

For the water works and all appurtenances thereof necessary to fulfill the requirements of said specifications to the extent of fifty (50) million gallons of water daily, together with the water supply, water rights, lands, reservoir sites, rights of way and all easements necessary to fulfill the requirements of said specifications and to the extent of seventy (70) million gallons of water daily forever, which purchase can be made by the City at the expiration of five (5), ten (10) or fifteen (15) years from the date of contract; provided, that the City shall give notice of its intention to purchase at least one year in advance of such purchase the sum of seven million nine hundred and ninety-five thousand dollars ($7,995,000.00).

For the water works, water supply, water rights, lands, reservoir sites, rights of way and all appurtenances and easements necessary to fulfill the requirements of said specifications and to the extent of seventy (70) million gallons of water daily forever, which purchase can be made by the City when the water works are completed and accepted hereunder; provided, that the City shall give notice of its intention to purchase within one year from the date of contract, the sum of eight million seven hundred and forty-five thousand dollars ($8,745,000.00).

For the water works, water supply, water rights, lands, reservoir sites, rights of way and all appurtenances and easements necessary to fulfill the requirements of said specifications and to the extent of seventy (70) million gallons of water daily forever, which purchase can be made by the City at the expiration of five (5), ten (10) or fifteen (15) years from the date of contract; provided, that the City shall give notice of its intention to purchase one year in advance of such purchase, the sum of nine million two hundred and forty-five thousand dollars ($9,245,000.00).

BE IT FURTHER RESOLVED, That the Corporation Attorney be instructed to prepare, subject to the approval of the Corporation Counsel, a contract to carry out the terms of this resolution, and that His Honor, the Mayor, and the President of this Board be requested to execute the same, under the seal of the City, to be attested by the City Clerk on behalf of the City.

Contract of July 8, 1901.

THIS AGREEMENT, made this 8th day of July, nineteen hundred and one, between the Mayor and Aldermen of Jersey City, a municipal corporation of the State of New Jersey, hereinafter called "Jersey City," party of the first part, and Patrick H. Flynn, of the Borough of Brooklyn, in the City and State of New York, and the Jersey City Water Supply Company, a corporation of the State of New Jersey, hereinafter called the "contractors," parties of the second part, witnesseth:—

WHEREAS, On the twenty-eighth day of February, eighteen hundred and ninety-nine, Jersey City entered into a contract with the said Patrick H. Flynn for a new supply of water from the Rockaway River, a copy whereof with the specifications and proposals are hereunto annexed and made a part hereof, and has since given notice of its acceptance of the option to purchase the same on completion for the sum of seven million five hundred and ninety-five thousand dollars; and

WHEREAS, Said contract was afterwards assigned by said Patrick H. Flynn to the Jersey City Water Supply Company, wherein said Flynn holds a controlling interest and which company has already executed a large portion of the construction of the plant and works provided for in said contract; and

WHEREAS, In said accepted proposal of said Patrick H. Flynn he stated that there would be tributary to his proposed intake and storage reservoir, now in process of construction at Old Boonton, Morris County, New Jersey, the whole flow of the Rockaway River; and

WHEREAS, the Morris Canal and Banking Company now claims that it has the right by prescription or otherwise to divert from the Rockaway River, and out of the watershed thereof at Boonton, above said proposed reservoir, so much of the waters of the Rockaway River as may be necessary for purposes of navigation east of Boonton over and above the waters brought into said watershed by said canal from Lake Hopatcong and elsewhere west of Dover, and that by virtue of such alleged right said Morris Canal and Banking Company claims that it does at times divert some of the Waters of the Rockaway River for such purposes, all which claims and rights are disputed by all the parties to this agreement; and

WHEREAS, Jersey City claims that under said contract of February 28, 1899, the said Flynn is required to pass through said reservoir the whole flow of the Rockaway River, and that the city is entitled to divert said flow to the extent of seventy million gallons of water daily forever; and

WHEREAS, In the judgment of the Board of Street and Water Commissioners of Jersey City and of the Board of Finance thereof the modifications herein provided for are needed to ensure the construction of the works for such new water supply and the delivery thereof to Jersey City; now, therefore, in consideration of the premises and of one dollar each to the other paid, it is agreed by and between the parties to these presents by way of modification of the original contract as follows:—

FIRST.—That the surety bond for five hundred thousand dollars ($500,000) attached to the original contract, which by its terms is to remain in force so long as Jersey City shall purchase water of the contractors by the million gallons, shall continue in force for the benefit of Jersey City until the contractors shall secure to Jersey City by contract the extinguishment of the claims, if any, of the Morris Canal and Banking Company and its lessee or the entry of final judgment in the Courts of the State of New Jersey adverse to such claim.

SECOND.—That the limit of time for the testing of the works and water supply, after completion, shall be extended, if desired by Jersey City, to a period not beyond January twenty-eighth, in the year nineteen hundred and five (January 28th, 1905); in case of such extension Jersey City shall not be required to pay therefor the additional sum of four hundred thousand dollars provided for in the original contract.

THIRD.—That Jersey City shall upon the completion and acceptance of said works and water supply, so contracted for, in case the claims aforesaid of the Morris Canal and Banking Company, and its lessee, shall not have been released or extinguished, be entitled to retain out of the purchase price of seven million five hundred and ninety-five thousand dollars the sum of five hundred thousand dollars, until the happening of any one of the following events:—

(A) A final judgment or decree of the highest court of the State of New Jersey to which a test case may be carried that the Morris Canal and Banking Company has no legal or equitable right, by prescription or otherwise, to divert out of the watershed of the Rockaway River at Boonton any of the waters of the Rockaway River over and above the amount of water brought into said watershed by said canal from Lake Hopatcong and elsewhere outside of the Rockaway River watershed.

(B) The delivery of a valid release from the

Morris Canal and Banking Company and its lessee, vesting in said contractors for the benefit of Jersey City, the first right to the whole flow of the Rockaway River into said storage reservoir at Old Boonton so far as the same may be required from time to time to furnish and deliver, with the storage provided for in the original contract and proposal all the water said Jersey City may require up to seventy million gallons per day, it being the intent hereof that such release shall vest in the city the first and paramount right to divert all of the waters of the Rockaway River watershed up to seventy million gallons per day as the same may be required.

(C) The abandonment under legislative sanction by the Morris Canal and Banking Company and its lessee of the portion of the Morris Canal lying between Dover and Montville and the surrender of all its rights to divert the waters of the Rockaway River above said proposed reservoir site.

Upon the happening of any one of said three events Jersey City shall pay over to the contractors said retained sum of five hundred thousand dollars without interest.

The bond of five hundred thousand dollars mentioned in paragraph one of this agreement shall also be held as additional security by Jersey City against the claims, if any, of said Morris Canal and Banking Company and its lessee.

FOURTH.—Whenever the contractors shall deliver to Jersey City a valid release from the Morris Canal and Banking Company and its lessee, releasing all their rights to divert the waters of the Rockaway River watershed out of said river above said proposed reservoir site, the same to take effect upon their abandonment of the navigation of said canal between Dover and Montville, under legislative sanction, for a sum therein to be named and to be paid upon such abandonment, then there shall be paid over by Jersey City to said contractors all of said sum of five hundred thousand dollars, except the amount named in said release, which last mentioned amount the contractors authorize Jersey City to pay to said Morris Canal and Banking Company and its lessee upon the actual abandonment aforesaid.

FIFTH.—That for the purpose of construing said contract of February 28th, 1899, any waters which may be drawn and diverted from the watershed of the Rockaway River above the location (as now fixed) of the storage and intake reservoir at Old Boonton, by the Morris Canal and Banking Company for the purposes of navigation (if any there be) over and above the quantity of water cast into said Rockaway River shed by said Canal Company from the watershed of Lake Hopatcong and elsewhere outside of the Rockaway River watershed, shall not be deemed to affect the whole flow of the Rockaway River tributary to said storage reservoir as offered in the accepted proposal of Patrick H. Flynn, and shall not be deducted in any calculation of the capability of the drainage area tributary to the Rockaway River to furnish 666,000 gallons per day per square mile of such drainage area, nor used to modify any calculation of storage capacity of reservoirs as proportioned to the drainage area as set forth in the specification annexed to said contract. It being the intent hereof to make such calculations as if no waters were drawn by the canal from the area of 121½ square miles in the Rockaway River watershed above Old Boonton.

That the modifications in this contract contained shall not relieve said contractor or his sureties from furnishing and delivering to Jersey City the quantity and quality of water required by the original contract, nor from constructing the plant in accordance with the original contract as modified hereby; it being and remaining the duty of said contractors to furnish Jersey City with a water supply of seventy million gallons per day and a plant capable of actually delivering fifty million gallons of water per day. This contract shall not take effect until the sureties of the said Patrick H. Flynn shall assent thereto in the form hereto annexed.

SIXTH.—That said contractors shall convey to Jersey City upon the purchase of the plant and supply by Jersey City, and without additional compensation, all of their rights in the water of the Rockaway River watershed.

SEVENTH.—That said contractors shall not sell any waters out of said Rockaway River watershed at any time to any other person or corporation.

EIGHTH.—Nothing herein contained shall be construed as an admission on the part of any of the parties hereto of any rights in the Morris Canal and Banking Company or its lessees to divert any of the waters of the Rockaway River watershed east of Boonton.

NINTH.—That the agreements and stipulations aforesaid shall apply to and bond the executors, administrators, successors and assigns of the respective parties.

In witness whereof the said party of the first part hath caused its corporate seal to be hereto affixed, and these presents (executed in triplicate) signed by its Mayor, the President of its Board of Street and Water Commissioners, and the President of its Board of Finance, and attested by the City Clerk, and the said Patrick H. Flynn, of the second part, hath hereto affixed his hand and seal, and the said Jersey City Water Supply Company, of the second part, hath caused its corporate seal to be hereto affixed, and these presents signed by its President and attested by its Secretary the day and year first above written.

In consideration of the sum of one dollar to it in hand paid, the Fidelity and Deposit Company of Maryland, a corporation organized under the laws of the State of Maryland, the surety of Patrick H. Flynn, to the Mayor and Aldermen of Jersey City, in the sum of five hundred thousand dollars upon his contract of February 28, 1899, for a new water supply for said city (a copy whereof is hereto annexed) hereby assents to the modification of said original contract by the contract hereto annexed of even date herewith, made between the Mayor and Aldermen of Jersey City, of the first part, and Patrick H. Flynn and the Jersey City Water Supply Company (the assignees of said Patrick H. Flynn), of the second part, and agrees that its bond aforesaid shall stand as security for the performance of said original contract as modified this day.

Witness, its corporate seal and the hand of its President, this 8th day of July, nineteen hundred and one.

Contract of March 31, 1902.

"X"

THIS AGREEMENT, made the 31st day of March, A. D., nineteen hundred and two, between the Mayor and Aldermen of Jersey City, a municipal corporation of the State of New Jersey, party of the first part, and Patrick H. Flynn, of Brooklyn, in the State of New York, and the Jersey City Water Supply Company, a corporation of the State of New Jersey, party of the second part, witnesseth:

WHEREAS, A contract in writing was entered into between the Mayor and Aldermen of Jersey City and Patrick H. Flynn, dated February twenty-eighth, one thousand eight hundred and ninety-nine, whereby said Flynn was to provide a supply of water for said City and to construct water works for said City, which the City had the option to buy, as by reference to said contract, which is hereto annexed and made a part hereof, will more fully appear; and

WHEREAS, Afterwards the said contract was by the said Patrick H. Flynn assigned to and his obligations thereunder assumed by the Jersey City Water Supply Company; and

WHEREAS, By another agreement dated July eighth, nineteen hundred and one, between the parties hereto, the said contract was in divers respects modified and changed as by reference to said contract, which is hereto annexed and made a part hereof, will more fully appear; and

WHEREAS, The water works provided for in said contracts have not yet been completed, and it is apparent that the same cannot be completed for a long time to come, and the said party of the second part desire the party of the first part to extend the time for the completion of the said works and the fulfillment of said contracts, as hereinafter provided, and to waive any claim for liquidated or unliquidated damages for delays until the expiration of such extended time; and

WHEREAS, The City is now receiving its supply of water from the East Jersey Water Company under a temporary contract, which will expire on October twenty-third, nineteen hundred and two; and

WHEREAS, For the purpose of inducing the City to grant the extension of time hereinafter mentioned, and to waive all claims for liquidated or unliquidated damages for delay during such extended time, and as a consideration therefor, the party of the second part have secured the consent of the East Jersey Water Company and the New Jersey General Security Company to execute an agreement bearing even date herewith, and a copy whereof is appended hereto, whereby the Mayor and Aldermen of Jersey City will secure a continuance of the temporary supply of water until the new supply from the Rockaway River shall be put in use, and whereby the said City will secure the early completion of that portion of the new pipe-line which will lie between Upper Montclair and the High Service Works in Jersey City, and will secure the delivery of said temporary supply of water through the same more copiously and at the high pressure called for in the said contract of February twenty-eighth, eighteen hundred and ninety-nine, and will also secure the conveyance of about five hundred and two (502) acres of land in the Longwood Valley, and certain other advantages and benefits under said contract, as by reference thereto will more fully appear.

NOW THEREFORE, in consideration of the premises and of One Dollar to them in hand paid by the party of the second part, The Mayor and Aldermen of Jersey City do hereby agree that the time to complete the work and furnish the water specified in said contract of February twenty-eighth, eighteen hundred and ninety-nine, shall be and hereby is extended until December twenty-fifth, nineteen hundred and three, and that the payment of five hundred dollars per day as liquidated damages for delay under said contracts and specifications shall be incurred or reckoned only from and after December twenty-fifth, nineteen hundred and three.

It is further agreed that the limit of time for the testing of the works and water supply and the payment therefor by the City, after completion and before the acceptance thereof for purchase, shall be extended, if desired, by Jersey City to a period not beyond October first, nineteen hundred and five; in case of such extension, Jersey City shall not be required to pay therefor the additional sum of four hundred thousand ($400,000) dollars provided for in the original contract of February twenty-eighth, eighteen hundred and ninety-nine.

And it is further agreed that the modifications in this contract contained shall not relieve the said Patrick H. Flynn or his sureties, or the said Jersey City Water Supply Company, from their obligation to furnish and deliver to Jersey City the quantity and quality of water required by the said contract of February twenty-eighth, eighteen hundred and ninety-nine, as modified by the said contract of July eighth, nineteen hundred and one, nor from constructing the plant in accordance with the said contracts as hereby modified. This contract shall not take effect until the sureties of the said Patrick H. Flynn shall assent thereto in the form hereto annexed.

And it is further agreed that in all other respects the said contract of February twenty-eighth, eighteen hundred and ninety-nine, as modified by the contract of July eighth, nineteen hundred and one, is hereby ratified and confirmed; and all the contract rights and relations between the parties hereto, as they existed before the making of this instrument, are ratified and continued unchanged, except as expressly changed by this instrument.

In witness whereof, the party of the first part hath caused its corporate seal to be hereto affixed, and these presents (executed in triplicate) signed by its Mayor, the President of the Board of Street and Water Commissioners, and the President of the Board of Finance and attested by the City Clerk; and the said Patrick H. Flynn has hereunto set his hand and seal and the Jersey City Water Supply Company hath caused its corporate seal to be hereto affixed and duly attested and these presents to be signed by its President the day and year first above written.

Contract of March 31, 1902.

"Y"

THIS AGREEMENT, made the thirty-first day of March, nineteen hundred and two, between the East Jersey Water Company, a corporation of the State of New Jersey, party of the first part; the New Jersey General Security Company, a corporation of the State of New Jersey, party of the second part; Patrick H. Flynn, of Brooklyn, New York, and the Jersey City Water Supply Company, a corporation of the State of New Jersey, parties of the third part, and The Mayor and Aldermen of Jersey City, party of the fourth part;

WITNESSETH:

WHEREAS, The Mayor and Aldermen of Jersey City, at the request of the parties of the first and second parts, have granted to the parties of the third part an extension of the time to complete the work and furnish the water specified in the contract dated February twenty-eighth, eighteen hundred and ninety-nine, between said City and Patrick H. Flynn, as by reference to an agreement bearing even date herewith between The Mayor and Aldermen of Jersey City, of the one part, and Patrick H. Flynn and the Jersey City Water Supply Company, of the other part, will more fully appear; and

WHEREAS, The party of the fourth part are at present obtaining their public water supply from the party of the first part under a temporary contract, which will expire on October twenty-third, nineteen hundred and two; and it is now apparent that the new water works cannot be completed and a supply obtained therefrom until long after that date, and the city is desirous of providing and continuing such temporary supply until the said new supply can be obtained, and also of obtaining the use as soon as possible of the easterly portion of the new main, in lieu of the old mains, now being used between Belleville and Jersey City, so that the temporary supply of water may be delivered in Jersey City more copiously and at a sufficiently high pressure to answer the High Service requirements of the said Flynn contract, and to relieve the City from the necessity of pumping; and the City is desirous to obtain the other advantages of this contract, hereinafter set forth.

NOW, THIS AGREEMENT WITNESSETH:

FIRST—That the party of the first part has agreed and hereby doth agree to continue its said temporary supply of water to Jersey City, which it is now furnishing under its contract with said City, dated April twenty-second, eighteen hundred and ninety-seven, at the present price of thirty-five dollars ($35) per million gallons (1,000,000) until the twenty-fifth day of December, nineteen hundred and three, and thereafter, until the City shall have obtained and put in use the new supply from the Rockaway River by means of the water works which are being constructed under said contract with said Patrick H. Flynn, the terms and conditions of said contract of April twenty-second, eighteen hundred and ninety-seven, being continued in force accordingly, but not beyond March first, nineteen hundred and seven.

SECOND—And the party of the first part further agrees that as soon as the new main, now being constructed under said Flynn contract by the Jersey City Water Supply Company, shall be completed from the High Service Works at Jersey City to the point in Upper Montclair, where the same crosses the existing main of the party of the first part, it will permit and allow, under its direction, the Jersey City Water Supply Company to connect the two mains at that point with proper pipes, connections, valves, meters and other appliances, and will thereafter, as soon as the said new main is ready for use, deliver the said temporary supply of water into said new main at Upper Montclair so that the City may receive the same through said new main at High Service Works in Jersey City instead of through the old main from Belleville to Jersey City, as heretofore, and will deliver the same into said new main at a pressure sufficient to answer all the High Service conditions of the said Flynn contract of February twenty-eighth, eighteen hundred and ninety-nine, the said water to be metered at the connection between said mains at Upper Montclair; the said new main while so used for the carriage of said temporary supply is to be maintained and kept in order by and at the expense of the Jersey City Water Supply Company. The said connections, valves, meters and other appliances at Upper Montclair, which are to be installed as aforesaid by the Jersey City Water Supply Company, shall, in case of the purchase of the water works by the party of the fourth part, be transferred to them as a part of the works without additional charge. The Mayor and Aldermen of Jersey City hereby consenting to receive such delivery in lieu of delivery at Belleville, as provided in the contract of April twenty-second, eighteen hundred and ninety-seven; and agreeing also to the continuance of said temporary supply in the manner and at the price and under the conditions aforesaid.

THIRD—And the parties of the first and second parts, for the considerations aforesaid, hereby further covenant and agree to and with the party of the fourth part that they will forthwith acquire a controlling interest in the shares of stock of the Jersey City Water Supply Company, and through such controlling interest will take control of the offices and management of that Company, and will provide the treasury of that Company, from time to time as fast as may be needed by it for the construction of the said new water works and the carrying out of the said Flynn contracts with Jersey City, with money to the amount of three million two hundred and eighty thousand ($3,280,000) dollars in cash, and will see to it that said moneys are promptly and efficiently applied by the Jersey City Water Supply Company in the construction of the said water works, and that the construction of the portion of the new main between Upper Montclair and Jersey City High Service Works shall be undertaken and pushed to completion with all practicable dispatch, so that the delivery of said temporary supply of water through said new main may commence at the earliest practicable date, which it is estimated will be on or before December first, nineteen hundred and two, the parties of the first and second part being of opinion that the work under said contracts and the furnishing of water therein specified can be fully completed for the said sum of three million two hundred and eighty thousand dollars ($3,280,000).

FOURTH—The party of the first part guarantees that the Jersey City Water Supply Company shall construct and complete Jersey City's new water works to such an extent that the water from the new source can be turned on on or before March first, nineteen hundred and four, and that the same shall be turned on by said Company on or before that date so that the City shall thereafter receive the same to the full extent of its then current requirements; and if said water works are not so sufficiently constructed and completed and said water so turned on by that date, the East Jersey Water Company agrees that it will continue to deliver the temporary supply of water to Jersey City from March first, nineteen hundred and four, until said new supply is so turned on at the rate of three hundred and fifty-three thousand eight hundred ($353,800) dollars per annum, payable quarterly, but the agreement of the East Jersey Water Company relative to said temporary supply shall not extend beyond March first, nineteen hundred and seven.

Upon the turning on of the water from the new source, as hereinbefore provided, then all the obligations of the East Jersey Water Company to furnish a temporary supply shall forthwith cease.

FIFTH—The parties of the first, second and third parts, as a further consideration for this agreement, agree that at the time of the execution and delivery of this agreement they will cause to be delivered to the Mayor and Aldermen of Jersey City a Bargain and Sale Deed conveying to them the title, free and clear of incumbrances, of about five hundred and two (502) acres of land situate in Longwood Valley, in the Township of Jefferson, in the County of Morris, and commonly known as the Longwood Valley Reservoir site, being property now or lately owned by the Society for the Establishment of Useful Manufactures at Paterson, and that on or before June first, nineteen hundred and two, they will turn over and deliver to said City searches, abstracts and guarantees of title for said lands made by the New Jersey Title Guarantee and Trust Company, of Jersey City, or by approved counsel; which abstracts and guarantees of title shall be continued and guaranteed down to the date hereof without expense to such City.

And the parties of the third part have joined in this agreement to signify their assent to and concurrence in the terms hereof; and they undertake on their part to do all things necessary to be done by them to enable the parties of the first and second parts to carry out the provisions of this agreement.

IN WITNESS WHEREOF, the several parties to this agreement, who are corporations, have caused their respective corporate seals to be hereto affixed and duly attested by the signatures of their appropriate Executive Officers, and the said Patrick H. Flynn has hereunto set his hand and seal the day and year first above written.

CONSENT OF SURETY.

In consideration of the sum of one dollar to it in hand paid, the Fidelity and Deposit Company of Maryland, a corporation organized under the laws of the State of Maryland, the surety of Patrick H. Flynn to The Mayor and Aldermen of Jersey City, in the sum of five hundred thousand dollars, upon his contract of February twenty-eighth, eighteen hundred and ninety-nine, for a new water supply for said City, as modified by a contract between The Mayor and Aldermen of Jersey City and said Patrick H. Flynn and the Jersey City Water Supply Company, under date of July eighth, nineteen hundred and one (copies of which contracts are hereto annexed), hereby assents to the modification of the said contract by the two contracts hereto annexed of even date herewith, one marked "X," and made between The Mayor and Aldermen of Jersey City, party of the first part, and Patrick H. Flynn and the Jersey City Water Supply Company, party of the second part; and the other marked "Y," and made between the East Jersey Water Company, party of the first part, the New Jersey General Security Company, party of the second part, Patrick H. Flynn and the Jersey City Water Supply Company, party of the third part, and The

Mayor and Aldermen of Jersey City, party of the fourth part; and agrees that its bond aforesaid shall stand as security for the performance of the said contract of February twenty-eighth, eighteen hundred and ninety-nine, as modified by the said contract of July eighth, nineteen hundred and one, and as further modified this day as aforesaid.

Witness its corporate seal and the hand of its this thirty-first day of March, nineteen hundred and two.

State of New Jersey, }
County of Hudson. } ss.:

Mark M. Fagan, being by me duly sworn, on his oath deposes and says:

That he is the Mayor of Jersey City and has been such since ——————; that he has read the foregoing bill of complaint and that the facts, matters and things therein stated, so far as they are within his knowledge, are true, and so far as they are within the knowledge of others, he believes them to be true; that he has caused diligent search to be made for the statement in writing, signed by said Patrick H. Flynn, mentioned in the affidavit of Edward Hoos, former Mayor of Jersey City, hereto annexed, and that he has been unable to find said paper.

MARK M. FAGAN.

Subscribed and sworn to before me this 21st day of July, 1905.

Frank G. Turner,
Notary Public for New Jersey.

State of New Jersey, }
County of Hudson. } ss.:

George C. Whipple, being by me duly sworn on his oath deposes and says, that he resides in Brooklyn and has his office in the St. Paul Building in New York City; that he is a Consulting Engineer and Sanitary Expert; that in the year nineteen huudred and four he was employed by the Mayor and Aldermen of Jersey City to examine the sanitary quality of the new water supply of Jersey City, derived from the Rockaway River at Boonton; that he analyzed the water and personally inspected the important sources of pollution of the Rockaway River above the reservoir at Boonton; that he found that pollution entered the stream from the lands known as the Cooper-Lord Estate; from the City of Boonton, and the Rag Mill at Powerville; from the Liondale Print Works; from the Hibernia Mines; from the Hibernia Village; from the Wharton Mines; from the Mount Hope Mines; from the Rockaway Village; from Mt. Tabor, and from the City of Dover; that he has analyzed daily samples of water from the Rockaway River at Boonton where it enters the reservoir, from May thirteenth, to June seventeenth, nineteen hundred and five; that these analyses show that the water in the Rockaway River has practically the same sanitary quality as it had last summer; that he also inspected the said sources of pollution on the twelfth and thirteenth days of July instant, except those at Wharton, Mt. Hope and Mt. Tabor; that he found the conditions at the above stated places to be substantially the same as they were in nineteen hundred and four, except at the Liondale Print Works and the lower level canal at Boonton; that in his judgment, the quality of the new water supply derived from the Boonton reservoir does not, under existing conditions, comply with the specifications forming part of the Flynn contract of February 28th, 1899; that the river water now receives polluting substances, and that the possible effects of this pollution are but slightly minimized by the time the water reaches the Boonton reservoir; that the river enters the reservoir on one side, comparatively near the outlet gate house, so that the flood conditions in the river, which would cause the greatest amount of pollution to be washed into the reservoir, would at the same time tend to cause the water to flow to the outlet to Jersey City, most rapidly; that in spite of a certain amount of purification which takes place in the reservoir, the analyses indicate that this cannot be always depended upon to remove the effects of pollution; that the main causes of pollution are the centres of population near the river, such as the cities of Dover and Boonton, each of which has a public water supply, but no system of sewage disposal.

GEORGE C. WHIPPLE.

Sworn and subscribed before
me this 13th day of July,
A. D. 1905.

FRANCIS V. MANY,
Master in Chancery of New Jersey.

STATE OF NEW JERSEY, } ss.:
COUNTY OF HUDSON. }

WINTHROP W. RUGGLES, being by me duly sworn on his oath deposes and says: That he has been a surveyor for many years and that he was the Chief Engineer of Jersey City for several years; that at the request of the Mayor and Aldermen of Jersey City, this deponent in June, nineteen hundred and five, ascertained the names of the owners of the land fronting on the Rockaway River between the dam of the Boonton Reservoir at Boonton and the Parsippany Turnpike, which crosses the Rockaway River a short distance above its entrance into the Passaic River; that the names of the owners on the North side of said River, between said dam and said turnpike, with the number of feet owned by each respectively, is as follows:

Name.	Frontage.
Fireman's Home,	1035 ft.
Abr'm Vreeland,	1386 ft.

Herman Behr,	776 ft.
Phineas H. Kingsland,	657 ft.
J. H. Kingsland,	566 ft.
Widow Doremus,	1600 ft.
Elijah B. Hanna,	1100 ft.
A. Zabriskie,	1290 ft.
Cullen Estate,	2300 ft.
Estate of Henry Beach,	1178 ft.
Estate of Benjamin Starkey,	3100 ft.
Jacobus,	1040 ft.
Walter Young,	810 ft.
George Strohlein,	1745 ft.
Jeremiah Banta,	150 ft.
Henry Banta,	150 ft.
John Banta,	249 ft.
Abram Van Riper,	742 ft.
Samuel Ketay,	1850 ft.
Phillips Estate,	1740 ft.
Albert C. Courter,	1630 ft.
Newton Van Duyne,	2690 ft.
Charles Kayhart,	545 ft.
Estate of F. P. Van Ness,	1160 ft.
George E. Miller,	1620 ft.

And that the names of the owners on the south side of said River, between said dam and said Turnpike bridge, with the number of feet owned by each respectively, fronting on the River are as follows:

Name.	Frontage.
Estate of John P. Peer,	2875 ft.
Herman Behr,	990 ft.
Catherine J. Davenport,	800 ft.
J. Nelson Peer,	1070 ft.
Catherine J. Davenport,	2785 ft.
J. Nelson Peer,	1070 ft.
Richard Meldrum.	1700 ft.
Elizabeth Meldrum,	650 ft.
Estate of George Romine,	640 ft.
Hugh Riley,	800 ft.

Joseph H. Bastedo,	2961 ft.
Phineas Farrand,	6050 ft.
Wolf Halprin,	1169 ft.
Albert Courter,	1075 ft.
Ebenezer Lockwood,	920 ft.
William Case,	800 ft.
Theodore Mitchell,	1900 ft.
Anna Van Ness,	600 ft.
Estate of Isaac Emmons,	550 ft.
Elisha Bierce,	539 ft.
Charles Leonard,	378 ft.

WINTHROP W. RUGGLES.

Subscribed and sworn to before me this 21st day of July, 1905.

FRANK G. TURNER,
Notary Public of New Jersey.

STATE OF NEW JERSEY, }
COUNTY OF HUDSON. } ss.:

JACOB RINGLE, being by me duly sworn, on his oath deposes and says:

That this deponent is and has been for many years last past, a resident of Jersey City; that he was a member of the Board of Finance of said city in the year eighteen hundred and ninety-eight, and has been a member of such Board ever since; that before the resolution adopted by the Board of Street and Water Commissioners at its meeting held December eighth, eighteen hundred and ninety-eight, was concurred in by the Board of Finance, Patrick H. Flynn, through his attorney, William D. Edwards, stated to the Board of Finance with reference to the proposal of Patrick H. Flynn to provide a new water supply for Jersey City, as an inducement to that Board to concur in said resolution, that he would eliminate the Rag Mill at Powerville, and build intercepting sewers at Boonton and build a sewage disposal plant at Dover, for the purpose of preventing the possible pollution of the water supply of Jersey City from those sources, and that that statement did induce this deponent to vote to so concur, and this deponent believes that if said statement had not been made said Board would not have concurred in said resolution; that he was present at the Mayor's office when Mayor Hoos (then Mayor of Jersey City) refused to sign the contract between said Flynn and the Mayor and Aldermen of Jersey City, of February twenty-eighth, eighteen hundred and ninety-nine, unless said Flynn signed a written statement to the effect that he understood the contract to require him to eliminate the Rag Mill at Powerville, and that he would do so; that the Mayor did not sign said contract until said Flynn had signed and delivered said written statement to him.

JACOB RINGLE.

Subscribed and sworn to before me this 21st day of July, 1905.

FRANK G. TURNER,
Notary Public of New Jersey.

STATE OF NEW JERSEY, }
COUNTY OF HUDSON. } SS.:

GARWOOD FERRIS, being by me duly sworn on his oath deposes and says: That he is the engineer appointed by the Board of Street and Water Commissioners of Jersey City to superintend the construction of the water-works under the contract of February twenty-eighth, eighteen hundred and ninety-nine; that he has lived in Jersey City for the past forty years and has been, during all that time, familiar with, and made a study of, water matters in Jersey City. That he has read the bill of complaint herein and the facts, matters and things therein stated, so far as they are within his knowledge, are true, and so far as the same are within the knowledge of others, he believes them to be true, except as to the dam at Boonton.

That it is true that much of the land within the said reservoir at Boonton, and the land forming the right of way for the conduits, steel pipes and tunnel, from the dam at Boonton to the reservoir at Jersey City, has been condemned in the name of the Mayor and Aldermen of Jersey City for a water supply for said City; that the delay in the completion of the water-works by the Water Supply Company compelled the Mayor and Aldermen of Jersey City to pay a larger sum for poorer water than that to be delivered under the said contract, and prevented it from gaining customers for said water which it otherwise would have obtained; and prevented it from selling a portion of the water which it otherwise would have sold, and caused it to lose many customers for the water which, if said plant had been completed in accordance with said contract, it would have retained. That the water from the new water-works was not turned on until the twenty-fourth day of May, nineteen hundred and four. That the sum of three hundred and fifty-three thousand eight hundred dollars per annum was fixed by the East Jersey Water Company and the City because it was the interest on said consideration of seven million five hundred and ninety-five thousand dollars at four per cent., to which was added fifty thousand dollars as representing the amount which it was assumed the City might have to pay to its own employees and others, if it were in possession of the said water plant and operating the same; that the cost of operating said plant is very much less than fifty thousand dollars a year. That deponent has read paragraphs VIII. and IX. of said bill, and that the facts therein stated are within his knowledge and are true. That it is true that the inhabitants of Jersey City now require about thirty-three millions of gallons of water a day, and that the population of Jersey City is growing rapidly, and that the amount of water required in Jersey City increases at about the rate of three per cent. per annum. That it is true that the only supply of water now available for the use of Jersey City in this State is from the water-shed of the Passaic Valley; that the City of Newark and the East Jersey Water Company claim to control such supply, and this deponent believes they do so control it; that the City of Newark cannot spare but a comparatively small amount of water. That it is true that the voters of Jersey City, on the thirteenth day of February, nineteen hundred, voted to purchase said water-works for the sum of seven million five hundred and ninety-five thousand dollars. That the defendants are not the owners of all the land overflowed by the reservoir; that they have not acquired the rights of riparian owners on the Rockaway River and its branches above said reservoir, at Boonton, to so use their land as to deposit in the waters of that stream matters which will pollute the water supply; that the defendants have not obtained the consent of the riparian owners mentioned in the bill of complaint in this cause, to the diversion of the amount of water required by the said contract. That it is true that the defendants insist that they are not required by the terms of the contract to obtain the consent of any such owners to such diversion, as stated in the bill of complaint in this cause. That it is true that polluted matter passes into this water supply from the places mentioned in the bill of complaint. That it is true that the Parsippany dike as now constructed, shows a seepage of water under the core wall.

That no tests have been made in the presence of this deponent, or any one on behalf of the City, of that portion of the works known as Conduit Number Four, which includes the concrete Conduit Number Four and the Watchung tunnel,—being a distance of about eleven thousand (11,000) feet, and the most important part of the whole system.

That this deponent, on the twelfth day of July, nineteen hundred and five, received from the said defendants digests of tests of that section, made by people unknown to this deponent and without notice. That this digest was the first notice that deponent had, or that the complainant had, so far as this deponent knows and believes, of tests of any portion of that section of the works. That these tests were made by persons in the employ of the defendants, without notice to, or knowledge of, this deponent or of the complainant. That as to when, how and by whom the original tests were made, and by whom collated and digested, this deponent has no knowledge. That the proper way to make said tests is by tests made by persons in the employ of the City, who can have some control of the works while the tests are being made. That one of the tests which the complainant has requested the defendants to make is that the full amount of water, to wit, fifty million gallons per day, should be delivered through the conduits and pipes for a reasonable period of time, without charge. That the defendants have declined to deliver any amount of water in excess of the present needs of the inhabitants of Jersey City, to wit, about thirty-three million gallons per day, unless the complainant will agree to pay for such excess at the rate per million gallons provided in the contract. That the taxable ratables within the City of Jersey City exceed one hundred million dollars; and that the debt of Jersey City does not exceed twenty million dollars. That there is no conveyance and no agreement in writing for the conveyance of a piece of land within the Boonton Reservoir and overflowed by the waters thereof, owned by the Delaware, Lackawanna and Western Railroad Company, or one of its subsidiary railroad corporations. That there are other lands on which the works are constructed, for which as yet no conveyance or agreement in writing has been obtained from the owners for the use thereof by the defendants or the complainant.

That the Rag Mill at Powerville has not been eliminated, that no intercepting sewer has been built at Boonton and no sewage disposal works or plant has been built at Dover; that as to the main dam at Boonton, deponent says that it cannot be safely raised so as to impound enough water to insure a capacity of seventy million gallons per day by simply building higher on the top of the present structure; that in order to raise the same safely it will be necessary to enlarge the whole dam by building an additional face or front upon the present structure and to tie or fasten such new face or front to the present dam; that such a construction will be inferior to and less desirable from an engineering standpoint than a dam of the same dimensions originally constructed as one piece of masonry, and that to add to the present dam in the way above indicated will be much more expensive than the said additional masonry would have been if constructed at the time the present structure was being built, and that such additional expense will be so great that it will be more economical for Jersey City to build another smaller dam and reservoir at some other place farther up the river.

GARWOOD FERRIS.

Subscribed and sworn to before me this 21st day of July, A. D. 1905.

FRANCIS V. MANY,
Master in Chancery of New Jersey.

STATE OF NEW JERSEY, } ss.:
COUNTY OF HUDSON. }

EDWARD HOOS, being by me duly sworn, on his oath deposes and says:

That he was Mayor of Jersey City during the year Eighteen Hundred and Ninety-nine; that when the contract between Patrick H. Flynn and the Mayor and Aldermen of Jersey City of February twenty-eight, Eighteen Hundred and Ninety-nine was presented to this deponent for signature, he refused to sign the same until said Patrick H. Flynn, or his attorney, William D. Edwards, in said Flynn's presence, stated to this deponent that he Flynn would build an intercepting sewer at Boonton and that he would build a sewage disposal plant at Dover, and that he would eliminate the Rag Factory at Powerville; that this deponent insisted that said Flynn should make the statement in writing that he would remove the Rag Factory at Powerville. Flynn did make such statement in writing and delivered it to this deponent as Mayor of Jersey City, before this deponent signed said contract; this deponent believes that he left said paper with the other papers of the Mayor and Aldermen of Jersey City, in his office at Jersey City, when his office expired, and that he has not seen said papers since; that the following is a copy of said statement:

Copy of letter from Wm. D. Edwards, also signed by Patrick H. Flynn:

Jan. 26, 1899.

Hon. Edward Hoos,
Mayor, Jersey City.

Dear Sir:

When the tour of inspection was made to the Rockaway Water Shed under the pending proposal of my clients, Patrick H. Flynn, to furnish a new water supply to Jersey City, attention was called by his engineers to the Rag Factory, at Powerville, as among the possible sources of pollution. You were then told that it was the intention of the contractor to removè the same, although no specific mention has been made of this place in the specifications or proposal. I beg to assure you that such removal has always been contemplated in our plan and that, if the contract is awarded to him, such removal must take place.

Yours respectfully,

(Signed) Wm. D. Edwards.

(Signed) P. H. Flynn. (Feb. 28th, 1899).

EDWARD HOOS.

Sworn and subscribed be fore me this 21st day of July, 1905, at Jersey City, N. J.

Francis V. Many,
Mastery in Chancery of New Jersey.

State of New Jersey, }
County of Hudson. } ss:

William F. Midlige, being by me duly sworn, on his oath deposes and says:

That he was a member of the Board of Finance of Jersey City during the year eighteen hundred and ninety-nine; that before the resolution adopted by the Board of Street and Water Commissioners at its meeting held in December, eighteen hundred and ninety-eight, was concurred in by the Board of Finance, Patrick H. Flynn, through his attorney, William D. Edwards, stated to the said Board that he, said Flynn, would, under the proposed contract of February twenty-eighth, eighteen hundred and ninety-nine, remove the Rag Factory at Powerville, build intercepting sewers at Boonton and a sewage disposal plant at Dover for the purpose of preventing the possible pollution of the water supply from these sources.

WILLIAM F. MIDLIGE.

Sworn and subscribed to before me this 21st day of July, 1905.

FRANK G. TURNER,
Notary Public for New Jersey.

STATE OF NEW JERSEY, }
COUNTY OF HUDSON. } ss:

FERDINAND HEINTZE, being by me duly sworn, on his oath deposes and says: That he is the President of the Board of Street and Water Commissioners of Jersey City; that he was a member of that Board in the years eighteen hundred and ninety-eight and eighteen hundred and ninety-nine.

That before the resolution of the Board of Street and Water Commissioners passed at its meeting held December, eighteen hundred and ninety-eight, was passed, Patrick H. Flynn, through his attorney, William D. Edwards, stated to the said Board that he, said Flynn, was bound under the terms of the proposed contract of February twenty-eighth, eighteen hundred and ninety-nine, to remove the Rag Factory at Powerville, to build intercepting sewers at Boonton and a sewage disposal plant at Dover for the purpose of preventing the possible pollution of the water supply from these sources.

FERDINAND HEINTZE.

Sworn and subscribed to before me this 24th day of July, A. D. 1905.

Edward B. Lee,
Notary Public, New Jersey.

IN CHANCERY OF NEW JERSEY.

Between:

THE MAYOR AND ALDERMEN OF JERSEY CITY,
Complainant,

and

THE JERSEY CITY WATER SUPPLY COMPANY,
Defendant.

NOTICE.

MESSRS. COLLINS & CORBIN,
Solicitors of the above named defendant:

TAKE NOTICE, That I will move the Chancellor at his Chambers, at the State House in Trenton, on Tuesday, the first day of August next, at ten o'clock in the forenoon, for the injunction prayed for in the bill, a copy of which is hereto annexed; that on said motion I will read the said bill and the affidavits thereto annexed.

July 20, 1905.

ROBERT CAREY,
Sol. for Compl'ts.

JAMES B. VREDENBURGH,
of Counsel.

IN CHANCERY OF NEW JERSEY.

Between:

THE MAYOR AND ALDERMEN OF JERSEY CITY,
Complainants.
and
JERSEY CITY WATER SUPPLY COMPANY, et al.,
Defendants.

On Bill, etc.
Motion for Preliminary Injunction.

JAMES B. VREDENBURGH, for Complainants.

GILBERT COLLINS, for Defendants.

BERGEN, V. C.

Under a contract dated February 28, 1899, between the complainant and Patrick H. Flynn who has since assigned his interest therein to the defendant Jersey City Water Supply Company. Flynn agreed to construct a system of Water Works for Jersey City, and to supply it with pure and wholesome water in accordance with specifications made a part of the contract. The city on its part agreed to pay for such water, at a price fixed in the contract, per million gallons according to the quantity used. The contract further stipulated that upon receipt of a notice that the city desired to purchase the works when completed, Flynn would convey the completed plant to the city for $7,595,000.00 provided notice of the intention to purchase was given within one year after date of the contract. The contract contained other options to purchase reserved by the City, but as to the option to purchase at completion was exercised, and the required notice given, they need not be considered. The case made by the bill is, that the city instead of buying the water at so much per gallon, has exercised its option and elected to buy the plant at its completion for the price named. It appears that Flynn did not complete the works within the time agreed upon, and it is claimed has not yet fully qualified himself to convey all he agreed to pass over. Nevertheless, the city in view of the great interest it has in securing a proper water supply, demands that the defendant comply as fully as they can, submitting to such deduction from the contract price as this court shall adjudge equitable to meet the cost of a substantial compliance with the contract. The right to a decree for specific performance is not now under consideration and only so much of the contract and claim is here set out as is necessary to properly determine whether suits brought by defendants against the complainant to recover for water furnished at the price fixed per gallon in the contract, if the City do not purchase, should be restrained, and the defendants enjoined until the final determination of this cause, and the equitable rights of the respective parties ascertained and decreed.

The default in the completion of the works compelled the complainant to contract for a temporary supply of water with the East Jersey Water Company, a corporation whose relations with the Jersey City Water Supply Company were sufficiently friendly to induce it to agree to furnish the quantity required in consideration of the payment of a sum equal to the interest, at four per cent., on the purchase price and the estimated cost to the complainant of operating the plant if it were in possession. This arrangement continued until May 24, 1904, when the East Jersey Company without complainant's knowledge, ceased to furnish the water, and turned over to the defendant the supply main then in use, and the Company then began to furnish water from its incomplete system, and to charge the complainant therefor, but against its protest, at the rate fixed in the contract should the City not purchase on completion, which increased the cost to the city, over the rate paid for the temporary supply, to the extent of $80,000.00 per annum. It is the refusal to pay these charges that is the foundation of the action at law sought to be enjoined. The present claim of the city is that having complied with its agreement, and thereby entitled to a conveyance, it is in equity the owner, and while at law it will not be able to resist, successfully, the actions at law, that in equity the defendant holds the property in trust for it, and is not, in any event, entitled to more than the purchase price interest thereon, and the necessary cost of operation, and tenders itself ready to accept the conveyance and to make such payment as may equitably be required.

It appears to me that this claim has the support of authority in the law, and that upon the performance of the conditions cast upon it by the contract, all of which are allowed to be performed, a prima facie case is presented, which shows that the vendee has acquired an equitable estate in the property, subject to the vendor's lien for the purchase price, falling within the rule as stated in Pom. Eq. Juris, Sec. 372, and that the vendor can not by neglecting to perform his part of the contract obtain, as alleged in the bill, a position to extort money, beyond the reach of this Court. A large and populous City is dependant for health and comfort upon the water to be furnished from this supply, and if the defendant, by refusing to complete the works and comply with its bargain, can compel the city to accept its construction of this agreement and take the water on its terms *for use, the water, the people* must pay or perish—a condition is presented that not only justified but demands the interference of this Court. As specific performance can only be had in this court, the complainant is properly here; and as the right of the defendants to recover for water supplied depends upon the question of equitable ownership and the price to be paid depends upon deduction to be allowed for incomplete performance, a cause cognizable in equity is presented. I think the suits should be restrained at least until the equitable questions are disposed of, and I will so advise. In consideration of the large amount of money involved and the great expense of operating the plant, the defendant ought not to be deprived of all income; and to meet this the City should pay the interest on the principal sum at the rate of four per cent. per annum, to cover the past and future period since May 24, 1904, less payments, if any, made on account of water supplied by the defendant, and also $50,000 per annum for the same term, and subject to same conditions as the estimated cost of operation, that being the basis of the agreement for the temporary supply. Such payments to be made quarterly as to the future, and in full as to the past, but without prejudice to either party; nor shall payment or acceptance be taken as a waiver of any right, either in this cause or on the suits enjoined. If performance shall be decreed, the payments can be adjusted in fixing the amount to be paid; if refused, they will be considered as so much paid on account. I will advise an injunction order according to the views I have expressed.

IN CHANCERY OF NEW JERSEY.

Between:
THE MAYOR AND ALDERMEN OF JERSEY CITY,
Complainant,
and
JERSEY CITY WATER SUPPLY COMPANY,
Defendant.

ANSWER.

The Answer of the *JERSEY CITY WATER SUPPLY COMPANY* to the Bill of Complaint of *THE MAYOR AND ALDERMEN OF JERSEY CITY.*

This defendant *admits* that prior to the year Eighteen Hundred and Ninety-Five, the water used for domestic purposes by the inhabitants of Jersey City was obtained from the pumping station of the City at Belleville, on the Passaic River.

It denies that the complainant expended many millions of dollars in the erection of said plant, but *admits* that is expended several hundred thousand dollars in its erection and maintenance for a long term of years.

It *admits* that the water became polluted and that the complainant was compelled to abandon its supply from that source, but *denies* that the diversion of waters from the river had anything to do with such abandonment.

It *admits* that a contract was made between the complainant and the defendant, Patrick H. Flynn, for a supply of water, a copy of which is annexed to the Bill marked "Schedule A," and that the

Jersey City Water Supply Company was organized to carry out said contract, which was assigned to it.

This defendant *admits* that in the year Eighteen Hundred and Ninety-Five, the complainant made a contract with the East Jersey Water Company for a temporary supply of water, and that on April Twenty-Second, Eighteen Hundred and Ninety-Seven, made a supplemental contract with that Company to continue the supply of water, but *denies* that said supply was to be made from the plant, located on the Passaic River, near the City of Paterson, except for about twelve months, and says that said contract called for a supply, in part, from the main of the City of Newark, leading from the Pequannock River to that City, and, in part, from pumping works at Little Falls of the East Jersey Water Company; and as to the terms of said contract, this defendant refers thereto.

This defendant *admits* that a further contract for a temporary supply was made May Thirty-First, Nineteen Hundred and Two, by the East Jersey Water Company, in connection with other contracts relating to the supply of the City, which were made about the same time, and that "Schedule D" is a copy of the said contract of the East Jersey Water Company.

This defendant *admits* that an election was had on the Thirteenth day of February, Nineteen Hundred, in Jersey City, and that certain of the voters of Jersey City voted on a proposition to accept the option to purchase a new water supply to be constructed by this defendant under the Flynn contract, and that notice of the result of such election was given to this defendant; and this defendant *prays* a reference to the record of the proceedings relating to said election, and makes no admission as to the legal effect thereof, and *denies* that by said vote or notice, the complainant became bound to this defendant to purchase said works, and *shows* that by the terms of said contract, complainant reserved the right to reject the works; and this defendant *shows* that the complainant has never yet accepted the same, or agreed to pay to the defendant the price fixed in the contract for the sale of the said works to the City, and that no contract now exists whereby this defendant is now required to convey the said works to the complainant, or whereby the complainant is liable to pay the contract price or any price therefor to this defendant.

This defendant *denies* that by the contract of July Eighth, Nineteen Hundred and One, a copy of which is annexed to the Bill, marked "Schedule B," this defendant admitted that the complainant had exercised the option to purchase the water supply for the sum of Seven Million Five Hundred and Ninety-Five Thousand ($7,595,000) Dollars, and refers to the said agreement for a true statement of the terms thereof.

This defendant *admits* that by the terms of the contract, "Schedule A," the penalty of Five Hundred ($500) Dollars per day was fixed as a sum to be paid, if the works were not completed at the time specified, and this defendant *admits* that by the agreement, dated March Thirty-First, Nineteen Hundred and Two, for a valuable consideration then paid to the City, the claim for liquidated damages and penalties was waived, and the time for the completion of the works was extended until December Twenty-Fifth, Nineteen Hundred and Three, after which date it was provided that the said damages were to be estimated and reckoned.

This defendant *denies* that by the delay in the completion of the plant by the said Flynn and by this defendant, the complainant was compelled to pay a larger sum for water, than that which would have been delivered under said contract, and *denies* that by the delay the complainant was prevented from gaining customers for its water, or was caused to lose any customers for its water.

This defendant *admits* that the water-works were not fully completed on the Twenty-Fifth day of December, Nineteen Hundred and Three, although it states that a part of the works, namely, the steel main from Montclair Heights to Jersey City reservoir, had been completed before that time, and *that at the request of the City,* and pursuant to the terms of the contract dated March Thirty-First, Nineteen Hundred and Two, the East Jersey Water Company had delivered water to the City through said completed main instead of delivering the same into the mains of the City at Belleville, and that thereby the City had obtained a very valuable use of the water-works of this defendant, because the mains of the City across the Hackensack, which had theretofore been used for the reception of the supply of the City, had become *inadequate and unfit for use;* and by the construction and use of the new main built by this defendant, at a cost exceeding One Million Dollars, the City was saved from the very great expense of renewing its mains across the Hackensack Meadows and from the expense of maintaining a pumping station in Jersey City for high service, amounting to forty-thousand dollars per year, and upwards; and this defendant *admits* that the East Jersey Water Company continued to deliver its temporary supply of water, and that after March First, Nineteen Hundred and Four, it was paid for said water until May Twenty-Fourth, Nineteen Hundred and Four, being a period of fifty-four days, at the rate of Three Hundred and Fifty-Three Thousand Eight Hundred (353,-800) Dollars per annum only; and says on the Twenty-Fourth day of May, Nineteen Hundred and Four, the East Jersey Water Company ceased to deliver water, because its contract had terminated, and thereupon, this defendant began the delivery of water from the Rockaway River, pursuant to its contract.

Prior to March First, Nineteen Hundred and Four, the contract price paid to the East Jersey Water Company was Thirty-five (35) Dollars per million gallons, and the consumption of water by the City had so increased, that during the year ending March First, Nineteen Hundred and Four, the payments, at that rate, exceeded Four Hundred Thousand ($400,000) Dollars. The contract, whereby between March First, Nineteen Hundred and Four, and May Twenty-First, Nineteen Hundred and Four, the price to the East Jersey Water Company was limited to the rate of Three Hundred and Fifty-Three Thousand Eight Hundred Dollars per annum, was in the nature of a penalty to compel the early delivery of water to the City by this defendant, and that penalty fell upon this defendant, because in order to induce the East Jersey Water Company to consent to said reduced rate and to assume the other obligations of its contract (Exhibit D), this defendant was compelled to pay, and did pay, a very large sum of money to the East Jersey Water Company.

The reasons why the complainant desired to hasten the construction of the works and procure its supply of water from this defendant instead of from the East Jersey Water Company were, that on March Thirty-First, Nineteen Hundred and Two, when the contract was made, the old mains used by the City to carry the water from the point of delivery by the East Jersey Water Company to the City, namely, near Belleville, were inadequate and unsafe, and it was important to the City to secure the use of the new main of the defendant at the earliest possible date, whereby the water was delivered directly into the reservoirs of the City on Jersey City Heights, and the expense of pumping for high service was ended, and also because the water delivered by the East Jersey Water Company from Little Falls was not filtered for Jersey City, the filtering plant of that Company at Little Falls not being adequate for the Jersey City water supply, and the water delivered was discolored and inferior to the Rockaway supply which could be furnished by this defendant.

This defendant turned over the use of its main from upper Montclair to the City's reservoir on Jersey City Heights in June, Nineteen Hundred and Three, from which date the same was used by the East Jersey Water Company until May Twenty-Fourth, Nineteen Hundred and Four, and this defendant began its own supply of water from the Rockaway River on May Twenty-Fourth, Nineteen Hundred and Four, and is entitled to receive therefor the prescribed contract price, without deduction, until the complainant shall purchase and pay for the water works.

It was not contemplated by the City, at the time of making said contract, that the City would accept and purchase the works as soon as the water was turned on, and it was agreed that the City should have a reasonable time (not later than October First, Nineteen Hundred and Five), to examine and test the works, and that this test should be by actual use of the works for the supply of the City; and meantime, and until full payment of the contract price for the works should be made, the City should pay the contract price for the water delivered by defendant under its contract, namely, Thirty-Six Dollars per million gallons up to twenty-five million gallons per day; Thirty-Four Dollars per million gallons, from twenty-five up to thirty million gallons per day; Thirty-Two Dollars per million gallons, from thirty up to thirty-five milion gallons per day, and Twenty-Four Dollars per million gallons for each million gallons in excess of thirty-five million gallons up to forty-five million gallons per day, and Twenty Dollars per million gallons for each million gallons in excess of forty-five million gallons per day.

The contract price at the present rate of consumption by the City is about Thirty-Five Dollars per million gallons per day, being the same as the price paid to the East Jersey Water Company for the temporary supply, but the rate will be much less than that average as the consumption increases beyond thirty-five millions per day. The value of the delivery of water to the City by defendant, under its contract, is much greater than that of the water delivered by the East Jersey Water Company, because the point of delivery by this defendant is in the reservoir on Jersey City Heights and at greater pressure, thus relieving the City from the cost of constructing and maintaining new mains across the Hackensack Meadows and from pumping in Jersey City for high service, and also because the water furnished by this defendant is superior to that which was provided by the East Jersey Water Company.

This defendant *admits* that it claimed the right to charge for water at the rate fixed in its contract (Schedule "A"), and that it rendered bills therefor; and it *shows* that the complainant construed the contract in like manner and made payments of said bills for two quarters, as rendered by this defendant.

This defendant *admits* that the price payable to this defendant for the water supplied by it is in excess of that which was paid to the East Jersey Water Company between March First, Nineteen Hundred and Four, and May Twenty-Fourth, Nineteen Hundred and Four; but, it *says* that the rates thus paid to the East Jersey Company for the term of fifty-four days following March First, Nineteen Hundred and Four, was reduced from the previous rate paid to the East Jersey Water Company as a penalty for delay of this defendant in supplying water, as above stated, and that the contract rates paid by the City, prior to that time, to the East Jersey Water Company were at the rate of Thirty-

Five Dollars per million gallons, and amounted to more than Four Hundred Thousand Dollars per year during the year ending May First, Nineteen Hundred and Four.

This defendant *further shows* that the East Jersey Water Company having exhausted its right to draw water from the Newark pipe, was no longer able to supply Jersey City with the water needed for the full supply of that City after May, Nineteen Hundred and Four, and was no longer under any contract-obligations to do so; that the consumption of water by the City increased greatly during the period while the construction of the works of this defendant was going on, and the quantities supplied by this defendant since May Twenty-Fourth, Nineteen Hundred and Four, have substantially exceeded the amounts supplied by the East Jersey Water Company; and this defendant *shows* that on the Twenty-Fourth day of May, Nineteen Hundred and Four, its works had been sufficiently completed to enable it to properly supply the complainant pursuant to the contract, and that its delivery of water on that date terminated the period during which the complainant could collect the penalty or liquidated damages of Five Hundred Dollars per day and a further penalty of the reduced rate, payable to the East Jersey Water Company; that the works were at that time substantially completed, but that there remained certain details of construction not essential to the supply of the City, which were completed before November, Nineteen Hundred and Four.

This defendant *denies* that there is in the contract any requirement that the depth of water in the reservoir should be raised to the level of eight feet below the full water level throughout seventy-five per cent. of the entire area before the contract should be deemed completed, and refers to the contract, specifications and plans, whereby it will appear that no such requirement is found therein.

The reservoir is constructed in order that the water be drawn down, and it may be drawn much lower than eight feet below the level of the dam without impairing the efficiency of the supply.

This defendant *admits* that it commenced suit against the complainant for water supplied, as set forth in paragraph Nine of the Bill, and that the complainant filed several Pleas to the Declaration of this defendant, some of which Pleas were stricken out on the motion of this defendant, and others of which were held bad on demurrer, and that the case stands at issue on the remaining Pleas and is ready for trial at the September Term, Nineteen Hundred and Five, at the Passaic Circuit of the Supreme Court.

As to the allegations of paragraph Ten of the Bill, this defendant *admits* that the consumption by Jersey City amounts to more than thirty-three million gallons per day and is increasing at the rate of three per cent. per annum, and *says* that, in fact, the consumption for the six months ending May Twenty-Third, Nineteen Hundred and Five, exceeded thirty-four and a half million gallons per day.

This defendant *denies* that the complainant has become the owner in equity of the water-works built by this defendant, or is entitled to the possession thereof.

(a). This defendant *denies* the statement that it cannot convey the whole of the works to the complainant, as required by the contract, or that it is not the owner of the land flowed by the reservoir. It *admits* that one, William J. Righter, recovered a small judgment in the New Jersey Supreme Court against this defendant, and *says* that said judgment was for alleged damages for obstructing the drainage of a certain parcel of his land, of small value, outside of the reservoir, and was for One Hundred and Fifty........Dollars. It *denies* that the damage to him is continuing.

(b). As to the rights of the Morris Canal & Banking Company, this defendant *shows* that by the contract dated July Eighth, Nineteen Hundred and One, (a copy of which is annexed to the Bill) this defendant is not required to acquire the rights of that Company to divert water from the Rockaway River, and it *denies* that the Canal Company either has, or claims to have, any right to divert water to such an extent as can prevent the defendant from furnishing a supply, with a capacity in excess of seventy million gallons per day, as required by the contract.

(c). This defendant *denies* that any of the riparian owners above the reservoir at Boonton have any right to pollute the waters of the river, and *denies* that it has contracted to acquire any rights to pollute.

(d). This defendant *admits* that it has acquired the right to divert the water of the river for the supply of Jersey City from the owners of mill powers, and other valuable rights in the stream below the reservoir.

This defendant *denies* that the riparian owners in the Bill mentioned have been or can be in any manner damaged by the diversion of seventy millions of gallons per day from the stream, or that their consent to the diversion is necessary, or that this defendant is required, by the contract with complainant, to obtain such consent.

This defendant *denies* that polluted water passes into the water supply from the Cooper-Lord estate, or from the other places named in Paragraph Ten of the Bill; and *further denies* that this defendant is, by its contract, required to prevent the passing into the stream of any pollution, and *says* its duty is limited to the delivery of a pure supply of water to the City and to the prevention of such pollution only as impairs the purity of the water delivered, as by reference to the contract will appear.

This defendant says that there is not any such thing existing in nature as a water-shed where there is no pollution passing into the stream to some extent, and that it was not contemplated by the contract that it was or would be possible to procure a water supply from a watershed in which there was no pollution, but only that danger of pollution by which the water delivered would be contaminated, should be prevented.

This defendant *denies* the allegations of the Bill that the water-works have not been constructed according to the contract and specifications.

(a). As to the Parsippany Dyke, this defendant *denies* that there is any seepage under the core walls, whereby its efficiency and usefulness are in any wise impaired or in excess of what is usual in well constructed works of its class, or that the dyke in any respect fails to conform to the contract requirements.

(b). This defendant *denies* that the reservoir dam at Boonton was required by the contract to be built for any other purpose than to impound a supply of fifty million gallons per day. It *denies* that there was specified in the contract any manner of construction of the dam, such as would provide for any greater supply than fifty million gallons, unless the construction of such greater dam should be expressly demanded by the complainant and an increased price paid therefor, and no such demand was ever made upon this defendant.

This defendant *denies* that the dam which was constructed cannot be raised, if ever required, so as to provide for a supply of seventy millions of gallons per day. This defendant *shows* that the raising of the height of the dam of the present reservoir is only one of several modes, whereby the waters of the Rockaway River may be impounded and made available to provide seventy millions of gallons per day, and that it was no part of the contract of this defendant to provide a dam or reservoir adequate for a supply in excess of fifty millions of gallons per day, but only a reservoir site and water-shed capable of development by further construction to a capacity of seventy millions.

(c). This defendant *denies* that in constructing its Watchung Tunnel it adopted a mode of construction cheaper than that provided by the contract. It *admits* that there was a variance in the mode of construction of the invert of the tunnel in a trifling detail from the plans as first made by the defendant, but not from the contract, because unlooked for physical difficulties made it impossible to construct the tunnel in the precise mode contemplated, namely, the pressure of the water flowing through the fissures in the rock, through which the tunnel was built, made it impossible to cement the bottom of the tunnel; but this defendant *shows* that the tunnel was built in evcess of the size called for by the contract, and that the bottom was properly built and lined to suit the physical conditions, and that the construction is a practical and substantial compliance with the contract, and was so held in a suit in Chancery brought by the complainant against this defendant in the year Nineteen Hundred and Four.

(d). This defendant *denies* that the concrete conduits have not been demonstrated to be sufficient in size to deliver seventy millions of gallons per day, as required by the contract, and *says* that in fact they have such capacity, and have been shown to have it by the actual conveyance of water through them.

(e). This defendant *admits* that no fence has been built around the reservoir, and *says* that none is required, to be built, by the contract.

This defendant *denies* that the failure to complete the contract to deliver water on or before December Twenty-Fifth, Nineteen Hundred and

Three, prevents the City from purchasing the works, if they desire so to do, and *shows* that the contract provides liquidated damages of Five Hundred Dollars per day for delay until delivery of the water and *says* that said amount is the full measure of the damages which the City is entitled to recover for the delay.

This defendant *admits* that the complainant is entitled to a reasonable time to test the works before purchasing the same and making payment of the price of Seven Million, Five Hundred and Ninety-Five Thousand ($7,595,000.00) Dollars, and *says* that the test provided by the contract consists of the actual delivery of water from the works to the City; that such delivery has continued without interruption since May Twenty-Fourth, Nineteen Hundred and Four, and the complainant has had the fullest opportunity to test the works in the manner provided by the contract and in every other manner which could be reasonably desired, and have, in fact, made tests as fully as they desired; and that by the terms of the contract, such privilege of delay in payment of the contract price for the purpose of testing the works continues until October First, Nineteen Hundred and Five, and then terminates.

This defendant *denies* that in order to make the test required by the contract or any reasonable tests, the possession of the works should be delivered to the complainant, and *shows* that upon a threat of the complainant to take possession, the complainant was enjoined by this Court from so doing, at the suit of this defendant, on the ground that by the contract they were not entitled to possession.

This defendant has never been requested to permit water to be delivered to the complainant without compensation, and *denies* the right of the complainant to have such delivery, and *says* that the reservoirs of the City, within its own limits, contain several days supply, so that they may readily be so used by the City as to receive for several days continuously a supply of over fifty million gallons per day. And this defendant has repeatedly delivered water through the mains and conduits, under the observation of the Officials, at a rate in excess of fifty million gallons per day.

As to the allegations of the Bill that the complainant is amply responsible for the payment of the price of the works and is ready and willing to pay therefor, this defendant *denies* the same, and *says* that the complainant has no means wherewith to make such payment and has no lawful authority to obtain such means, except by issuing its bonds at par, bearing interest at not less than four per cent.; and this defendant *says* that the complainant has not sufficient credit to enable it to sell its four per cent. bonds at par for an amount sufficient to enable the complainant to purchase said works, and has made no effort to sell bonds or provide for payment of the price.

WHEREFORE, this defendant *denies* that the complainant is at the present time either ready or willing or able to carry out said purchase of the water-works, and *denies* that the payment of the contract price per million gallons for water delivered can in any manner be said to increase the compensation agreed to be paid to this defendant, either for the water supplied by it, or for the works.

This defendant *admits* that it insists that it is entitled to be paid by the complainant, at the contract rate, for water delivered since May Twenty-Fourth, Nineteen Hundred and Four, when the delivery began, till the contract price for the works shall be paid, and that unless such payment shall be made on or before October First, Nineteen Hundred and Five, the option of the complainant to purchase the water-works for Seven Million Five Hundred and Ninety-Five Thousand Dollars will terminate, and that, pursuant to the contract, any subsequent purchase will be at an increased price, and it refers to the contract and insists upon its rights thereunder and does not waive them, or any of them.

This defendant *admits* that it has not removed any factory at Powerville and that it has not built any intercepting sewers at Boonton or any sewage disposal plant at Dover, and *says* that no such removal or construction is required by the contract, or is necessary for the delivery to the complainant of water, free from pollution, as required by the contract. And this defendant *says* that it has, in all respects and in every detail, performed its contract for the delivery of water to the City and is now daily engaged in delivering such water to the City in full and complete compliance of its contract for such delivery, and that it is entitled to receive quarterly, therefore, the full payment of the contract price for the water so delivered, without any deduction or diminution.

This defendant *further says* that it has substantially completed the water-works pursuant to the contract, at a total cost of more than Nine Millions of Dollars, and this defendant *tenders* itself ready to convey and deliver said works to the City, on receipt of the contract price, on or before the First day of October, Nineteen Hundred and Five.

ALL which matters this defendant is ready to maintain and prove, and *prays* to be hence dismissed, with costs.

Collins & Corbin,
Solicitors of Defendant.

IN CHANCERY OF NEW JERSEY.

Between
THE MAYOR AND ALDERMEN OF JERSEY CITY,
Complainant,
and
PATRICK H. FLYNN AND JERSEY CITY WATER SUPPLY CO.,
Defendants.

ON BILL, &C.
Decree Pro Con

This cause being opened to the Court by Robert Carey, of counsel with the complainant, and it appearing that process of subpœna for the defendants to appear and answer the complainant's bill, hath been duly issued and returned served upon the defendant Jersey City Water Supply Co., and that due notice of the order of this Court, made on the twenty-ninth day of August last, directing the defendant Patrick H. Flynn to appear, plead, answer or demur to the complainant's bill, on or before the thirtieth day of October, nineteen hundred and five, has been duly published and also mailed to the said defendant in the manner and as in the said order directed and prescribed, and that the defendant Patrick H. Flynn has not appeared and pleaded, answered or demurred to the said bill within the time limited by law and the said order, or at any other time, but that he has wholly failed and neglected so to do;

It is thereupon, on this Twenty-fifth day of November, nineteen hundred and five, ORDERED AND DECREED that the complainant's bill be and the same is hereby taken as confessed against the said defendant Patrick H. Flynn, to the end that such decree may be made against him as the Chancellor shall think equitable and just.

W. J. MAGIE,

C.

A true copy,

VIVIAN M. LEWIS,

Clerk.

IN CHANCERY OF NEW JERSEY.

Between THE MAYOR AND ALDERMEN OF JERSEY CITY, Complainant, and JERSEY CITY WATER SUPPLY Defendant.	ON BILL, &C. REPLICATION.

The complainant joins issue on the answer of the defendant Jersey City Water Supply Company.

ROBERT CARY,

Solicitor of Complaint.

IN CHANCERY IN NEW JERSEY.

Between
The Mayor and Aldermen of Jersey City,
Complainant,
and
Patrick H. Flynn, and the Jersey City Water Supply Co.
Defendants.

First Day.

Before His Honor Vice Chancellor Stevens.

Mr. Allan L. McDermott, Mr. James B. Vredenburgh and Mr. George L. Record, counsel for the complainant.

Mr. William H. Corbin, Mr. W. D. Edwards, counsel for the defendant Jersey City Water Supply Company.

Transcript of shorthand report of the evidence given upon the trial of the above stated cause, on Tuesday, the twentieth day of February, nineteen hundred and six, at the Chancery Chambers, Newark, New Jersey.

THOMAS McEWAN, JR., sworn on behalf of the complainant.

Direct examination. By Mr. Vredenburgh.

Q. Mr. McEwan, you are the Comptroller of the Mayor and Aldermen of Jersey City?
A. Yes, sir, I am.

Q. Have you brought with you from your records the original contract between the Mayor and Aldermen of Jersey City and Patrick H. Flynn?

A. I have.

Q. Will you produce it?

A. (Witness produces same).

Q. You have here only the contract of February 28th, 1899?

A. Yes, sir.

Mr. Vredenburgh: I have also here, may it please your Honor, copies of the contracts, in that shape, perhaps your Honor would like to have one of those, and I think they might be marked, as the other side have had copies of those.

Mr. Edwards: There is no objection.

Mr. Vredenburgh: Will your Honor have this original contract marked?

The Court: No, I think not.

Mr. Vredenburgh: Well, what shall it be called?

The Court: Exhibit C 1.

Profile marked "C 1 profile."

Map marked "C 1 map."

Mr. Vredenburgh: The third one is Map No. 2. The original is here, however, to be seen.

Q. Now Mr. McEwan, have you also the original contract of July 8th, 1901?

A. Yes, sir (producing same).

Mr. Vredenburgh: I offer the original contract of July 8, 1901.

Marked Exhibit C 2.

Q. Have you also the contracts of March 31, 1902?

A. (Same produced).

Q. Contract X and contract Y, and annexed to them is another copy of the specifications and contract of February 28, 1899, the copy annexed to the bill of complaint of contract X and Y have not the signatures of the parties, that it is a mistake; I show natures of the parties, that is a mistake; I show your Honor the original contract, and that is signed by all of the parties.

Mr. Corbin: The execution is not disputed at all.

Mr. Vredenburgh: I offer those in evidence.

Contract X marked Exhibit C 3.

Contract Y marked Exhibit C 4.

Q. Now, Mr. Comptroller, have you also from your files, a copy of the contract with the East Jersey Water Company, dated October 12th, 1895?

A. (Produced).

Mr. Vredenburgh: I might say to your Honor, and to counsel that I propose to offer in evidence the three contracts which form the whole of the dealings between the East Jersey and Jersey City, because the last two contracts refer to the other, and therefore I offer them all in evidence. First is the contract of October 12th, 1895, between the Mayor and Aldermen of Jersey City and the East Jersey Water Company.

Marked Exhibit C 5.

Q. Now the "Supplemental Agreement" of April 22, 1897, between the same parties?

A. April 22nd, 1897. (produced).

Marked Exhibit C 6.

Mr. Vredenburgh: The third contract, may it please your Honor, is Y which has been already offered in evidence.

No cross-examination.

GEORGE T. BOUTON, sworn on behalf of the complainant.

Direct examination. By Mr. Vredenburgh.

Q. Mr. Bouton, you are the clerk of the Board of Street and Water Commissioners of Jersey City?

A. I am.

Q. And you have occupied that position how long, sir?

A. Ever since there was a Board of Street and Water Commissioners, about seventeen years last past.

Q. I show you a resolution adopted October 13, 1898, by the Board of Street and Water Commissioners, and ask you whether that is produced from your files.

Mr. Vredenburgh: Perhaps I might state first what it is, in order to give the other side a chance to object, if they desire to. This is the resolution:

"That the corporation counsel be and is hereby requested to submit to this Board an opinion in writing as to the adequacy of prevention of pollution of the contemplated new water supply under proposal submitted to this Board on August 18th last, and as to the responsibility for the future maintenance of such prevention."

Mr. Corbin: What is the date of that?

Mr. Vredenburgh: The resolution is dated October 13, 1898.

Mr. Corbin: I object to it as not competent evidence.

The Court: I do not know what its purpose is.

Mr. Vredenburgh: Your Honor will recall that the proposal is dated August 18th. The contract was not executed until the subsequent year, in February. This is between those dates, and is, as I have read to you, with reference to pollution. Of course your Honor is not yet in possession of the facts which will show the materiality of this particular evidence. The objection to it is that it is not material; I maintain that it is material.

The Court: Let it be marked then, for identification.

A. This is from my file, the files of my office.

Marked C 8 for identification.

Q. I show you the Answer thereto of the City Council, November 5, 1898—and ask you whether that comes from the files of your office.

Mr. Corbin: Same objection, it is not material or competent.

A. It did.

Q. Filed there on the day it bears date?

Mr. Edwards: What is the date?

Witness: November 5, 1898. Filed November 7, 1898.

Mr. Vredenburgh: I ask that that be marked for identification also.

Marked for identification C 9.

Mr. Corbin: Shall I examine now, or wait until later?

The Court: Well, you have the right, as they are offered for identification, to see them and examine on them.

Mr. Vredenburgh: I have no objection to their seeing them at all.

The Court: The situation with respect to those papers is that while their relevancy don't appear now counsel states that he will show them to be relevant hereafter; in other words, show them to be part of something broader.

Mr. Corbin: My only question was as to the proper time for my cross examination on these papers.

The Court: Each piece of evidence which goes to make up one whole is necessarily subject to cross examination at the time.

Mr. Vredenburgh: As I understand the rule, when counsel reads it then it makes it evidence and I can put it in at any time if it is material.

The Court: No. When counsel calls for a paper and you produce it and counsel reads it, then it is evidence, but counsel didn't call for this, and I don't think that makes it evidence.

Mr. Vredenburgh: Their relevancy will be determined when I offer them.

The Court: Yes, but counsel can always cross examine with respect to a paper, for the purpose of bringing out facts, which are apparent on the surface.

Mr. Vredenburgh: Yes; I have no objection to the cross examination.

Cross Examination. By Mr. Corbin.

Q. This paper in the form of a resolution which you produce, is it entered in the minutes of the Board?

A. It is.

Q. This is your file from which you made up your minutes?

A. Yes, sir, original, from which the minutes are made up.

Q. Where is it entered in your minutes?

A. It is entered in the minutes of that date.

Q. October 13th, 1898?

A. Which one do you refer to now? The resolution?

Q. The resolution?

A. That is on October 13th, 1898, you will find it in the Manual of the year 1898, on page 259—201 on the Manual of 1898, page 201.

Mr. Vredenburgh:

Q. Well, my record says page 229.

A. Opinion of A. L. McDermott as to legality of bid, is that it?

Q. No, requesting opinion.

A. Requesting opinion of A. L. McDermott as to matter of pollution, October 13th, 1898, page 229 of Manual of that year.

Mr. Corbin: Well, I have that much respect for Mr. McDermott's opinion that I will withdraw my objection to the whole thing, and it may go in.

(The paper which was heretofore marked for identification C 9, is Marked Exhibit C 9, the objection having been withdrawn.)

Adjourned until Wednesday, February 21st, 1906, at the Chancery Chambers, Newark, N. J.

Second Day, February 21, 1906.

Mr. Vredenburgh: I propose to offer the resolution of the Board of Works, passed October 31, 1899. I will read the resolution to your Honor: "Whereas, in the provisions of specifications and contract for a New Water Supply heretofore adopted and entered into by the city, the Contractor for the building of New Water Works and the furnishing of such supply is permitted to change the location of reservoir site from that offered in his bid, if certain physical conditions are such as to warrant said change, and the site and reservoir desired to be substituted therefor is 'of equal value and efficiency,' etc., and

"Whereas, the agent of this Board, viz., the Engineer in charge of construction of said water works has, conformably with his duty, notified this body of the desire of the contractor to make such change, and that he, the said Engineer in charge, etc., believes that the best interests of the city would be conserved by the permitting of such change and substitution,

"Resolved, That the change and substitution as suggested be acquiesced in and agreed to by this

Board provided that no additional charge therefor shall be made to the city, and that all responsibility for lack of storage capacity, efficiency, or for the proper and speedy completion of the works as a whole, which may hereafter appear as resultant from such change and substitution, shall be assumed and borne wholly by the contractor and all defects and deficiencies, which may be caused by such change, fully corrected by him at his own expense, and

"RESOLVED, That the Engineer in charge, etc., be and is hereby directed to notify the contractor of this action."

Do you care to look at it, Mr. Corbin?

Mr. Corbin: No, I have no objection to it.

Mr. Vredenburgh: I offer that resolution in evidence.

Marked Exhibit C 10.

Now I offer a resolution of the Board of Works, produced by this witness, passed January 9, 1900, as follows:

"RESOLVED, That His Honor the Mayor be and is hereby requested to call by proclamation, a special election of the voters of Jersey City to be held not later than Tuesday the sixth day of February next to vote upon the question of acceptance or rejection of a new water supply as provided in specifications heretofore approved and contract heretofore awarded, and as further provided in Chapter 390 of the Laws of 1895, entitled 'An act to submit to popular vote the purchase of a supply of pure and wholesome water in cities of the first class in this State,' and further

"RESOLVED, That the Board of Aldermen be requested on the issuance of such proclamation, to take charge of the election pursuant to the provisions of the Act before cited."

Marked Exhibit C 11.

Mr. Vredenburgh: I offer the resolution of January 16, 1900:

"Resolved, That in accordance with and conformably to specifications for new water supply heretofore adopted by this Board July 8, 1898, with proposals presented thereunder August 18, 1898, with award of contract made by virtue thereof to Patrick H. Flynn December 8, 1898, with contract entered into with said Patrick H. Flynn February 28, 1899, and with resolution in matter of change or reservoir site adopted by this Board October 31, 1899, notice is hereby given of the intention of the city to purchase the water works and all appurtenances thereof necessary to fulfill the requirements of said specifications and to the extent of Fifty (50) million gallons of water daily, together with the water supply, water rights, lands, reservoir sites, rights of way and all easements necessary to fulfill the requirements of said specifications and to the extent of seventy (70) million gallons of water daily forever, when the water works are completed and accepted, at the price named in the proposal submitted by the said Patrick H. Flynn, as aforesaid, under Plan No. 1, namely: Seven million five hundred and ninety-five thousand dollars ($7,595,-000)."

Marked Exhibit C 12.

Mr. Vredenburgh: That is the resolution of the Board of Finance.

I offer in evidence from the files of this office, a letter from M. J. O'Donald, City Clerk, enclosed in a letter from Edward Hoos, Mayor, with regard to the election.

"Office of City Clerk, City Hall, Jersey City, N. J., February 20th, 1900:

"Honorable Board of Street and Water Commissioners.

"Gentlemen: You are hereby notified that there is on file in the office of the City Clerk a statement of the determination of the Board of County Canvassers relative to a Special Election held in the city of Jersey City on February 13th, 1900, on the question of accepting or rejecting the proposition of the purchase of a new water supply.

"Said Board determines that at said election the majority of the ballots cast for and against the said purchase contained the words 'Purchase of New Water Supply accepted.' Respectfully submitted, M. J. O'Donald, City Clerk."

Those last words are in quotation, and they are the words required by the statute.

Mr. Corbin: They are the words the statute require to be on the ballot, is not that so?

Mr. Vredenburgh: I think it is, the statute requires what words are to be on the ballot, and these I understand were the words on the ballot:

"Executive Department, Jersey City, N. J., Feb. 20th, 1900. Honorable Board of Street and Water Commissioners. Gentlemen: I have been officially notified that there is on file in the office of the City Clerk a statement of the determination of the Board of County Canvassers as to the result of the Special Election held in this City on February 13th, on the question of accepting or rejecting the proposition to purchase the new water supply, and that the said Board determines that the majority of ballots cast for and against said purchase contain the words 'Purchase of New Water Supply Accepted.' I therefore respectfully request your Honorable Board to officially notify Mr. Patrick H. Flynn of the result of the election above referred to.

"Respectfully submitted,

"EDWARD HOOS,

"Mayor."

Marked Exhibit C 13.

Mr. Corbin: I enter an objection to that as not competent evidence of the result of the election.

Mr. Vredenburgh: I now offer in evidence a communication from the Jersey City Water Supply Company. I will read it:

"The Mayor and Aldermen of Jersey City and Board of Street and Water Commissioners of Jersey City.

"Dear Sirs: You are hereby notified that in order to carry out the provisions of the contract dated February 28th, 1899, made between Jersey City and Patrick H. Flynn, Contractor, for a new supply of water for said City (which contract has since been assigned by said Flynn to the Jersey City Water Supply Company) it is necessary to purchase or condemn, in the name of the City, at this time, certain lands for the right of way and construction of the pipe line and tunnel conduits now being constructed for the City between the main reservoir near Boonton, New Jersey, and the Bergen Reservoir, in Jersey City, which lands are described in the schedule hereunto annexed.

"You are hereby requested in accordance with the terms of said contract, to acquire title to said lands for the purposes aforesaid by the exercise of the City's rights of condemnation. We further request that power to proceed in the premises be conferred upon our Counsel, William D. Edwards. Yours respectfully, Jersey City Water Supply Co. M. J. Kennedy, Treasurer. Dated April 2nd, 1900."

Marked Exhibit C 14.

Mr. Corbin: I object to it as not pertinent to any issue in this suit.

The Court: Well, what was the paper that you offered before, whose certificate was it, the one relative to the election?

Mr. Vredenburgh: That was the certificate—the last letter was signed by the Mayor, the letter accompanying it. both marked as the same exhibit, was from the City Clerk of the City to the Board, and it was directed to the Board of Street and Water Commissioners, and is brought from the files of their office.

The Court: What body determines the result of the election?

Mr. Vredenburgh: It is a body—an Election Board for the city, and their certificate will be, in a moment, produced from the clerk's office of the City.

The Court: Mr. Corbin makes objection to that other paper, I presume that that objection is well founded, if that paper is intended to be evidence of the result of the election. I suppose the best evidence of the result of the election is the determination in writing of the Election Board.

Mr. Vredenburgh: Yes, and that we have here.

Mr. Corbin: That was my objection.

Mr. Vredenburgh: This shows the communication by the City to the Board that has control over the water.

Mr. Corbin: Well, Mr. Vredenburgh read a letter from the City Clerk O'Donald, and he says there is a communication from the Mayor appended to it. I did not hear that read, and I did not understand that it was offered.

Mr. Vredenburgh: Oh, yes, I read it.

Mr. Corbin: From whom to whom is it?

Mr. Vredenburgh: From Edward Hoos, Mayor, to the Board of Street and Water Commissioners.

This paper which I have just read and which was marked Exhibit C 14, is filed April 3, 1900, and it describes five tracts of land, containing several acres each.

Mr. Corbin: My point is that it is not pertinent to any issue made by the pleadings.

GEORGE T. BOUTON, recalled for further direct examination by Mr. Vredenburgh.

Q. There were two or more exhibits that were last seen in your hands last night?

A. Yes, sir, I have them.

Q. You have?

A. Yes, sir.

By Mr. Vredenburgh: I now read to your Honor Resolution of Board of Street and Water Commissioners, October 13, 1898, Exhibit No. 7. "Resolved, that the Corporation Counsel be and is hereby requested to submit to this Court an opinion in writing as to the adequacy of prevention of pollution of the contemplated new Water Supply under proposals submitted to this Board on August 18th last, and as to the responsibility on August 18th last, and as to the responsibility for the future maintenance of such prevention."

This is the reply:

"November 5, 1898.

"To the Honorable the Board of Street and Water Commissioners:

"Gentlemen: I respectfully advise you that, under the specifications adopted for a new water supply there is not any question that the contractor will be obliged, before he can compel the city to receive water, to take all steps necessary to prevent pollution. He must continue to keep the water pure until the city purchases the plant. If it is decided to purchase, the contractor must deliver a plant free from pollution. Afterward, the question of pollution will have to be settled by the vigilance of the city. No municipality or corporation or individual will have any right, for any purpose, to pollute the source of this city's supply, and any such attempt will be promptly enjoined by the Courts. "Respectfully,

"ALLAN L. McDERMOTT,

"Corporation Counsel."

Now, may it please your Honor, I desire to offer the resolution of the Board of Finance at a meeting held February 21, 1900:

I now offer a resolution of the Board of Finance at a meeting February 21, 1900, which was approved by the Mayor February 23, 1900, as follows:

RESOLVED, That the Board of Finance hereby concurred in the following resolution adopted by the Board of Street and Water Commissioners on February 20, 1900, to-wit: Resolved, that the resolution heretofore adopted by this Board on January 16, whereby notice was given to Patrick H. Flynn, that it was the intention of the city to exercise certain options provided for in the contract heretofore entered into with the said Patrick H. Flynn, on February 28, 1899, for the purchase upon completion and acceptance under plan No. 1, of water works built in accordance with the specifications, and capable of delivering 50 million gallons of water daily, together with a water shed capable of producing 70 million gallons daily, &c., &c., which said resolution is in manner and form as follows: Then comes the resolution, if it pleases your Honor.

By Mr. Corbin. He don't seem to have had any such resolution as is there concurred in.

By Mr. Vredenburgh: Yes, it is in; I read it fully.

Q. I show the witness a letter and ask him whether that came from his files?

A. It did.

Q. What date?

A. July 3, 1900.

Mr. Vredenburgh: "To the Honorable Board—"

Mr. Corbin: I ask a ruling from the Court, that when a letter or resolution is offered, counsel state from what Board it comes, and, if it is a letter, he state from whom and to whom, and its date. We should at least know that before it is read to the Court.

The Court: I think that is the ordinary course.

Mr. Vredenburgh: It is addressed "To the Honorable, the Board of Street and Water Commissioners," and is signed "C. A. VanKeuren," without any title; he is the chief engineer of the city.

Mr. Edwards: Not at that time, was he?

Mr. Vredenburgh: At that time.

Mr. Edwards: Well, he says July 3, 1900.

Mr. Vredenburgh: July 3, 1900. It is endorsed "From the chief engineer in regard to new water supply."

Q. Mr. Bouton, was Mr. C. A. Van Keuren chief engineer of Jersey City on the date of that paper?

A. He was.

Mr. Vredenburgh: Now, I propose to read it, your Honor.

"To the Honorable, the Board of Street and Water Commissioners:

"Gentlemen: The new system of water supply will be completed, and water available for delivery in the year 1902, at which time the city's consumption will probably be about thirty-one million gallons (31,000,000), per day.

The capacity of this plant is fifty million gallons (50,000,000) per day, so that there will be available, but not required for the use of the city, about nineteen million gallons (19,000,000) per day under the present conditions, and probably thirty million gallons (30,000,000) if all taps are metered. It would seem desirable and to the best interest of the city for this surplus water to be utilized in some way, and as the only practical method would be by the sale of the same, I would suggest that your Board direct that specifications be drawn with a view to calling for bids for the purchase of any surplus, without lessening or interfering with the supply of the city or its present consumers.

"Very respectfully,

"C. A. VAN-KEUREN."

Objected to as not competent, and not relevant to any of the issues of the case.

The Court: It will have to go in, I suppose, subject to your objection; I can deal with it better hereafter.

Said letter marked C 16.

Q. I show you a resolution of the Board of July 31, 1900——

Objected to.

Admitted, subject to objection.

"Resolved, That the Corporation Counsel be requested to inform this Board on what date the contractor for a new water supply is bound to complete his work and deliver water to the City."

Objected to.

Admitted.

Marked Exhibit C 17.

Mr. Vredenburgh: I now offer the answer of the Corporation Counsel to that resolution.

"Jersey City, August 14, 1900.

"To the Honorable, the Board of Street and Water Commissioners:

"Gentlemen: I am in receipt of your resolution that I inform you 'on what date the contractor for a new water supply is bound to complete his work and deliver water to the city.'

The contract awarded to Mr. Patrick H. Flynn was executed on the 28th of February, 1899. It provides that the contractor shall be allowed 'Two years and six months from the date of contract to complete the work and furnish the water specified;' and that the contractor shall pay the City of Jersey City the sum of five hundred dollars, as liquidated damages, for every day's delay beyond the term of the contract, but that 'all the time lost by reason of strikes, accidents or other delays unavoidable or beyond the control of the contractor, shall not be computed as part of the time herein specified, if the unavoidability of such delays is certified to by the engineer appointed by the city to superintend said work.'

"On March 8, 1899, an application for a writ of certiorari, to test the validity of the contract, was made to Supreme Court Justices Depue, Van Syckel and Gummere. The writ was refused on the fourteenth of that month. On the 28th of March, 1899, notice was served upon the city and contractor that another application would be made to Justice Lippincott for a similar writ. The argument on this application was had on the first of April, 1899. On the 14th of that month, Justice Lippincott denied the writ, suggesting, however, that further application could be made to the Supreme Court. Notice was served on the City and contractor that a third application would be made for the writ, and argument on this application was had at Trenton, June 8, 1899. On the thirtieth of August, 1899, Justice Gummere filed the opinion of the Supreme Court, affirming the validity of the contract.

"In my opinion, the time of the contractor must be computed from the date of the final decision of the Supreme Court, and the contractor must therefore complete his work and furnish the city with water on or before the 28th of February, 1902.

"Respectfully,
"ALLAN L. McDERMOTT,
"Corporation Counsel."

Objected to as incompetent.

The Court: I do not think it is competent, unless there is some paper introduced showing that the Water Supply Company agreed to that view.

Mr. Vredenburgh: They did, sir.

The Court: I cannot pass upon that until all the papers are in, but, as the opinion of the City Counsel, of course, it cannot bind the Water Company.

Mr. Vredenburgh: I think your Honor will find that that was all agreed to, the six months; it explains how it happened that there should be six months additional.

Said letter marked Exhibit C 18.

Q. (Handing witness a paper) Is this a letter from your files? What is the date of it, I mean when was it filed?

A. October 23, 1900.

Q. And has it been in your possession ever since?

A. Yes, sir.

By Mr. Vredenburgh: This is a letter from the East Jersey Water Co. dated October 22, 1900, and reads as follows:

"To the Mayor and Aldermen of Jersey City, and Jersey City Board of Street and Water Commissioners:

"Gentlemen: Please take notice that the East Jersey Water Company, will on and after October 23, 1902, cease supplying the city of Jersey City with water under its contract with the city, dated April 22, 1897.

"This action is given by direction of the Board of Directors of the East Jersey Water Company, and pursuant to the 6th section of said contract.

"THE EAST JERSEY WATER COMPANY,
"By Albert P. Fisher, Secretary."

Marked Exhibit C 19.

Q. I show you another letter, or a communication, and ask you whether that came from the files of your office?

A. It did.

Q. When was it filed with you?

A. April 30, 1901.

Q. And has it been in your possession as clerk of the Board ever since?

A. It has.

By Mr. Vredenburgh: It is a letter signed by Corbin & Corbin, Attorneys for the Morris Canal & Banking Company.

(Mr. Vredenburgh handed it to Mr. Corbin, who admitted its genuineness.)

"To the Mayor and Aldermen of Jersey City, The Board of Finance, and the Board of Street and Water Commissioners:

"On behalf of the Morris Canal and Banking Company your attention is respectfully called to the rights of said Company in the Rockaway Water Shed, from which shed you have entered into a contract to obtain a public water supply for your City.

"The Morris Canal is located in the Rockaway Valley for a distance of about 13 miles above your proposed intake, and takes water from the river and its tributaries at Dover, Beaver Brook, Powerville, and Boonton, the boats actually passing into and out of the waters raised by slackwater dams at Dover and Powerville.

"The Supreme Court in setting aside a former water contract of the City decided that the City has no power to take by condemnation water that is needed for navigation purposes; nor has the Canal Company the power to give up by contract or consent water so needed, it being bound to maintain the canal as a public highway until the expiration of its Charter in 1973.

"Before Mr. Flynn made his present contract with your City dated February 28th, 1899, he applied to the Canal Company for a grant of certain water rights, which grant was made, and is still in force. He also applied for an agreement whereby the Canal Company should abandon navigation on the canal, if Mr. Flynn, among other conditions, should obtain the needful authority from the Legislature of 1899. To this the Company assented. Mr. Flynn caused a bill for the abandonment of navigation on the canal to be introduced into the Legislature but did not secure its passage. His agreement for the abandonment of navigation therefore expired when the Legislature of 1899 adjourned. Mr. Flynn never renewed the subject with the Canal Company until during the past Winter, when he was endeavoring to obtain a loan with which to complete the construction of your water works. It was then shown that the water-shed was insufficient to allow of the operation of the Morris Canal and still supply Jersey City under its contract, and that either larger reservoirs must be built or the canal abandoned. Mr. Flynn then applied to the Canal Company for a renewal of the agreement to abandon navigation, to which the Company assented, consenting also to join in an application to the Legislature for the passage of such legislation.

"Mr. Flynn accordingly caused a second bill to be introduced into the Legislature of 1901 permitting the abandonment of the canal, which, however, failed to pass, and Mr. Flynn's second agreement for abandonment thereby expired.

"To operate the Canal the waters of the Rockaway River are necessary. Very careful tests extending over a long period demonstrated years ago that the control of the Rockaway Water Shed above Old Boonton is essential to the operation of the Canal, and the Company has for more than fifty years had and enjoyed the first right to use these waters, and its right to use them is unquestionable. Its duty to use them is no less clear, for the Canal is a public highway which the Company is bound to maintain.

"The result is that Jersey City can obtain from the Rockaway Water Shed only such waters as remain after the needs of the Canal are supplied, such needs being necessarily variable from year to year.

"We have stated these details at length so that it may be understood that the Canal Company has taken no position of hostility to the City, but has sought to further the City's project of obtaining a permanent water supply by aiding the City's contractor to get the water; this statement is further made to the end that at this juncture when it is proposed to modify the City's contract with Mr. Flynn, the City may have renewed notice of the rights and claims of the Canal Company and of the duty and necessity under which it remains, to continue the use of the waters of the Rockaway for Canal purposes as heretofore.

"When the Canal Company contracted with Mr. Flynn it was never contemplated that he would construct his water plant without obtaining either the abandonment of the Canal, or provision for sufficient storage, and special provision was made in the grant of water-rights, (above mentioned) and which he still holds, (in case the Canal should not be abandoned), for additional storage in the shape of a reservoir at Beach Glen, and also a reservoir at Longwood Valley, from each of which the Canal Company reserved a prior right to a prescribed daily flow for the purposes of the Canal. For this purpose Mr. Flynn acquired 502 acres of land for the reservoir at Longwood. The Canal Company then stated in its contract that with sufficient storage capacity (but only on this condition) they believed there was sufficient water in the Rockaway Shed, both for the City and for the Canal.

"The provision in the grant of water rights from the Morris Canal & Banking Company, and the Lehigh Valley Railroad Company, to Mr. Flynn, bearing on this point, is as follows:

" 'The Railroad and Canal Companies covenant and agree that they will hereafter draw from the Rockaway River and its tributaries at or above Boonton only such quantity of water, as together with the waters of Lake Hopatcong as now used by said Companies is reasonably sufficient and necessary to operate their Canal as heretofore operated; and it is understood and agreed that the right so to draw is hereby reserved by said Companies, anything herein contained to the contrary notwithstanding (the parties hereto being satisfied that with sufficient storage there is enough water in the Rockaway Water Shed above Old Boonton including the waters of Lake Hopatcong as heretofore drawn, to supply Jersey City with 70,000,000 gallons of water daily, and to operate the canal as now operated). And said Companies agree that they will co-operate with said Flynn, who may, in the name of the said Railroad and Canal Companies, but at the expense of said Flynn, take legal measures to prevent and punish pollution of the waters herein referred to, and that the canal above Boonton shall be operated with care to avoid, as far as may be practicable, pollution of its waters. Said Flynn agrees that until the Morris Canal at Boonton is abandoned for navigation, he will establish no intake for the diversion of water, and will divert no water above Old Boonton. After such abandonment said Flynn may establish intakes in the Rockaway Water Shed and divert the waters at such points above Old Boonton as he may desire.'

"By this it will be seen, that the Canal Company also agreed so far as might be practicable, to aid in lessening the pollution of the City's water supply resulting from the evils incident to canal boats being passed through it, until such time as this source of pollution could be eliminated by abandonment of navigation. The canal boats are towed about eight miles from Lake Hopatcong to Dover through water that is discharged into the Rockaway River at Dover, and from Dover they pass for about eight miles through water that is again discharged into the Rockaway at Powerville, both these discharges being above the City's intake at Boonton.

"Statements have been published that the Morris Canal and Banking Company made no claim to the waters of the Rockaway River until after your contract for water supply with Mr. Flynn had been entered into, and that, in fact, they have no rights to these waters. Both statements are erroneous.

"On the twenty-fourth day of February, 1898, the Canal Company gave the City written notice of its rights. At the request of the Corporation Counsel for particulars, he was given a written statement, which was published April 30th, 1898, and was reported by him to the Board of Finance. In the course of this statement we said:

" 'Possibly some bidders have proceeded on the theory that there is water enough in the Rockaway and its tributaries which supply the Morris Canal to supply not only the Canal but also to supply Jersey City; we know this is a mistake, for long experience has shown that in dry times the Company has barely been able to continue navigation, and in one extreme drought navigation was suspended.'

"Not only was full notice given to the City and to Mr. Flynn, but Mr. Flynn recognized the rights of the Canal Company by requesting from it the grant and agreements above referred to before he contracted with the City. The fact is that to supply both the City and the Canal from the Rockaway Water Shed, it is necessary to save and utilize substantially the entire flow of the Water Shed by the construction of reservoirs sufficient for that purpose.

"If the City sees fit to release Mr. Flynn from his contract to make the 'whole flow of the Rockaway River' tributary to his intake, and to relieve him from the necessity of building reservoirs which would cost from $800,000 to $1,000,000 the Canal Company desires that the City shall do so without any misunderstanding as to the Canal Company's rights, and shall not base such action upon a denial of the Canal Company's prior right to draw waters needed for the Canal.

"MORRIS CANAL AND BANKING COMPANY,
"By
"CORBIN & CORBIN,
"Attorneys.

"Jersey City, April 24, 1901."

Marked Exhibit C 20.

By Mr. Corbin: I object to the paper as incompetent and irrelevant, and for the further reason that it already appears that the conflict over all this matter was settled and closed in a contract whereby the city agreed to retain $500,000. Moreover, this letter cannot bind the defendant in this suit, anyway, and I object to it.

By Mr. Vredenburgh: Your Honor will see by the answer in this case that the defendants deny that the Morris Canal and Banking Company never claimed any such rights. There is nothing in this suit to show that the Morris Canal and Banking Company has ever consented in any way to the use by Jersey City of the full flow of the Rockaway River.

By the Court: The paper may go in subject to objection.

Marked Exhibit C 20.

Q. I show you a resolution of the Street and Water Commissioners and ask you whether that was duly passed, and when it was passed?

A. Passed by the Board of Street and Water Commissioners on February 25th, 1902.

Mr. Vredenburgh: I offer this in evidence, and will read it: "Whereas, On the 28th day of February, 1899, a contract was entered into by the City of Jersey City through its proper officers with one Patk. H. Flynn for a New Water Supply for Jersey City and the necessary building of the works therefor, which said contract in its terms required the completion of the work and the furnishing of the water thereunder at a period not later than two (2) years and six (6) months from the date of contract, and

"Whereas, By reason of certain litigation in connection with said contract the Corporation Counsel of Jersey City has advised the City that a further allowance of six (6) months should be made said Contractor in which to complete said contract, which said six (6) months will expire on the 28th day of February, 1902, and

"Whereas, This Board has informed itself and has been informed by its Agents and the Agents of the said Patrick H. Flynn that it will be impossible for the said Patk. H. Flynn to complete said contract within the time so specified and extended as aforesaid

"Resolved, That the said Patk. H. Flynn and his assignees, the Jersey City Water Supply Company are hereby notified that for and beyond the period of two (2) years and six (6) months dating from the 28th day of Feby, 1899, and a further period of six (6) months, expiring on the 28th day of February, 1902, the city will hold them liable for delay in accordance with the following clause of contract: 'For every day's delay beyond the term of contract, the Contractor shall pay the city of Jersey City the sum of Five Hundred ($500) dollars per day as liquidated damages and not by way of penalty.'

" 'In the serving of this notice the City does not thereby intend to, nor does it, waive any of the rights or privileges or duties accorded to it or devolving upon it, by reason of said contract or the process of its execution or the completion thereof.

and reserves to itself all its legal rights in the premises.' "

Mr. Vredenburgh: Mr. Corbin, I demand from you the production of the original served upon your clients.

Mr. Corbin: I object to it as incompetent, as contracts already offered show that all this preliminary negotiation was congealed into a contract settling this very question.

The Court: Well, no objection is made to the fact that you haven't the original paper.

Mr. Corbin: I think there is no doubt we had notice of it, of course.

Marked Exhibit C 21.

Q. I show you a letter from Mr. Garwood Ferris, Engineer in charge, to the Board of Street & Water Commissioners, dated September 16, 1902, and fastened thereto, a letter from Mr. Harrison, who signs himself Chief Engineer, J. C. W. S. Co. to Garwood Ferris Esquire, dated September 12, 1902, to which letter is annexed a tracing of the Parsippany Dyke, to which is annexed a letter to Mr. Harrison of September 16, 1902, from Mr. Ferris, and ask you whether those letters came from your office as clerk of this Board?

A. They did.

Q. And they were filed with you when?

A. September 23, 1902.

Q. And they have been in your possession ever since?

A. Yes, sir.

Q. As clerk?

A. Yes, sir.

Mr. Vredenburgh: I offer this in evidence, and will read it.

Jersey City, September 16th, 1902.

"Hon. Board of Street & Water Commissioners.

"Gentlemen: For the information of your honorable body I herewith enclose copy of a letter received by me from E. W. Harrison, Chief Engineer of the Jersey City Water Supply Co., bearing date September 12th, (received September 15th) also copy of a letter which I have this day sent him in reply.

"Very respectfully,
"GARWOOD FERRIS,
"Engineer in Charge."

"September 12th, 1902.

"Garwood Ferris, Esq., Supervising Engineer New Water Supply.

"Dear Sir: Yours of Sept. 5th, received relative to construction of Parsippany Dyke by the Jersey City Water Supply Company.

"To prevent misunderstandings, I will state the position of the contractor. The contract for the Water Supply gave the City an election to require a reservoir suited for a supply of 50 million or of 70 million gallons. It also provided that the proposed site of the dam might be changed if the foundation was found to be unsuitable. The ground was found to be unsuitable for foundations, and a change of site was proposed by the Contractor in June, 1899, and again in October, 1899. At that time the City had not decided whether the Contractor must provide a dam necessary for a supply of fifty millions or one for seventy millions, and the contractor might be called upon, at any moment 'during the term of the contract,' to conform his construction to a 70-million basis. It seems from your letter, that while the application for a change of site was pending before the Board, you, in order to advise the Board, sought information from the contractor, or his engineer, and among other things, obtained an approximate estimate of the relative cost of increasing the dam and reservoir capacity from 50 million gallons per day to 70 million gallons per day capacity at the two sites. This information formed no part of the contract, and giving it, placed the contractor under no new obligations.

"The sole object of the schedule referred to in your letter, was to approximate the cost of enlargeing the capacity of the reservoir at the two localities, and to compare these costs. The particular section on which this comparison was based, could not, and did not affect this difference, provided that the comparison must be made with similarly designed sections for both locations. The difference in cost depended entirely upon the natural physical conditions, topography of the reservoir, and the difference in the elevation between the planes of high water at either capacity at the two sites, and the relative widths of the valleys at the levels of full reservoirs at each capacity.

"The increase in thickness of base which you contend for, would have been, for cases of true comparison, made in the case of both sites, or omitted in both sites. In either case, the one example balances the other.

"The real difference in cost of increase between the two sites, is all in construction between the elevation of the two relative planes of 50 million and 70 million capacity reservoir.

"In the original reservoir, these planes were fifteen and a half feet apart, and in the final selection, 19 feet apart.

"In this increase of height, and also length across the valleys is the $53,000 difference in cost cited in your letter of October 29, 1899, recommending change of site, and the difference was entirely independent of any particular section given the dam and dyke for purpose of comparison.

"It further appears from your letter, that you obtained from the Engineer's office of the Contractor, a blue print of one of the many studies or sketches, which had been prepared as a possible plan of construction, showing a mode which might be adopted for a supply of 50 million, and be increased for a supply of 70 million. This blue print was dated November 11, 1899, which was after the Board had, by resolution of October 31, 1899, approved the new site, so that it could not have been considered in making that change. Furthermore, it is unsigned, and was never adopted by the contractor, or submitted by him to the City authorities, and has no force whatever to bind the contractor or affect the contract.

"In the Spring of 1900, the City formally accepted the option to require construction for a supply of 50 million gallons only, and to purchase the works on completion. This action made the plans for 70 million unimportant. We are not required to construct any dykes for the purpose of furnishing the larger supply. We submit that the power of the City to supervise and approve of our work, does not embrace the power to compel us to build, in addition to a dyke suited for a supply of 50 million, any part of a dyke not needed for such a supply, but which may, at some future time, be needed for a supply of 70 millions. Our contract is to provide only the water supply, water rights, lands, reservoir sites, rights of way, and all easements necessary to fulfill the requirements to the extent of 70 million; it does not require any construction at the reservoir for that purpose.

"While not bound by the contract to do so, we are quite willing to so prepare our plans as to make our construction useful as a part of the larger plan, and we have done so; but we cannot undertake to do more, and to actually construct work not needed for our contract, but only for a possible future enlargement of the works.

"I understand from your letter of September fifth as well as from our conversations, that your objection to the plan we have submitted for the Parsippany Dyke is that it does not provide a core wall sufficiently thick to be raised, if needed hereafter, as the core of a dyke for a supply of 70 million, and that it also does not provide new the base of the inner slope of the enlarged dyke, if raised for a supply of 70 million gallons per day. I understand that you do not question the fitness of the core, or section, as proposed by me, considered as a dyke for a supply of 50 million alone. The construction proposed by me is illustrated by the proposed section sketch 'A' which alone shows, in one of several ways, how it may be incorporated in the larger plan, if that shall ever be needed. I have not indicated a core wall in the larger section, as there are now many ways in which the tightness of the dyke can be secured—by puddled, concreted, or asphalt slopes—steel core, puddle core, &c., all in harmony with good engineering practice; with the advance of the art of construction, no engineer can say now, what the engineer of the future may adopt. I do not consider that either you or I are warranted, under the contract, to prepare or adopt a detail of construction of a work so far in the future, and possibly never to be called for, and as yet unauthorized.

"Your requirement, as I understand it, is shown in the enclosed section sketch 'B,' in which the portion of bank and core wall colored green, represent those portions of the plan not required for a 50 million plant, but which you contend should be now built by us to meet the possible future increase of the plant to a 70-million capacity per day. The lines in black on these sections, show the present construction in both cases, and the red lines the proposed methods of increase to a capacity of 70 million gallons per day.

"If I am in error as to the points of difference between us I request that you will set me right.

"Very truly yours,

"E. W. HARRISON,

"Chief Engineer,

"J. C. W. S. Company."

Mr. Vredenburgh: Annexed is the plan, which I also offer in evidence. Would your Honor care to see it now?

The Court: No, not now.

Mr. Vredenburgh: To that is annexed the following:

"Jersey City, September 16, 1902.

"E. W. Harrison, Esq.,

"Chief Engineer of Jersey City Water Supply Co.

"Dear Sir: In my letter to you of September 5th I gave as my general reasons for rejecting the plans of the Parsippany Dyke (marked 81, A-6) that the sections shown thereon were not in accord with the contract and dwelt more in detail on the fact that they did not conform to the specifications tendered by the contractor at the time he made his application for change in dam location. As that letter has not met with the response I had hoped for, and in order to have the City's case fully a matter of record it is necessary to go into the question as to the contractor's obligation under his bid. In order to get the measure of such obligation it will be necessary to go back and see what the city specifications called for in the way of tenders from bidders. On the City's printed 'Contract for New Water Supply,' P. 9 and 10, will be found the following:

" 'The first works must be constructed with storage reservoirs of sufficient capacity—as to be capable of collecting and delivering 50 million gallons daily—The lands, reservoir sites, water rights and easements necessary to enable the City to use 70 million gallons daily, must be acquired. The bidder had to obligate himself during the term of the contract, but prior to the exercise of the City's option to purchase, if notified to increase the capacity to immediately proceed to construct such additional storage—as to be capable with those previously constructed of collecting and delivering 70 million gallons daily.'

"On the storage question therefore, the bidder had to make definite tenders (1) to construct a reservoir adequate to a 50-million daily supply and (2) to tender a reservoir site capable of being properly improved without interfering with the use of the 50 million reservoir, so as to impound the additional storage required for a 70-million daily delivery.

"It made no difference then nor could it thereafter whether the City had ordered the increased capacity or whether it had not; the obligation was for the bidder to demonstrate that in case the increased capacity was desired that the additional storage could be properly, practically and safely accomplished. In compliance with requirement No. 1 the contractor offered to construct a reservoir at Old Boonton (Kingsland location) to meet requirement No. 2, he tendered the same site (slightly enlarged) stating P. 46; 'Whenever during the term of contract—the city shall notify the contractor to increase the capacity of his works, then it is proposed to increase the old Boonton reservoir by raising the dam'—and in no other way could the desired increase be obtained within the area tendered.

"Of course the same method of increase applies to the Parsippany Dyke which is practically a dam on the Southern part of the Reservoir.

"Prior to February, 1900, the contractor did not know but that 'during the term of his contract and prior to the exercise of the City's option to purchase' he might be notified to increase the capacity and construct such additional storage. He therefore in preparing his plan for the dyke, had to so design present construction (to meet the storage requirement for a 50-million daily supply) that it would be possible to 'raise' it in a proper, practical and safe manner to meet the requirement for a 70-million daily delivery.

"It would surely seem that the best way to secure the desired results would be for the contractor to first design a dyke which would meet all the engineering requirements of a dyke for the 70-million daily supply. Having such a design the location of the core wall (which should be central to the highest portion of the 70-million dyke) could be properly defined, and thereafter he could construct his embankment and core-wall of such a section as would furnish a dyke for the 50 million reservoir and also of such a width on the inner side of the core wall as would permit of the 'raising' of the dyke (for the 70 million supply) in a proper and safe manner. In fact, such was the plan of construction then intended by the contractor, for Blueprint B-168, Nov. 11/99, issued by the contractor to the City Engineer as the intended plan of constructing the dyke, delineated just such a dyke—and that blue print plan is the only one that has been submitted to the City Engineer up to the ones received on 5th of this month.

"In February, 1900, the city gave notice that it would exercise the option to purchase the 50 million plant and of course that ended the contractor's liability to actually construct the possible enlargement, but it did not relieve him of his obligation to so construct the 50-million dyke as to leave his tendered reservoir site (for impounding the additional storage required for a 70-million daily delivery) in such a shape as would be permissive of its being properly and safely improved for the purpose intended. No notice followed from the contractor that he therefore intended to change the contour of his dyke.

"In October, 1900, the City Engineer notified the contractor's Engineer that he would expect the height of dyke shown on above blue print to be slightly increased (which was agreed to) but no intimation was even then received that the contractor desired to make any changes from the blue print of Nov. 11/99. Nor was any such intimation ever received until July 1902, and that was informal, the formal notification being the plans Sept. '02, 81—A 6, which did not reach the City Engineer until the 5th of this month.

"In addition therefore to my objections to those last received plans as set forth in my letter to you of Sept. 5th, I desire to add a specific objection to them in that they do not fulfill the contractor's obligation to so construct his dyke for the 50 million supply as to permit of its being properly, practically and safely 'raised' to obtain the additional required storage and without interfering with the use of the 50-million reservoir.

"The core wall of an earth dyke is its most important element—and failure in it is a failure in the dyke.

"Its foundation must be secure, the erection must be stable and of continuous impervious construction to at least the height of the water to be impounded—necessarily it must be located in the highest section of the embankment.

"The core wall on the plan in question is wrongly located. For the purposes of the prospective enlargement it cannot be 'raised.' The core wall should be located so that it would be central to the highest portion of the dyke, as possibly to be completed, for the 70-million supply and then the core wall could be raised when desired. In fact, as a whole the dyke as submitted can not be 'raised' for the purposes of the prospective enlargement, and therefore can not fulfill the contractor's tender when bidding.

"The only suggestion that the contractor now makes as to a way of providing the additional storage is that practically another dyke can be constructed outside of and connected with the dyke he wishes now to construct. But that solution is not permissible. The additional dyke would require another core wall (located where the present one should have been) and its foundations would have to go down to rock or hard pan, much below the present surface of the ground, the excavation therefor, would have to be largely within and below the outside embankment of the dyke which the contractor now desires to construct. Considering the great length of that dyke (about 2,900 feet) the great quantity of water it is intended to hold back (a superficial area of 767 acres with a maximum depth of 23 1/4 feet) the embankment when once constructed should never be cut into or interfered with."

"As it would be eminently unsafe and perilous, and no plan of construction of present dyke should be permitted which required for its enlargement such prospective extensive excavations within the limit of its enbankment.

"It is not the City Engineer's function to prepare the Contractor's plans and working drawings, he simply is to receive and criticise them and in certain cases he is clothed with absolute veto power. When he rejects any, the contract states that they 'shall not be used on construction.' There is no provision for any appeal from his decision. The plans of the proposed Parsippany Dyke (marked 81 A-6) having been rejected by me I must insist that they shall not be used in construction and that when such dyke is built it shall be constructed on plans that are not radically objectionable.

"If in so insisting I should be calling upon the contractor to execute any work that is not called for by his contract, he has his remedy. The law would allow his claim for extra work and the City is solvent.

"Since writing the foregoing I am in receipt this day of your letter of Sept. 12th. Therein you state that 'the blue print' (in question) 'was dated Nov. 11/99, which was after the Board Resolution of Oct. 31, 1899, approved the new site so that it could not have been considered in making that change.'

"It seems necessary to reply that the schedule given me prior to Oct. 23, 1899, by the contractor showing the quantities of core wall and earth embankment in the 50 and also the 70-million Parsippany Dykes clearly proves that a dyke section shown on that blue print was used in computing the quantities.

"The information furnished by that schedule was one of the elements on which I based my report of Oct. 23, to the Board of Street & Water Commissioners, which report together with the Contractor's letter of Oct. 7, formed the basis of the Board's acquiescence in the desired change of location of dam.

"Yours very truly,
"GARWOOD FERRIS,
"Engineer in Charge."

Marked Exhibit C 22.

Mr. Corbin: I object to this correspondence as not competent and not relevant to the issue, the real question raised by the pleadings is, what was the contract with regard to these works, and what is the work that has been done, if there is a discrepancy, that is it, but the correspondence of five years between those engaged in the work cannot change the contract and cannot be relevant. It leads us to an interminable examination of things that are no longer either conclusive, or in my judgment, competent evidence as to the contract.

Q. I show you a resolution adopted September 23, 1902, by your Board, and ask you whether that is from your files?

A. Yes, sir.

By Mr. Vredenburgh: The resolution is as follows:

"Whereas, in correspondence heretofore submitted to this Board between the representatives of the contractor for completion of the new Water Works and the Chief Engineer in charge of the construction of said works, representing the City, a clearly-defined difference of opinion is shown to exist as to the completion of said works, in full accord with the letter and spirit of the contracts. Resolved that the Board hereby expresses itself as in accord with the Chief Engineer, as aforesaid, and hereby ratifies and confirms the action already taken by him in the premises."

Marked Exhibit C 23.

By Mr. Corbin: I object to that resolution as incompetent and unlawful evidence against the defendant.

Q. When was that adopted?

A. That was adopted by the Board of Street and Water Commissioners September 23, 1902.

Q. I show you another paper, and ask you whether that application comes from the files of your office?

A. It does.

Q. When was it filed with you?

A. May 5, 1903, that is to say it was presented at the meeting of May 5, 1903.

Q. Has it been with you ever since?

A. Yes, sir.

By Mr. Vredenburgh: It is the application of the Jersey City Water Supply Company for the city to condemn lands, and it is endorsed "Application of the Jersey City Water Supply Company for authority to condemn lands for a new water supply for Jersey City." 13th application. Bedle, Edwards & Thompson, Attorneys. May 5, 1903. George T. Bouton."

By Mr. Corbin: It is certainly not pertinent to the issue.

By Mr. Vredenburgh: I will read the first part of it:

"Whereas the Jersey City Water Supply Company, the assignees of Patrick H. Flynn, contractor, has given notice to The Mayor and Aldermen of Jersey City that it will be necessary for the City to purchase or condemn certain tracts or parcels of land for the main reservoir now being constructed for the City, under the contract of February 28, 1899, a particular description of which lands is annexed to said notice on file with the clerk of this Board; and

"WHEREAS, the City by its contract with said contractor agreed, if necessary, to exercise its powers to condemn such lands and rights as might be required in securing the supply of water contracted for, and the works to supply the same, such proceedings to be at the cost and expense of the contractor:

"RESOLVED, That the City deems it necessary and proper and hereby determines to purchase and acquire the said lands for the purposes aforesaid, and it further determines, in case the City shall be unable to agree with the owner or owners of said lands for the purchase of the same, to condemn the said lands for the purposes aforesaid; and be it further

"RESOLVED, That in pursuance of said contract, William D. Edwards and Edwin F. Smith, as agents of The Mayor and Aldermen of Jersey City, be, and they are authorized and directed to agree with the owner or owners of said lands, as to the price and terms of the purchase thereof, and in case no agreement can be made for said purchase, that they proceed forthwith to cause the same to be condemned in the name of the City for the public uses and purposes aforesaid.

"Thirteenth Application.

"To the Mayor and Aldermen of Jersey City and the Board of Street and Water Commissioners of Jersey City.

"Gentlemen: You are hereby notified that in order to carry out the provisions of the contract dated February 28, 1899, made between Jersey City and Patrick H. Flynn, contractor, for a new supply of water for said City (which contract has since been assigned by said Patrick H. Flynn to the Jersey City Water Company), it is necessary to purchase or condemn in the name of the City at this time, certain lands for the main reservoir now being constructed under said contract; which lands are described in the schedule hereto annexed. You are hereby requested in accordance with the terms of said contract to acquire title to said lands for the purposes aforesaid, by purchase or by the exercising the City's right of condemnation. We further request that the power of proceeding in the premises be conferred upon our counsel, William D. Edwards and Edwin F. Smith.

"Yours respectfully,

"JERSEY CITY WATER SUPPLY COMPANY,

"By

"

"Attorneys.

"Dated April 1903."

By Mr. Corbin: I make the same objection to the resolution as I do to the application itself. It is not pertinent to the issues in this case.

Marked Exhibit C 24.

At this point the Court and Counsel entered into a short discussion as to some features of the case, which the Stenographer was directed not to take down.

Mr. Vredenburgh: Now I offer a letter from the Jersey City Water Supply Company to the Board of Street and Water Commissioners.

Q. Mr. Bouton, does that letter come from your file?

A. It does.

Q. And filed when?

A. November 15, 1904?

Q. Been on file there ever since?

A. It has been.

"To the Honorable Board of Street and Water Commissioners, Jersey City, N. J.

"Gentlemen: In reply to your communication of October 31st, 1904, requesting the co-operation of this company, in making a contract with the town of Nutley for a supply of water, we beg to say that the Water Works designed for the City of Jersey City are completed and in use, and ready for the city to purchase the same if desired. We therefore think it would be unwise to make any change in the contract at this time, and we are

"Very respectfully yours,

"JERSEY CITY WATER SUPPLY CO.,

"By

"[SEAL] "EDMUND LeB. GARDNER,

"President.

"Attest:

"WHITNEY CONANT,

"Secretary."

Mr. Vredenburgh: I request your Honor's attention to the seal; that becomes a very important question in the case; it is under the seal of the company, purporting to be a letter regarding the——

Mr. Corbin: It is a letter; we admit it.

Mr. Vredenburgh: No, it is not a letter; you do not put a corporate seal on a letter.

Marked Exhibit C 25.

Mr. Vredenburgh: Now I offer a resolution of January 3, 1905.

Q. Was that resolution passed by your Board, Mr. Bouton?

A. It was.

Q. Passed on the date mentioned, was it, January 3, 1905?

A. That is right.

"WHEREAS, with present rate of water used by Jersey City the concrete conduits of the New Water Supply are, as plant is being operated, running only partially full, and,

"WHEREAS, it is deemed desirable that a test of said conduits should be had running along continuously for two or three months under conditions, as near as may be, under which they would operate if delivering the full capacity of the six-foot steel pipe line number four,

"Resolved, that the Jersey City Water Supply Company is hereby requested to so operate its plant as to make such a test, Jersey City in that event, hereby releasing said Jersey City Water Supply Company from any responsibility for any damage which might thereby result to the Jersey City High Service system by reason of any resulting increased delivery pressure."

Marked Exhibit C 26.

Mr. Vredenburgh: I now offer a resolution of May 8, 1905.

Q. Was that passed by your Board?

A. Yes.

"Whereas, a communication has been received. purporting to come from the contractor, to the effect that the Water Works designed for this city are completed; and

"Whereas, by the terms of the contracts, this city was to have reasonable time to test said works and water supply, if desired by it; and

"Whereas, such tests are being made as the city is able to make, without possession of the water works and the city finds that to complete such tests the possession of the water works and water supply is necessary;

"Now, Therefore, Be It Resolved, that demand is hereby made upon Patrick H. Flynn, and the Jersey City Water Supply Company to deliver over to this city the possession of said water works and water supply for the purpose of making reasonable tests to ascertain whether said water works and water supply are completed in accordance with the terms of the contracts, specifications and plans; and

"Further Resolved, that Garwood Ferris, Esquire, Engineer in charge of Construction of Water Works in behalf of Jersey City, be and he hereby is authorized and required to make demand upon the Jersey City Water Supply Company for such possession of said water works and supply, and is further authorized and required to take possession of said water works and supply in the name of the city for the purpose of making such tests; and that the said Garwood Ferris be and he hereby is authorized to appoint and employ such subordinates, assistants and agents as may be necessary to take possession of said works and for the purpose of making such tests and that the said Garwood Ferris report to this Board on or before the first day of June next."

Same marked Exhibit C 27.

Q. I show you a blue print stated on the paper to be daily amount of water delivered to Jersey City from January 1st to December 31, 1905; where does this come from?

A. It is a paper, a duplicate copy of which is on file in my office.

Q. And who made it up?

A. Presumably the agent of the East Jersey Water Company; it was forwarded with the other.

Q. (By Mr. Edwards) The East Jersey Water Company?

A. It is the same thing; what do you call it?

Q. Jersey City Water Supply Company.

A. Jersey City Water Supply Company.

Q. Very different?

A. No.

Mr. Vredenburgh: Averages about thirty-three millions a day.

Witness: Thirty-three and eighth-tenths; I averaged it.

Said paper marked Exhibit C 28.

Q. On February 28, 1899, the date of this contract, was the Mayor and Alderman of Jersey City supplying water to any person or corporation outside the limits of Jersey City?

Objected to as irrelevant and incompetent.

A. Jersey City was.

The Court: Well, the evidence will have to go in.

Q. Who?

A. Supplying the Township of Harrison, Township of Kearney, Township of East Newark——

The Court: Do you mean there are existing contracts with each one of these municipalities, or is the witness putting his own construction upon the situation?

Mr. Vredenburgh: The question was, "supplying on a certain date."

The Court: I know, but that is the question that has been disturbing the courts for the last three or four years, as to who was doing it. The contention of one party was that the East Jersey Water Company was doing it, and on the other side that Jersey City was doing it. You had better put your question in such a form that there will be no ambiguity about it. If you mean there are existing contracts between the municipalities, let that fact appear.

Mr. Vredenburgh: I am asking him as of February 28, 1899, and I want to frame a question which shall so appear to him. We were supplying water, without question being paid for it at that time.

The Court: It does seem to me if we go into that question we will be involved in a world of difficulties.

Mr. Vredenburgh: I withdraw the question, your Honor.

The Court: Of course, the production of written contracts between the municipalities, stands upon a different basis.

Mr. Vredenburgh: That is all, Mr. Bouton.

Cross Examination. By Mr. Edwards.

Q. You haven't given us all the papers in your office mentioned in your minutes with reference to this contract with Patrick H. Flynn, and the contract which was afterwards assigned to the Jersey City Water Supply Company?

A. I have not.

Q. Have you a list or a reference to all the papers in your office or in your minutes?

By Mr. Vredenburgh: I object to that, if it pleases your Honor.

By Mr. Edwards. I want to see if he has it indexed.

By Mr. Vredenburgh: I object to that, I don't think their case ought to be put in with mine, and the question whether he has it indexed or not, is not competent on cross examination. I produced certain papers which bore upon the subject, of course, and which seemed to me to be the issues here; now they ask him whether he has an index of all the papers in his office. It is certainly not cross examination. It is evidently asked for the purpose of getting out something that helps their case.

By the Court: You have put in a certain number of papers, now it is certainly competent for them to inquire as to whether there are any more papers bearing upon the same transaction.

A. I have.

Q. Will you give us now a memorandum, or a list of the papers and minutes in your office, which you have referred to?

A. I will not do that unless I am directed to do so by the Court.

By the Court: I notice that the witness has been referring from time to time during his direct examination, to a written list of papers in his possession. Of course, the list will not be evidence of the papers or their contents, it would merely indicate how many letters or papers there are bearing upon this subject, which have not been offered in evidence.

By the Witness: May I say a word, your Honor? Counsel last week sent one of his young men up to the office in ample time to make just such a list as I have, and ample facilities were afforded him to make such a copy. I don't think he is entitled to see what I have worked night and day for, to benefit the city of Jersey City.

By the Court: What Counsel desires to know is what other papers you have on your files bearing upon the question, and have not yet been offered in evidence. He has a right to that information.

By the Witness: Whatever your Honor directs me to produce, I will produce. Does your Honor direct me to produce this paper?

By the Court: Yes.

By the Witness: Then I will ask the Court to allow me, before doing so, to eliminate some private marks which I have made upon it for my own guidance.

By the Court: Certainly.

(The witness was then withdrawn in order to give him an opportunity to eliminate the private marks, and in the meantime another witness was called.)

Thomas J. Halstead sworn for Complainant.

Direct Examination. By Mr. Vredenburgh.

Q. You are in the Office of the Clerk of The Mayor and Aldermen of Jersey City?

A. I am.

Q. And as such, have you produced from your files certain papers at the direction of the Clerk?

A. I have.

Q. Have you them with you?

A. I have.

Q. Will you please produce them?

A. (Witness does so).

Q. You produce the papers relating to the vote of Jersey City for a new water supply. Produce them please in the order of their date. Now the first paper you hand me is the proclamation?

A. Yes, sir.

By the Court: It may be that we can shorten this matter. I do not understand Mr. Corbin to insist that there was not a vote taken, or that the vote is irregular.

By Mr. Corbin: We assume so.

By the Court: And that the result has been correctly announced either in the paper now produced or in some other paper.

By Mr. Corbin: It is a subject I have not investigated; if I can see them, I will do what I can to shorten it.

By Mr. Vredenburgh: Suppose I read the proclamation.

Jersey City, N. J., Jan. 20th, 1900.

"Honorable Board of Aldermen.

"Gentlemen: I herewith respectfully notify your Honorable Board, that in accordance with the provisions of an act entitled 'An act to submit to popular vote the purchase of a supply of pure and wholesome water in cities of the first class in this State,' (approved April 1, 1895) I issued the following proclamation on January 19th, 1900:

"P R O C L A M A T I O N

"BY THE MAYOR OF JERSEY CITY.

"Whereas, the Mayor and Aldermen of Jersey City on the twenty-eighth day of February, 1899, entered into a contract with Patrick H. Flynn, for a supply of pure and wholesome water, which contract contains an option for the acquiring, by the city, of the works, reservoir, pipe-lines, lands, water and water rights and all appurtenances thereof necessary to provide the city with a supply of water to the extent of fifty million gallons daily, with water supply, water rights, lands, reservoir sites, rights of way and all easements necessary to supply the city with seventy million gallons of water daily forever, for the sum of seven million and five hundred and ninety-five thousand dollars ($7,595,000); and

"WHEREAS, by the provisions of an act entitled 'An act to submit to popular vote the purchase of a supply of pure and wholesome water in cities of the first class in this State,' (approved April 1, 1895), it is required that the question of purchase according to such option shall be submitted to the voters of Jersey City; therefore,

"I, EDWARD HOOS, MAYOR OF JERSEY CITY, proclaim that the question of the purchase of said works, reservoirs, pipe lines, lands, water and water rights and appurtenances, according to the terms of said option, for the sum of seven million and five hundred and ninety-five thousand dollars ($7,595,000), (said purchase to be consummated when the said Patrick H. Flynn or his assigns shall have in all matters completed his contract with the Mayor and Aldermen of Jersey City), is submitted to the voters of Jersey City, to vote on the adoption or rejection of the right to purchase under said option, at an election which is hereby specially called to be held in Jersey City on

"TUESDAY, THE THIRTEENTH DAY OF FEBRUARY, 1900.

"At such election each voter in favor of such purchase shall deposit a ballot containing the words "City of Jersey City. Purchase of new water supply accepted" written or printed thereon, and those voters opposed to such purchase shall each deposit a ballot with the words, "City of Jersey City. Purchase of a new water supply rejected," written or printed thereon.

"EDWARD HOOS,
"Mayor of Jersey City.

"Mayor's Office, City Hall,
"Jersey City, January 19th, 1900."

"In order to carry into effect the said proclamation I hereby request your Honorable Board to take charge of the election thus called for.

"Respectfully submitted,
"EDWARD HOOS,
"Mayor."

Q. You have here the advertisement of the proclamation in accordance with the statute?

A. Yes, sir.

Q. And there was an election?

A. There was.

Q. And subsequently there was a certificate of the result?

A. Yes, sir.

Q. Have you that certificate here?

A. Yes, sir.

Q. Please produce it?

A. I do.

By Mr. Vredenburgh: He produces the minutes of the Board of Aldermen of Jersey City for 1899 and 1900, kept by the City Clerk, and here is a certificate of the different wards showing the vote, signed Augustus A. Rich, Chairman of the Board of Canvassers, and John G. Fisher, Clerk.

By the Court: What is the result?

By Mr. Vredenburgh: The substance of it is I hereby certify that we have made it up and the papers annexed hereto shows the result. Then comes a recapitulation—accepted so many and rejected so many. Accepted, 3,964; rejected, 576.

By the Court: Is there any paper subsequent to that?

By Mr. Edwards: Here is a statement of the result of an election held in the city of Jersey City, Hudson county, N. J., on the 13th day of February in the year 1900, on the purchase of a water supply. Then follows a statement and a recapitulation which shows that in the whole city the total vote for accepting it were 3,964, and the total votes rejecting were 576, and to this is appended the signature of the County Board of Canvassers, and is signed by them and dated February 16, 1900.

By Mr. Vredenburgh: I don't understand under the circumstances that any further evidence is necessary on that point.

By the Court: I understand it is not.

Q. Then that will be all.

Cross Examined. By Mr. Edwards.

Q. In 1900, about what was the vote in population in Jersey City?

By Mr. Vredenburgh: Does he know? I was going to prove that. I think we better have some other testimony on that point.

Q. Well, what was the total registry, can you tell us that?

A. I cannot tell the total registry, but I have the total vote for the spring election, that is, I have the statement of the Board of Canvassers.

Q. What was it?

By Mr. Vredenburgh: I object to it.

Q. Well, it is over 30,000?

A. Yes, sir, between twenty-five and thirty thousand.

Re-direct.

Q. Is that the number who voted at the spring election, or the whole number of voters, or what?

A. The whole number of votes cast.

By Mr. Vredenburgh: I ask that that be stricken out, if it please your Honor, I don't see what the point of it is.

By the Court: I will allow the question to stay in; I don't know whether it has any point or not, I cannot decide that question now. I do not know whether there will be any contention that the act requires a majority of the whole number of votes or not.

By Mr. Vredenburgh: That issue was not raised, and if such an issue is to be raised, I want notice of it.

The Court: As I recall the answer, there is a statement that the election was not a valid election; it is not stated in just that way or in those words.

By Mr. Vredenburgh: Is that the claim of the other side that it was not a valid election?

By Mr. Edwards: You don't want us to sum up now.

By Mr. Vredenbugh: On page 110 the defendant says that he admits that an election was had—it is at the bottom of the page, that on the 30th day of February 1900, &c. He makes no admission as to the legal effect, but denies that by said vote or notice the complainant became bound to the defendant to purchase said works, &c. I did not suppose that question was raised until your Honor spoke of it.

By the Court: I noticed that peculiar language. I will allow the evidence to go in. I will pursue the same course with regard to evidence as I pursued with regard to the complainant, that is to say that where the evidence is not obviously irrelevant, it ought to go in.

Bertrand Vroom sworn for Complainant.

Direct Examination. By Mr. Vredenburgh.

Q. Are you in the office of the City Engineer of Jersey City?

A. I am.

Q. As such did you make a copy of the profile annexed to the contract of February 28, 1899?

A. Yes, but out of office hours.

Q. (Handing witness a paper) Is this the copy you made?

A. I thought you referred to something else. Oh, yes, that is the copy I made; I thought you referred to the large map. Yes, that is all right. This stands as you ask me. I misunderstood you.

Q. Did you intend to make an accurate copy of the profile annexed to the contract?

A. Yes, sir.

Q. Is it an accurate copy of the profile in your judgment, annexed to the contract?

A. Yes, sir.

Q. Marked profile No. 1?

A. It is a correct copy of that.

Q. Of profile No. 1?

A. Profile No. 1, plan No. 1.

Q. Now is this a copy of the map (alluding to another paper). No. 1, annexed to the contract?

A. I presume it is practically the same with the exception of these red lines on this map.

Q. You mean those around the boundaries of the water shed?

A. Yes, sir. Now from the dam No. 1, the upper red line is the proper line.

Q. Running how?

A. Running east, south-east.

Q. Then, I understand, Mr. Vroom, that this map is not an exact copy of the map annexed and known as No. 1 annexed to the programme?

A. It is not an exact copy.

Q. And it is not exact in the respect that the red line showing the pipe line from the Boonton reservoir to the Jersey City reservoir is shown first by one red line where it was according to the original contract, and by another red line where it was actually built; is that right?

A. Well, will you allow me to answer that in my own way?

Q. Yes.

A. Mr. Belden had three maps made all like this, and this was the first one. There were a number of pencil line notes on this map that were not carried out, and when finally a line was adopted it was put on one of those maps, which map was filed with the contract. This is——

Q. (Interrupting) What do you mean by this?

A. This map before me is the first of the original sketch maps which wasn't used because it had lines that had no reference as to the finally adopted map, and was given me by Mr. Belden, simply as a keepsake.

Q. Who was Mr. Belden?

By Mr. Edwards. Perhaps I can help you. He is the Secretary of the Jersey City Water Supply Company, and one of the associates of Mr. Flynn.

Q. Is that right?

A. As far as I understand, yes, sir.

By Mr. Vredenburgh: Well, under the circumstances I don't know whether this map ought to be used or not.

By Mr. Corbin: We object to it.

By the Court: It is misleading.

By Mr. Vredenburgh: Then the map will not be offered.

Cross Examination.

Q. Your copy of the profile, Mr. Vroom, is an accurate copy of the one attached to the original contract?

A. It is a true copy, yes, sir.

Mr. Vredenburgh asks that Mr. Halstead be relieved from attendance in Court, which was granted upon Mr. Halstead's agreeing to furnish certain copies of papers and documents to Defendant's counsel.

George C. Whipple sworn for Complainant.

Direct Examination. By Mr. Vredenburgh.

Q. Where is your office at present?
A. New York City.
Q. Are you in business with any one, and if so, whom?
A. I am a partner of Mr. Allen Hazen.
Q. What profession do you practise there?
A. Sanitary engineer and water analyist.
Q. You graduated where?
A. I graduated from the Massachusetts Institute of Technology in 1889.
Q. What department?
A. As civil engineer.
Q. What official positions have you occupied since in connection with water supplies?
A. From 1889 to about 1897 I was biologist of the Boston Water Works, and also for a time, biologist for the Lynn Water Works of Massachusetts. From 1897 to 1903, I was the biologist and director of laboratory of first, the city of Brooklyn, and then in the city of New York, after Brooklyn and New York were consolidated.
Q. What water works have you been employed to investigate?
A. I don't know that I can name them all, without consulting notes.
Q. Were you in Brooklyn?
A. Yes, sir, Brooklyn Water Works.
Q. What investigation did you make there?
A. In connection with my official duties as biologist of the department, I made analyses of water at very frequent intervals from all the sources of water supply of that city, and also inspected the water sheds that furnished the supply.
Q. Did you make any investigation of water at Cleveland, Ohio?
A. Yes, sir, I made an investigation there in 1904, extending over nearly one year.

Q. For what purpose?

A. For the purpose of determining the quality of the water of the city at that time, and also for the purpose of advising them as to what should be their policy in regard to the use of the water of Lake Erie, in the future.

Q. Did you investigate the water of Lake Champlain?

A. Yes, sir, I made a brief study of that for the State Board of Health of New York during 1904.

Q. Did you make an investigation in Augusta, in the State of Maine?

A. I investigated that supply for several months in connection with an epidemic of typhoid fever which occurred there.

Q. When was that?

A. That was in 1903, and I think, perhaps, the investigation was begun in the latter part of 1902.

Q. What kind of an epidemic was that?

A. Typhoid fever.

Q. Was there any epidemic in Cleveland at the time you investigated that city, too?

A. Yes, sir, there was at that time, and there had been previously for some time.

Q. Did you investigate the cause of that epidemic?

A. Yes, sir.

Q. What was that, typhoid fever?

A. Yes, sir.

Q. After that did you examine the water at Waterville, Maine?

A. Yes, sir.

Q. What was the cause of that examination?

A. There was an epidemic of typhoid fever there in 1902.

Q. Pittsfield, Massachusetts, did you examine the water there?

A. I did not make an examination of the municipal supply at Pittsfield, but I made some studies there for a paper mill, in connection with the water supply of that paper mill, or rather, a proposed paper mill.

Q. Have you made a study of epidemics of typhoid fever?

A. Yes, sir.

Q. And have you examined the water in various other places with reference to its quality; for instance, at Meridan, Philadelphia, Wilmington, Santiago, Cuba; Birmingham, Alabama; and Bangor and Burlington, New Jersey?

A. I have, at all those places.

Q. Now, did such examination include the study of sewage deposited in the water?

A. In some cases; yes, sir.

Q. And are you a bacteriologist, also?

A. Yes, sir.

Q. And how long have you practiced that profession?

A. Since 1889.

Q. Now, are you also a—are you also proficient with the microscope, microscopical analysis of water?

A. Yes, sir.

Q. When were you employed by Jersey City to investigate this water supply?

A. The work began during the summer of 1904, in July, I think.

Q. And please state what you first did with regard to the examination?

A. I visited the water shed, went over that and made plans for the collection of samples of water at various places on the water shed, and also in Jersey City.

Q. Have you familiarized yourself with that water shed?

A. Yes, sir.

Q. And the sanitary conditions prevailing upon it?

A. Yes, sir.

Q. Now, will you shortly as you can, describe that supply, from a sanitary standpoint?

A. You mean to describe the sanitary conditions which exist in the water shed?

Q. Yes.

A. I can do that better if I could consult a map which I have prepared.

(Map placed on easel.)

Mr. Corbin: May I hear that question again.

(Question read as follows: "Now, will you, shortly as you can, describe that supply from a sanitary standpoint?")

Mr. Corbin: I think that question is too general; we cannot attack it; we do not know what it means.

The Court: It seems to me that the question is proper in form. Of course, the witness will speak from his own observation, his own researches, and not from the observation of others.

Mr. Corbin: Of course, what he finds I do not object to; but it seems to me it calls for conclusions, a question of that kind.

The Court: Well, he is an expert, and is giving us his expert information.

RECESS.

Q. Mr. Whipple, this map is now produced before you, and I will ask you about the preparation of this map. Will you please describe—first say what the map purports to describe, and then about its preparation and accuracy?

A. The map before me is a map of the water shed of the Rockaway River above the Boonton Dam, and it was prepared in my office, and under my personal direction. The basis of the map was the State geological map, and this is an enlargement of that map made with a pantograph, so far as the location of the streams, lakes, roads, towns, etc., are concerned. The houses which are indicated on the map were placed there first by copying from Robinson's Atlas of Morris County. These sheets were taken into the field, and the locations of the houses were checked, so that the data on the map represents practically the results of actual field work.

Q. Now, will you point out on the map where the Boonton Reservoir is?

A. The Boonton Reservoir is at this point (indicating.)

Q. (By the Court.) At the point "Boonton" on the map. Mr. Whipple, when you are pointing out objects on the map, please do so with such specific reference to names, or other objects, that when we come to read the notes as they are written out by the stenographer, they will appear intelligible.

A. The Boonton reservoir is at the point marked "Boonton Reservoir," and is indicated by a blue line with water lines inside of the main line.

Q. (Further direct.) The houses are indicated in what color?

A. In black.

Q. The river is indicated in what color?

A. Blue.

Q. The ponds and lakes are indicated in what color?

A. Blue.

Q. And with their names upon them?

A. In most cases, yes, sir; the larger ones are.

Q. And those are substantially accurate representations of the lakes and ponds that they purport to represent?

A. Substantially so; yes, sir.

Q. And the map is substantially correct to your knowledge?

A. It is.

Q. Now, will you please describe this water shed, so far as it has reference to sanitary conclusions?

Mr. Corbin: Are there any elevations indicated on that map?

Witness: I believe not. Shall I answer the question?

The Court: Yes.

A. The water shed is included within this broken line to which I am now pointing, and which surrounds the greater part of the map. The river, starting from the Boonton reservoir, and tracing its course upstream, comes down first from the west, and then turns, just above Wharton, and goes towards the northeast; or, starting, more properly, from the source of the river, it flows first in a southwesterly direction, turning just above Wharton and then flowing in a general easterly course into the Boonton reservoir. The river receives a number of tributaries, which are indicated by the blue lines.

Q. About what is the distance from its source to the Boonton reservoir, as the water runs?

A. Starting from the source, in the northwest corner of the map, and following the course of the river to the dam, it is about thirty-three miles.

Q. How much of that is above Wharton?

A. Speaking roughly, I should say a little less than half of it.

Q. And what is the character of the water shed above Wharton?

A. The region is generally hilly, almost mountainous, and is, to a considerable extent, wooded, and not very much populated, sparsely populated.

Q. Now, what is the distance from Wharton to the Boonton reservoir as the water runs?

A. Speaking roughly, it is about seventeen miles.

Q. Now, what have you to say further as to the water shed, Mr. Whipple?

A. The lower part of the water shed, meaning by that the part below Wharton, is somewhat less hilly than that in the upper part; it is to some extent, considerable extent, cultivated, but the slopes are generally pretty sharp, and the water shed, taken as a whole, would be considered as one from which there would be a rather rapid run-off. Below Wharton, from Wharton down, the population is considerably more dense than in the upper portion, and the population is concentrated chiefly at certain centers, as for instance, at Wharton, at Dover, at Rockaway, at Boonton, at Hibernia, and to a somewhat less extent at Mount Hope, at Mount Tabor during the summer season.

Q. Now, Mr. Whipple, in case of heavy rainfall, how long will it take, in your opinion, for the surface wash from the city of Dover to reach the Boonton reservoir?

A. It will probably be not much over a day; it might not be that.

Q. How much of this supply have you personally investigated, Mr. Whipple?

A. I have been to the Boonton reservoir a number of times. I have been a number of times to the city of Boonton——

Mr. Edwards: The city of Boonton?

Mr. Vredenburgh: Well, he calls it the city.

Mr. Edwards: It is not a city.

The Court: Say "Boonton."

Witness: I meant Boonton. I have been a number of times to Boonton, and observed the condition, especially near the river and canals. I have been a number of times to Powerville; I have seen the river all the way from Boonton to Wharton. I have been to Mt. Tabor. I have been to Rockaway a number of times, I have been to Hibernia a number of times and traced the brook up. I have been to Dover a number of times, and have ridden over most of the roads radiating in a southerly direction from the town—from the city. I have been to Wharton a number of times; I have visited the region marked "Mine Hill"; I have driven through the region of the Mt. Hope Mines, and I have driven a few miles over the roads north of Wharton, and I have driven through the grounds, or near the grounds, of the government powder mills at Tickatinny, in the Green Pond Valley. I have also driven over the roads to the north of Boonton as far as the Boonton reservoir—I mean the reservoir of the Boonton Water supply.

Q. You mentionel that there were some streams entering the Rockaway. Won't you please mention them in the order of their nearness to its source, the larger brooks?

A. We first have Stony Brook——

The Court: That don't answer the question.

Q. I said from the source.

A. There is a brook called Steven's Brook which flows into the river from its right bank about three-quarters of a mile above Wharton. There is also Green Pond Brook which flows into the river from the left bank just below Wharton. There is a brook known as Granny Brook——

Q. (By the Court.) One moment. That receives, I suppose, the waters of Longwood Valley water shed?

A. No. sir; the Longwood Valley is drained by the upper part of the Rockaway River itself. The Green Pond Brook is a brook nearly as large, and comes down to the east of that ridge which divides the two sheds.

Q. (Further direct.) Longwood Valley is really the continuation of the Rockaway, is it not?

A. Yes, sir.

Q. Now, you speak of the first stream, called Stevens, does that enter from the right or the left bank as you go up the river?

A. As you go up the river, from the left bank.

Q. Now, the next brook, Green Brook, enters from which side, going up the river?

A. It enters from the right bank going up. I am in the habit of speaking of streams going down stream.

Q. I happened to start you going up; does it make any difference?

The Court: Well, the left bank, as I understand it, means the left bank going down.

Mr. Edwards: Always, that is the scientific way.

Q. Then if you will pursue that course, instead of as I started you?

A. I was mentioning Granny Brook, which flows into the Rockaway River just above Dover, from the right bank, which flows down from the region known as Mine Hill, this being made up of two brooks, one known as Jackson's Brook, and the other known as Morris Spring's Brook. Below that there is Mill Brook, which flows into the Rockaway River from the right bank, about two miles below Dover. Then there is Den Brook, which drains the water of Shongum Pond, and flows through Essling Pond into the Rockaway River at Denville.

Q. Mr. Whipple, there was a question which I intended to ask you, and that was did you describe either of these brooks that flow through Dover; did you mention those?

A. I was mentioning merely the larger brooks.

Q. Then you didn't mention those that run through Dover?

A. There are two or three small feeders that enter the river at Dover, which I did not mention.

Q. Now, go on; you were at Den Brook.

A. I was speaking of Den Brook, which flows into the river at Denville, a few miles below Rockaway, from the right bank; and this river receives a feeder which drains Mt. Tabor. Then there is a brook which flows into the Rockaway River, just below Rockaway, from the left bank, known as Beaver Brook, and one branch of that brook is called White Meadow Brook, and this branch drains White Meadow Pond. The other branch of Beaver Brook preserves its name, and at Beech Glen receives what is called the Hibernia Brook, which drains the region where the Hibernia mines are located.

Q. And Hibernia Village, is it?

A. Hibernia Village.

Q. There are two villages, upper and lower?

A. Yes, sir. The next large brook which we come to is Stony Brook, which enters the Rockaway River on the left bank, a little ways above Powerville. This, and its tributaries, drain Dixon's Pond, and Powell's Pond, and the reservoir which furnishes the water supply for Boonton. I have mentioned the largest brooks only.

Q. Now, I asked you the time that it would take for the water to pass from Dover to the Boonton Reservoir. How long, in your judgment, would it take for the water, or contaminated substance entering the brook at Hibernia to reach the reservoir?

Mr. Corbin: Which, the water, or contaminated substance? Let us have a question we can understand.

The Court: Well, the witness may answer as to the flow of water, and then as to the foreign substance separate. I do not see how he can answer both together.

Q. All right, answer the question in that way.

A. It would, of course, depend upon the quantity of water flowing into the stream; but at times of ordinary flood flow it would certainly be not more than one day.

Q. (By Mr. Corbin.) That is from Hibernia?

A. Hibernia to Boonton Reservoir.

Q. (By the Court.) What would be one day?

A. The time required for the water to flow from Hibernia down the Hibernia Brook, Beaver Brook, Rockaway River, into the Boonton Reservoir, would be, at times of flood flow, certainly less than one day.

Q. How many miles an hour does the water flow in the Rockaway River on an average? Of course, there are slack places, and then there are places where it flows very rapidly. Have you made any examination of how rapid the flow of the water is?

A. No, sir; not accurately. I have, however, on a number of occasions, observed the rate of the flow of water under bridges, and have even done that by throwing in chips, and noting the time that was required for the chip to flow from one side of the bridge to the other, and then pacing off the distance, so that I have some idea of the——

Q. I know something about the Rockaway River, I have ridden all through that region repeatedly, and at some parts of it the Rockaway River flows very rapidly, and at other parts it is entirely slack, but I do not quite see how you can form any idea of the rapidity of the flow on the average by simply finding how fast it is flowing at one given point, because at no two points in the Rockaway River does the water flow with the same rapidity?

A. No, sir.

Q. You come, for instance, to a place where the water spreads out, and is slack, I suppose in the case of that slack water, even, the water would not flow as rapidly as it would if the banks were more contracted; so that I do not see how you could determine it, except by actual experiments finding out how long it would take for something thrown in at Hibernia, for instance, to flow down to Dover, if it did not get stopped on the way?

A. That is true, and that is why I answered the question in a very indefinite way.

Q. Well, then, you don't mean it would take twenty-four hours to go from Hibernia to Boonton?

A. I said not over twenty-four hours.

Q. Yes, but that is very indefinite.

A. It is very indefinite; yes, sir. I am unable to state from any data I have how long it would take. I was assuming, however, a condition of flood in the stream, and from a knowledge of the slope, and the general character of the river, I assumed it would not be over that; in my judgment it would be very much less, but just how much less I am unable to state from data I have.

Further direct.

Q. Assuming that contaminated matter should enter the stream at Hibernia, or should find its way into the stream at Hibernia, or at Dover, or at Boonton, or at Mt. Tabor, how long, in your opinion, would it require for their conveyance to the reservoir at—this new reservoir—at Boonton?

Mr. Corbin: I object; the witness has shown no competency to answer that question.

The Court: I think it is a question that, as it is put, is not capable of being answered, unless it is to be answered in the case of each place separately. But outside of that objection it seems to me that the words "contaminated matter" is too indefinite. Suppose that the water is contaminated by typhoid germs, they would, I suppose, be carried as rapidly as the flow of the stream itself. On the other hand, if the contaminated matter were some bulky substance, different sorts of waste, coming out of a factory, or taken up along the course of the river, as it ran through Boonton, why, the rapidity of the movement of such matter as that would be very much less. It seems to me that in order that the witness may answer the question intelligibly, and we may get some information from it, you ought to characterize the matter.

Mr. Vredenburgh: Then with the permission of the Court I will change the question.

Q. Assuming that human excrement should find its way to the River at Dover, how long, in your judgment, would it require for its conveyance, in times of ordinary flood, to the reservoir at Boonton?

Mr. Corbin: I object to that. I think it is a matter of common knowledge that the Court will take notice of that it would not be carried at all; it would be broken up.

The Court: I will let the question be asked. Of course, the witness may not be able to answer without an explanation. I think the question is proper enough.

A. I should say that, so far as the mechanical transmission, the physical transmission of the matter is concerned, it would flow with practically the same rapidity as that of the water itself, and that under the assumed conditions, it would pass from Dover to Boonton in less than twenty-four hours.

Q. I ask you the same question as to the lower village of Hibernia.

A. I should make the same answer.

Q. I ask you the same question with regard to the water from the mines at Hibernia, known as the Hibernia Mines?

A. I should make the same answer.

Q. I ask you the same question with regard to Mt. Tabor.

A. The same answer.

Q. (By the Court.) I suppose you are speaking now with reference to so much of this particular matter as would survive in its physical form, survive when it got to the dam; you do not mean to say it would all go into the reservoir?

A. I was speaking of it as a physical phenomena; that is, the material would be transmitted with the same velocity as that of the water; that is to say, there would not be a lagging behind of a part of it, to any appreciable extent.

Mr. Vredenburgh: My question was not intended to convey the idea that the feces, or other excrement should be carried in the exact form in which they entered the river; it was only that portions of them would.

Q. (By the Court.) Then your idea is that whether it was dissolved chemically, or whether it was carried physically, that its rate of progression would be the same?

A. Substantially so, within the limits of time of the answer; yes, sir.

Q. (Further direct.) Have you observed the sanitary conditions in Dover?

A. I have.

Q. Will you state specifically some of your observations of the sanitary condition at Dover, giving us the dates and days when those observations were made?

Mr. Corbin: I object to the question, if the Court please. The physical condition at Dover, and all of the rest of this water shed was a question that was considered and decided by Jersey City when it drew its specifications and invitations for bids. In its specifications it stated in words, that if the bid should afford water shed it should include Dover, Rockaway, Hibernia and Boonton, or if it should include Tuxedo and the other towns which are on the Ramapo River, or to include Pompton and the other towns on the other river, that then certain things should be done by the contractor or be provided for in the contract, but the taking of the physical conditions and the acceptance of one of these three water sheds was decided, and our city put into its specifications before it ever invited a bid, and printed in them, as shown here to your Honor, and those conditions not only were not to be controlled and limited in the ways indicated here, but were expressly accepted by the city, and pointed out the places where they wanted us to go, and when we said that the Rockaway should be our water shed, and they accepted it, it was with the knowledge of this physical and geographical condition, and the conditions of the population as well. As the map shows, and as is perfectly obvious, the water shed includes all the towns mentioned, besides something like a hundred and twenty square miles, and if it were parallel ground, twelve miles wide, and ten miles long, a large portion of the country; just as these other water sheds, the Pequanoc, for instance, for Newark, and it was never undertaken in this contract, and it is not the meaning of it, and inquiry in that line it seems to me is irrelevant; it was never undertaken by the contractor that these conditions should be changed. There are several clauses in the specifications which were not read, I think, to any great extent, to your Honor yesterday; some were; as to what was to be done, and your Honor will find repeatedly as the text of them all, that the water was to be delivered to Jersey City pure and wholesome for domestic and drinking purposes. The point of delivery is the high service works in Jersey City, and is so stated in the specifications, and if the water was seriously polluted so that it was not delivered in the condition of pure and wholesome water, suitable for domestic uses, then, upon the action of the Hudson County Board of Health, the contractor, during the period when he is furnishing water by the million gallons, was to take such steps to abate such pollution as the Board of Health should prescribe and order. Nothing is pretended in the bill, in the pleadings or otherwise, that any such step has ever been taken by Jersey City to move the Hudson County Board of Health or that any serious pollution has ever occurred, which required any such action. Any evidence bearing on any such point that the water as delivered was seriously polluted, of course would be competent evidence, and this evidence seems to me to be directed to the existence of the condition—the physical condition in a great water shed, with a population of growing proportions, no doubt of it, in a water shed which will, as time goes by, if the population increases, require increasing diligence, and it apparently is sought to show those conditions with the purpose of charging it upon the defendant. I say there is no such duty undertaken in the contract, it is not within the purview, the spirit or the letter of it, and that the evidence therefore is incompetent.

The Court: As I understand it, one of the questions between the parties is whether if the contract be fairly construed it requires the water company to see that no pollution enters the river, or whether the contract means only that the water at the point of delivery shall be pure and wholesome. I say one of the questions in the case is what is the meaning of the contract in that regard.

Now I believe it is a well known fact that water does to some extent—flowing water at least, does to some extent, purify itself as it flows, the purification will depend to some extent—the amount of purification will depend to some extent upon the volume of foreign matter as compared with the volume of water. I think those are matters about which there can be no dispute, and so I can very well understand that while the water might be impure and unwholesome, taken out of the river at a point below Dover, and yet by this process of purification which goes on in the flowing stream might become pure and wholesome at Jersey City. I understand that, but inasmuch as it is one of the questions in the case whether or not the Rockaway River is to be kept pure throughout its entire course, under the provision of this contract, expressed or implied, why I think I ought to allow this evidence to go in, because if that is the result of construction a contractor is required to see that no impurities go into the river above the reservoir, I mean no impurities such as would render the water impure and unwholesome. If the result of construction is that that is the meaning of this contract this evidence would be competent. If, on the other hand, the Water Company is right in its construction of the contract, then the question of how the water is at this point—at a point below Dover, or at a point below Rockaway, would be immaterial, and I must therefore admit the evidence because in one point of view it would be competent, and in another point of view it would not, and then I think that the evidence might be competent. I might as well add that I think that the evidence might be competent perhaps in either case if it should be shown, for instance, that there were germs introduced into the water anywhere along its course which would survive if introduced at the point of delivery. I don't know how that is. It may be, for instance, typhoid germs, if introduced into the water at Dover, might remain in the water at Newark. That is a scientific question with which I am not competent to deal.

Mr. Vredenburgh: We propose to produce evidence on that point.

The Court: Yes, and in that point of view, if the evidence went to that extent——

Mr. Corbin: I don't think anybody ever found typhoid germs in water yet; there are other things that indicate the presence of typhoid.

The Court: Well, the experiments were such as would indicate the presence of typhoid germs.

Mr. Vredenburgh: This question, may it please your Honor, goes to the root of this thing, and if it is to be argued why I would like Mr. McDermott and myself to have an opportunity to argue it, and I want to ask your Honor not to make up your mind with regard to it until you hear our side of it, because we differ in toto from the view which counsel has presented.

Mr. Corbin: May I simply read this clause?

The Court: Of course you have the right to object to the introduction of any evidence.

Mr. Corbin: Well, may I just read this clause? It is under the head of "Quality of Water." "The water to be furnished must be pure and wholesome for drinking and domestic purposes.

"If the villages, boroughs or cities of Port Oram, Dover, Rockaway, Boonton, Butler, Bloomingdale or Pompton, or any other municipality in New Jersey, or Suffern, Hillburn or Tuxedo Park, or any other municipality in New York, or any citizen thereof, or any manufacturing establishment therein or on the streams below said villages, boroughs or cities shall, in the judgment of the Hudson County Board of Health, seriously pollute the water supply at any time prior to a purchase of the works by the city, the contractor, upon notice by the city, of the existence of such pollution, shall forthwith prevent such pollution.

"All powers possessed by the city shall be exercised in aiding such prevention. The city shall not be bound to accept any plant or water therefrom until the supply is free from pollution."

Mr. Vredenburgh: May I read the eighth section of the contract?

The Court: I am going to admit this evidence, and then I will have to deal with it as it may seem proper later on.

A. I visited Dover on June 24, 1904, again about July 14, the same year, again July 21st, August 17th, and once about September 16th, all in 1904; I again visited it on July 12, 1905, and on February 16, 1906. I found that the Rockaway River runs through the central part of the city; that there are about six bridges crossing the river at various streets; I found a number of drains, apparently conducting the street wash from the city into the river.

By Mr. Corbin:

Q. Apparently conducting, you say?

A. I will leave out the word apparently, perhaps it will be more definite. Conducting the surface water. The street wash into the river. I saw same drains discharging what appeared to be sink water, wash water into the river; I saw a sewer opposite Morris street discharging sewerage into the river.

Q. Where was that?

A. Morris street and more easily spoken of as the Morris street sewer; I saw two sewers at that point, but in only one of them did I see evidences of sewerage; I saw one or two other drains which were connected with water closets which received sewerage.

Q. Won't you specify the places?

A. I have a memorandum of one of them as being at No. 99 East Blackwell street, and evidence as to that connection was obtained August 17, 1904. On the same date I inspected the stove works of Richardson & Boynton, just above Dover and saw urinals, the effluent from which discharged into a small brook, and upon the ground——

Mr. Vredenburgh:

Q. Did that brook enter the Rockaway River?

A. The brook apparently entering the Rockaway River through a culvert under the railroad.

Q. How far was the river from that?

A. I am unable to say, but it was a matter of a few hundred feet.

Q. Go on.

A. I saw a number of houses all along the course of the river, in the city, which backed up on the stream and where there were privies very close to the stream, although not immediately over it. I traced a brook, known as Ford's Brook, through the city, and saw sink wastes discharging into that, and saw numerous privies located near the course of that stream. I traced the course of a small ditch on the left bank of the stream into which other ditches or drains apparently connected, and I saw privies——

Mr. Corbin:

Q. What did you say, did you say probably connected?

A. I said apparently, but I will leave that word out. Into which other ditches connected, and with which were privies.

Q. Any others?

A. On the outskirts of Dover I saw what is termed Richards' abattoir, where animals were being killed, and where the refuse was discharged into the feeder of the brook or the river. I think I have named the most important of them.

Q. Did you go there on February 16th of this year?

A. Yes, sir.

Q. Did you observe these same conditions which you observed in 1904?

By Mr. Corbin: I object to that. Let him tell what he observed, not tell the same conditions existed.

By the Court: Why don't you put it in a different way? How did the conditions you observed on the 16th of February of this year compare with those you observed previously?

Mr. Corbin: I object to that also as calling for a conclusion. He ought to tell what he saw on the 16th.

By the Court: Then I will allow Mr. Vredenburgh's question.

Q. (Question read.)

A. On the 16th of February, 1906, I did not inspect all of the sources of pollution previously mentioned. I did observe the conditions of the Morris street sewer, and I found it worse than I saw it during the summer of 1904 and '05.

Q. Please tell what you mean by worse; what did you see there?

A. I saw a large amount of sewerage coming out of the sewer, and discharging into the Rockaway River—larger in amount than I had ever seen it before.

Q. What kind of sewerage?

A. Apparently human excrements.

Q. Well, apparently; can you tell—I don't know what you mean?

A. As near as I can judge by the eye, it was human excrements.

Q. You had some experience in that subject?

A. Yes, sir; the feces were unbroken, and they were accompanied by fragments of toilet paper.

Q. What other places did you observe on February 16th that you had observed in previous years?

A. I observed the general conditions along the stream. I did not make any tests of the other drains. I saw the surface drains in a number of places.

Q. Now when you say tests, you haven't told us any tests yet; what tests do you refer to?

A. I spoke of the tests I made on the 17th of August, 1904, by which we ascertained that the water closet at 99 Blackwell street——(interrupted)

By Mr. Corbin: I object to his giving the results; he should tell what tests he made.

By Mr. Vredenburgh: My question is what tests he made, what he did.

By the Court: Let him state what he did.

A. The tests I made at 99 East Blackwell street were these: I instructed Mr. Pierce, the assistant engineer who accompanied me, to go into the house and pour a bottle of bluing into the water closet. He went into the house and in less than five minutes he saw the blue color of the blueing, or at least I saw it appear at the mouth of the small drain which discharged into the stream.

Q. Now, to return, Mr. Whipple, to the conditions of February 16; did you observe the public prison in Dover at that time?

A. I did.

Q. Was it a building that had been there several years?

A. I should judge so from its appearance.

Q. How near the stream is it?

A. Perhaps within 20 feet; I could not measure the distance. I should say it was less than 15 feet.

Q. Did you go into the prison and examine it?

A. Yes, sir.

Q. Please state what you found as to the drainage in the prison?

A. I found there two rooms with bed cots; there was a concrete floor, and at the bottom of each there was a trough which led to the main drain. On the outside of the building I saw this drain discharging, pointing towards the stream. I took a bottle of blueing, poured it down into the trough inside the building, and saw the colored liquid come out of the drain and flow into the Rockaway River.

Q. Did you see the character of the deposit underneath at the outlet of that drain?

A. Yes, sir.

Q. What was that deposit?

A. I saw some excrement there, cigar—cigarette papers, burned matches, etc., all frozen to the ground.

Q. Any human excrement?

A. I judge so; yes, sir.

Q. Did you take a sample of it?

A. Yes, sir.

Q. Please produce the sample.

At this point the Court called counsel's attention to the case of the State Board of Health against the Silver Spring Paper Company and suggested that the question of pollution referred more to the intake than to the point at which pollution might arise.

Q. Have you that sample here?

A. I have it here, yes, sir.

Q. Is it human excrement or not?

A. I should say it was.

By the Court: When was this taken?

Mr. Vredenburgh: February 16th.

Q. That public prison, as far as you could see, had been in use for prisoners, in the same condition as it then was, for several years, hadn't it?

Mr. Corbin: I object to these leading questions.

By the Court: Well, he cannot tell about that; he said that the appearance of the building was such as to indicate considerable age. Outside of that he could not possibly say how long it had been used for present purposes.

Q. You saw the inside of the prison. How did that look as to whether or not it had been used for that purpose for several years?

A. It looked as if it might have been, but I could not say for how long.

Q. The prison was used for prisoners?

A. The prison looks as if it might have been used for the purpose of a prison for some considerable time, but how long I could not say.

Q. You have stated the condition of the floor —the appearance of the floor. Did that show the appearance of age or not?

Objected to as leading, and overruled.

By Mr. Vredenburgh: My object was to supply by the witness's sight, if he could tell whether it had been fixed up in a few months or not.

By the Court: He has described the building, and the question is not whether it was used for that purpose five years ago, but as to its use when he saw it.

Mr. Vredenburgh: I desired to show, if I could, that it had been so used for a long time, in order that the defendants could not say it was of very recent use and they had no notice of it.

Q. Did you ever examine in that neighborhood

—did you find other excrement in that neighborhood either near the sewers that you spoke of, or anywhere in that neighborhood of the river, in such condition that it would be washed by any ordinary rain into the river?

A. I found human excrement under the bridge at West Sussex street, and I also saw human excrement in the Rockaway River itself, at the mouth of the Morris street sewer, which excrement also came from that sewer.

Q. When you on this February 16th were there, did you notice the condition of Ford's Brook?

A. I saw that part of it near the railroad station—across the tracks from the railroad station.

Q. Was there any change in the condition from the time you had seen it a year before in 1904, and February 16th, 1906?

Mr. Corbin: I object to that.

The Court: I don't see any objection to it.

A. So far as I could see there wasn't, but there was more or less snow on the ground, and I don't think I got as good a view of it on the 16th as I did on the previous occasion.

Q. The water closets you saw in your visit, and that you spoke of as having seen on your trip there in August, 1904, did you notice them there on February 16th, 1906, when you were there?

A. I didn't look for them February 16th, no, sir.

Q. Have you any other samples that you have taken from that place here to-day?

A. I have a sample which I took at the mouth of the Morris street sewer.

Q. Produce that.

A. Here it is.

Q. In this bottle which you produce, is that human excrement?

A. Yes, sir.

Q. Taken from the river?

A. Taken from the river at the mouth of the Morris street sewer.

Q. How far from the outlet?

A. Well, within two or three feet, just as it came out.

Q. What is the other sample you have?

A. That's the sample of human excrement found under the bridge at West Sussex street.

Q. How near was that to the river?

A. I ought to correct that; it was East Sussex street.

Q. How near is that to the river?

A. About three feet from the bank of the stream.

By Mr. Corbin:

Q. It wasn't taken from the river, but from the bank?

A. From the river's bank; not from the river, no, sir.

Mr. Vredenburg: I offer these three samples in evidence.

Marked Exhibits 29, 30 and 31.

Further direct.

Q. What date did you take that last sample?

A. February 16, 1906.

Q. Did you, Mr. Whipple, cause a sanitary investigation to be made by your assistants?

A. I did.

Q. Who were they?

A. Mr. Langdon Pierce and Harold Bouton.

Q. You saw the results of their examination?

A. Yes, sir.

Q. Now as to Hibernia Village—lower Hibernia Village—did you make an examination of that village from a sanitary standpoint?

A. I did.

Q. Will you please state what was the result of your examination?

A. I found there a village of houses occupied by miners. The general sanitary conditions around the buildings were bad. The houses were served generally with privies, many of which were open, I mean exposed so that the feces were open to the air. The village itself was built on the side of a steep hill, from which the run-off would be very rapid, at the time of a full rain. I also saw water being pumped out of mines at three different cases, and in one place the water pumped out appeared to be foul.

Q. Did you learn how many men were employed in the mines themselves?

A. I saw several hundred men in and around the place at various times, and I was informed that numbers were employed, to upwards of a thousand, but just how many I am unable to state.

Q. What was the character of the water that was pumped out of the mines, so far as you could tell or observe?

A. Water which was coming from what is known as the Glendon mine was contaminated.

Q. The village of Hibernia is occupied by people of what occupation?

A. Miners and laborers.

Q. And the number of houses there, about how many?

A. I should have to consult my notes, but I should say several score of houses, if that is a sufficiently definite answer.

Q. And the number of people living there is how many?

A. If I may answer the previous question a little more definitely, I should say there are about 125 houses in lower Hibernia, and the number of people must have exceeded a thousand, between one and two thousand perhaps.

Q. Is there any public water supply at Hibernia?

A. I did not observe any.

Q. Is there any system of sewerage at Hibernia?

A. I did not observe any.

Q. Now returning one minute again to Dover; is there a public water supply in Dover?

A. Yes, sir.

Q. And is it a house supply also, used for domestic purposes?

A. Yes, sir.

Q. Is there any public system of sewers other than the sewers you have called the Morris street sewer and the other drains you have mentioned?

A. I did not observe any.

Q. The population of Dover is about how many?

A. Upwards of six thousand; I haven't the last census figures in my mind.

Q. I have here the census of 1905, certified, and by that it appears that the increase of population at Dover is—I will find it and read it.

Mr. Corbin: Certifies the increase?

Mr. Vredenburgh: Certifies the whole thing, Mr. Corbin.

Q. Will you give us, Mr. Whipple, the date when you examined the city of Mt. Tabor and what you found there?

Mr. Corbin: Same objection.

Mr. Vredenburgh: I might at this point state that the total population by the census of 1905 of the town of Dover is 6,353 people, and of Boonton 3,935.

Q. Now go on, Mr. Whipple.

A. You ask me the date when I saw Mt. Tabor?

Q. Yes.

A. September 3, 1904.

Q. What was its sanitary condition?

A. I can answer that best by describing briefly just what there is there. There is a Methodist Camp meeting ground there, with upwards of two hundred cottages. These buildings are served with privies and cesspools; there is a public water supply; the buildings are built on the side of the hill; the general cleanliness of the place was fairly satisfactory. I saw the point which the superintendent pointed out as the place where the contents of the privies were emptied when they were cleaned. The contents of the cesspools were emptied at a place not far from one of the feeders of the Rockaway River.

Q. How far, Mr. Whipple—not far don't mean very much.

A. I should say less than a hundred feet, speaking from memory.

Q. You said the cesspools were emptied at some place?

A. I was so informed, yes, sir.

Q. Did you go there where they were emptied?

A. Yes, sir.

Q. What did you see?

A. I saw a manure pile, and I saw near there a cart which they used in emptying the cesspools. They were not emptying them at the time I was there.

Q. How near was this pile to the brook?

A. I should say less than a hundred feet.

Q. What was the lay of the land between this pile and the brook?

A. The general slope was towards the brook.

Q. Now just tell us with regard to Boonton; has Boonton a public water supply?

A. Yes, sir.

Q. Has it any sewerage system?

A. I didn't observe any, except that I observed one sewer or drain—one drain which apparently performed, to some extent, the functions of a sewer.

Q. What is the sanitary condition there?

A. You mean as far as they relate to the pollution of streams?

Q. Yes.

A. In order to answer that question I should have to describe somewhat at length the conditions which I saw.

The Court: In the first place, what is the population?

Mr. Vredenburgh: 3,935 in Boonton Town.

A. I found that the river flows through the town, dividing the town into two parts, but the great bulk of the population was on the north side of the stream or on the left bank of the stream. Between the stream and the main part of the town is the Morris Canal; there are two levels of this canal, known as the upper level and the lower level, between which there is what is called the incline plane. A considerable part of the town drains naturally towards this inclined plane, and the lower lever of the canal. Some of the towns drain naturally towards the upper lever of the canal. In a number of places I saw drains discharging street wash or surface wash into both of these canals, and there is an open drain extending down the inclined plane which conveys the water from certain drains above or near the upper level of the canal. About half way down the plane this drain receives the waters of Brook Street brook, a natural stream covered in, and has a passage through the town. The waters of this brook or drain I found to be contaminated. I found at least one water closet which had direct connection with it, and my inspector, Mr. Pierce, and Mr. Bouton found others which were connected with it.

By Mr. Corbin:

Q. Did you specify them?

A. I only found one.

Q. Where was that?

A. The one I found was the water closet in the Mansion House.

Q. What was the date of that, Mr. Whipple?

A. I haven't it at hand.

Q. Give it approximately.

A. The fall of 1904 I made tests there, in company with Dr. Lieb.

Mr. Corbin (To Mr. Vredenburgh): You are not going to contend that that gets into the reservoir?

Mr. Vredenburgh: Oh, yes I am.

Q. Do you say so, Mr. Whipple?

A. I haven't been asked.

Further direct.

Q. Go on and tell us all about it?

A. Well, I have referred to the Brook Street brook, which discharges the drain on the incline plane. At about a point where it runs into that drain there is an overflow, where at times of high water there is an opportunity afforded for the water of this brook to pass across the incline plane, and to flow into the canals furnishing power to the Cooper Lord property, and from thence into Rockaway River. I have seen silt, etc., deposited at that point, and evidence that at times, and at a time only a short period before my visit, water had so passed over. I have never been up there on a day when the brook was in flood, although my inspectors report that they had seen it.

Q. Now, do you know why that overflow is put at that point of this open drain?

A. Only by what I have been informed, and that was to relieve the drain of the excessive water at times of flood, and also perhaps to protect that level—the lower level of the canal from excessive water at times of flood.

Q. What were the evidences that you saw that sewerage had been carried over there; what did you see?

Mr. Corbin: Silt, he said.

A. I saw silt and sand apparently having been washed over the grass, indicating a recent flow of water across there.

Q. Perhaps if you can, will you explain just what you mean by an opening?

A. It was a catch basin built so that it might discharge both into the drain which passes around the plane, and so that it would do that in a condition of a full stream flow, and also was arranged so that the overflow when the water flowed down too fast it would overflow on the other side of this catch basin and pass into the river as I have indicated.

By Mr. Corbin:

Q. At the time of a freshet?

A. Yes, sir; at the time of high water.

Further direct.

Q. When, in your judgment, is there most danger of contaminated matter being carried down this brook that you are speaking of—whether in ordinary times or times of freshet?

A. Judging from my inspection of the surroundings of this brook I should say at the time of high water there would be more apt to be a washing off of the contaminated substance in the brook at that time.

Q. Now just one other question; you have told us about the unsanitary condition of Dover, Hibernia, Boonton and Mt. Tabor; are those the only ones which you have discovered upon this water shed?

A. No, sir.

Q. Where are there others?

A. The most important source of contamination other than those mentioned is, or was the Lyondale Print Mills, where I found——

Q. Let me, perhaps stop you there, Mr. Whipple. I don't desire to ask you with regard to unsanitary conditions that are not there now, but as to unsanitary conditions that are there at the present time; that's all I desire to ask you about now.

Mr. Corbin: This is one of those you have charged in your bill.

Q. Well, then, you better tell us about it. I had forgotten it?

A. During the summer of 1904 I found the Lyondale Print Works, just below Rockaway, where there were upwards of two hundred operators—I found the waste from that mill and the water from the closets discharged into a canal, and then the water lead to a series of catch basins and then discharged through banks and stones into the stream.

Q. Can you name any others?

A. At Powerville, about one mile above Boonton, I saw a rag mill, where the waste was discharged into the basin, dug in a pit of cinders, or a bank of cinders back of the mill, in which bank I saw evidences that the liquid going into it had overflowed. I did not see it at the time I was there passing directly into the stream. That liquid represents the washing of the rags that are used in the mill.

Q. Did you see the rags there on February 16th?

A. Yes, sir.

Q. How near were they to the—what size packages were these rags in?

A. They were in bales, and I saw them piled up in various places, at one place very near the stream, within ten feet of it certainly.

Q. How big were the packages containing the rags; how much in weight?

A. I couldn't tell you the weight; they were about the size of an ordinary bale of hay, and I don't know how much they weighed.

Q. How many of them were there?

A. A good many dozen, I didn't count them.

Q. How near the stream?

A. Some were within ten feet.

Q. Can you tell what the character of the rags were, whether they were selected or soiled?

A. They appeared to be dirty rags; I cannot say much more than that.

Q. What have you to say about whether this was changed, so far as I mean, excrement was concerned?

A. I haven't seen it, but I have been notified.

Q. Well, I ask whether you have seen it?

A. I haven't seen it.

Q. Did you try to get into the mill to see?

A. I have not since the time about which I have specified.

By Mr. Corbin:

Q. When was that time?

A. The summer of 1904.

Further direct.

Q. You have been informed—who informed you?

A. Dr. Leal, I believe.

Mr. Vredenburgh: Do you care to have that information?

Mr. Corbin: Well, he stated something about the condition of the place at one time, and we all know those conditions don't exist there now.

Q. Now pass on to another question. Assuming, Mr. Whipple, that an extensive epidemic of typhoid fever should appear or break out in Dover, co-incident with the period of heavy rains, in your opinion would the germs of typhoid fever discharged into the Rockaway River be discharged into the Boonton reservoir?

Mr. Corbin: Objected to as not competent. This witness is not qualified to give an opinion upon it.

The Court: If you wish to examine him as to his competency to give an opinion on this point you may do so.

Mr. Corbin: I don't think any person is competent to answer a question of that kind.

The Court: I don't know about that; this witness is a bacteriologist and he has made a special study of this subject. Now whether that branch of science has progressed so far as that anybody is capable of giving an opinion upon it, I do not know. That will have to be a matter of cross-examination; but as it now appears I think the witness is competent to speak upon the question. I think the question might be put in a better shape, but I think the inquiry is a proper inquiry.

Mr. Vredenburgh: Of course I would be glad to adopt any form which the Court would suggest.

The Court: Well, cannot you ask this witness how typhoid germs may be carried?

Mr. Vredenburgh: How far?

The Court: Well, how they may be transmitted and carried.

Mr. Vredenburgh: I am going to develop that subject fully, but if your Honor thinks now it is the proper time I will develop it now. I am going in a regular way.

The Court: Proceed, and take your own course.

A. If I understand your question correctly, you assume an epidemic of typhoid fever in Dover, and with typhoid fever bacilli at that time discharged into the Rockaway River at Dover, and that there is an ordinary flood in the river, and you ask me if I think those germs would pass from Dover into the Boonton reservoir?

Q. That is it, sir.

A. And I answer that it is my judgment that some of them would; many of them would.

Q. Assuming the same facts as to the town of Hibernia, what have you to say, what answer would you make as to the germ of typhoid fever entering the brook at Hibernia, would they or not be discharged in the Boonton reservoir?

A. Assuming the same conditions at Hibernia, I should give the same answer.

Q. Now assuming the same conditions at Mt. Tabor?

A. Just the same.

Q. And assuming the same conditions at Boonton?

A. Just the same.

Q. Have you made a bacterial analysis of the water of the Rockaway River where it enters Boonton reservoir?

A. I have.

Q. Have you made a chemical, or caused to be made under your supervision, a chemical analysis of the water flowing?

A. Yes, sir.

Q. From the Rockaway River into the reservoir?

A. Yes, sir.

Q. And a microscopic analysis?

A. Yes, sir.

Q. And a physical analysis?

A. Yes, sir.

Q. Will you state the results of the analyses of the water of the Rockaway River where it enters the Boonton reservoir?

Mr. Corbin: I object. We should have the analyses and the circumstances under which they were taken, and what was done; his characterization of the result is not proper and certainly not at this stage.

The Court: I suppose the question ought to be: Have you the analysis?

Mr. Vredenburgh: Have you the record of the analysis?

The Court: Yes.

Q. I will ask you, have you the record of the analysis?

A. Yes, sir.

Q. And have you here those who assisted you in making those analyses?

A. Yes, sir.

Mr. Vredenburgh: Now, may it please your Honor, I am prepared to prove each one of them; take the witness off and prove each one, from the time it was taken out and analyzed, if they so desire. I have the witnesses here to-day, and brought them here for that purpose at great expense.

Mr. Corbin: Well, bacterial analysis is absolutely worthless without every condition being right.

The Court: As I understand, he is going now to give us in detail a statement of his experiments.

Mr. Corbin: The question called for his results.

The Court: The last question called for his analysis, and in that view the statement where the water was taken from, what was done with it, and what the result was, is competent.

Mr. Vredenburgh: I have characterized where, may it please your Honor—from the mouth of the——

The Court: The witness can state where he took that from and how he took it.

Q. Where did you take it, and how did you take it, from the river?

A. I understand you to refer to the Rockaway River as it runs into the Boonton reservoir?

Q. Yes.

A. I have a sample from the Rockaway River—

Mr. Corbin:

Q. You personally took it, you mean?

A. Yes, sir.

Mr. Vredenburgh: Wait a moment, Mr. Corbin; it will all come out.

Further direct.

Q. Go on and answer the question.

The Court: As I understand it, the question calls for an answer as to what the witness himself did.

Q. What you did yourself.

Mr. Corbin: Of course, his samples were not chiefly taken by himself, as he has already said.

The Court: I say that this question calls for facts within the knowledge of this witness. Now I cannot assume that he is going to give us something else until he does give us something else.

The Court:

Q. Just state those facts which are within your personal knowledge.

A. On July 19, 1904, I went to the Rockaway River where it discharges into the Boonton reservoir, and personally collected a sample of water from the reservoir.

Further direct:

Q. What do you mean by that?

A. At a point just above what is known as the Long Bridge, a bridge which crosses the stream at the northwestern part of the reservoir. I took the sample far enough up the river so that the sample was taken in running water—so that the sample fairly represented water coming down the river. I took that sample in two parts.

Q. In what did you take it in?

A. I took that sample in two parts; that is, I used two bottles for each one, a small two-ounce bottle which had been sterilized in order to fit it for the purpose of bacterialogical tests, and the other was a larger bottle with glass stopper which had been chemically cleaned, and which was to be used for the other portions of the analysis. This sample I took to my laboratory at the Brooklyn Polytechnic Institute in Brooklyn, and made a bacteriological examination of it.

Q. State the general result of your analysis of that sample which you took, as you have mentioned.

A. I found that the water contained 3,000 bacteria per cubic centimetre; that it had a turpidity recorded as 1 on the silica standard; that it had a color of 30; that it had an odor which I characterized as distinctly vegetable and very faintly mouldy; that it contained three and six-tenths parts per million to weight of chlorine, .128 parts per million of nitrogen albuminoid ammonia, 022 parts per million of nitrogen as free ammonia, no nitrites, .10 parts per million of nitrogen as nitrites, and the sample had a hardness of forty-four and three-tenths parts per million; the water contained sixty-two microscopical organisms per cubic centimetre.

Adjourned until Friday, February 23rd, 1906, at the Chancery Chambers, Newark, New Jersey.

NEWARK, N. J., FEBRUARY 23, 1906.

George C. Whipple recalled for further direct examination by Mr. Vredenburgh.

Q. Mr. Whipple, in speaking of your examination the other day, you did not mention what you found as to the baccilus coli?

A. I made no tests of the samples for that.

Q. Why?

A. At that time our laboratory was not equipped for doing that work. My partner and I had just established that laboratory and we were not fully equipped for all the work at the time the examination began.

Q. How long after that were you equipped with the apparatus?

A. About the middle of August.

Q. Did you arrange thereafter for a system of obtaining samples from the Rockaway river, where it entered the reservoir?

A. I did.

Q. What was that system?

A. On the 19th of July I took with me a young man by the name of Thomas Constable, and instructed him how to collect samples—how and where to collect samples from the Rockaway river, where it discharges into the reservoir, and instructed him to transport those samples to my laboratory at the Brooklyn Polytechnic Institute in Brooklyn. He was instructed to take those samples daily, Sundays excepted.

Q. Is he here?

A. I don't see him here this morning, I think he will be here.

The Court stated that Counsel might go on with the examination of the present witness, as to what he did with the samples, and that the evidence could be made competent hereafter by the production of the other witness.

Q. Did that man deliver the samples to you?

A. He did not.

Q. Who did he deliver them to?

A. I instructed him to deliver the samples to Mr. Baton, our bacteriologist, in our laboratory.

Q. Where was your laboratory?

A. The Brooklyn Polytechnic Institution.

Q. This Mr. Baton here?

A. Yes.

Q. What is his full name?

A. Warren U. C. Baton.

(Witness withdrawn for the present.)

Warren U. C. Baton, sworn for Complainant.

Direct Examination. By Mr. Vredenburgh.

Q. Where do you live?

A. Washington, D. C.

Q. What is your business?

A. Bacteriologist.

Q. Where were you educated?

A. Massachusetts Institute of Technology.

Q. Who are you working for now?

A. The Washington Aqueduct Filtration Company.

Q. Who were you working for in August, 1904?

A. For Mr. Whipple.

Q. Do you know the man Thomas Constable, mentioned by the last witness?

A. I do.

Q. Was he working at the same place at the time you were there?

A. Yes, sir.

Q. Will you please tell whether he delivered any bottles to you, and what you did with the bottles?

A. He delivered all the bacteriological samples to me?

Q. In the first place from whom did Mr. Constable get the bottles?

By Mr. Corbin: Objected to. He doesn't know that.

By Mr. Vredenburgh: Yes, he does, he got them from him.

A. He received the bottles from me.

Q. How often?

A. Daily.

Q. Except Sundays?

A. Yes.

Q. Where did he get those bottles?

A. He got them from me.

Q. Where—whereabouts?

A. Brooklyn Polytechnic Institute, Mr. Whipple's laboratory.

Q. What was the character of those bottles?

A. 2-oz. glass stopper bottles.

Q. In what condition were they as to being sterilized?

A. They were thoroughly sterilized by myself personally.

Q. And the bottles so sterilized were given to him by you?
A. Yes, sir.
Q. Every day?
A. Yes, sir.
Q. About what time of the day?
A. I should say between 2 and 3 in the afternoon.
Q. You mentioned two bottles, what was the other bottle for?
A. That was for the chemical analysis.
Q. When did you see those bottles again?
A. I saw those bottles again when they were returned to me by Thomas Constable containing the samples.
Q. How soon afterwards?
A. The following day.
Q. What time were they returned to you the next day?
A. Between two and three, usually.
Q. That is when he brought in these bottles with the samples in, you gave him the empty bottles for the next day?
A. Yes, sir.
Q. And from that time who had possession of the samples, until the examination of the analyses was completed?
A. I had it myself.
Q. Now, did you have anything to do with the chemical analysis of the water in the chemical bottle?
A. I did not.
Q. Who did this go to?
A. To Mr. Mayer.
Q. Now the sterilized bottle with the water for bacteriological examination, you retained possession of?
A. Yes, sir.
Q. What did you do with it, or what did you do with the water in it?

A. I analyzed it.

Q. And did you note down the results of your analysis?

A. I did.

Q. Have you those results there?

A. Yes, sir.

Q. Will you produce them?

A. (Witness produces his record.) They are the original notes.

Q. What is this book?

A. This contains the original notes, the results of the analyses as they were rendered and obtained.

Q. From those books what were they copied in?

A. From these books I have made up a tracing.

Q. Where is that tracing?

A. I have it here, sir.

Q. That is what I want, the tracing of the water examined by you, as coming from the mouth of the Rockaway river where it empties into the Boonton reservoir?

Mr. Corbin: Objected to as leading, and not a matter even pretended to be within the witness's knowledge.

The Court: Well, that is what Mr. Vredenburgh proposes to show; I think his statement is a little incorrect, that is, not the mouth of the Rockaway river, I take it the mouth of the Rockaway river is where it empties into the Passaic; what you mean is where it flows into the reservoir?

Mr. Vredenburgh: Yes, change my question in that respect, where the Rockaway river flows into the Boonton reservoir.

Mr. Corbin: Are you going to show us this book?

Mr. Vredenburgh: Oh, yes, there is no reason why you should not see things just as he speaks of them, Mr. Corbin.

(Witness produces a tracing.)

Q. Now that shows the results of your examination of the water I have mentioned?

Mr. Corbin: Objected to as leading, the witness is an intelligent witness, and he ought to say what it shows, he can state it better than counsel can.

The Court: Well, I don't believe myself in this extreme care of avoiding leading questions. I, myself, am a believer in the English way of trying cases, we get along a great deal faster and better if counsel asks leading questions up to a certain point.

A. Yes, sir.

Q. What does it show?

A. This shows the result of daily bacteriological examination of the water of the Rockaway river both in regard to members and also in regard to baccilus-coli.

Q. I notice that tracing that you have in your hand says, at the mouth of the river?

A. It does.

Q. What do you mean by that?

A. I mean by that, the point where the river enters into the Boonton reservoir.

Mr. Vredenburgh: I ask that the witness change that so as to make it accurate.

The Court: Yes.

Q. Just change that paper you have in your hand and strike out the word "mouth" and substitute for it "where it enters the Boonton Reservoir."

A. (The witness made changes in the paper referred to.)

Q. How does that tracing read now?

A. "The results of daily bacteriological examination of water of the Rockaway river at point where it enters Boonton Reservoir."

Q. Is that accurate?

A. Yes, sir.

Q. Did you finish stating what that tracing shows?

A. It shows, in addition to the daily counts, the average of the counts for each month.

Q. Under whose directions did you make these examinations?

A. Under Mr. Whipple's directions.

Q. Where did you make them?

A. At the Brooklyn Polytechnic Institute in his laboratory there.

Q. When did you make them, from what date to what date?

A. From July 19 to September 30.

Q. Of what year?

A. The year 1904.

Q. Have you checked up this tracing with the original book to see whether it is correctly taken or not?

A. It was done so at the time the tracing was made.

Q. Have you done it?

A. Yes, sir.

Q. Is it correctly taken?

A. Yes, sir.

The Court: Are you going to offer this book?

Mr. Vredenburgh: Yes, I have not proved it sufficiently yet but I will offer it for the purpose of cross examination.

The Court: It will be offered subject to your ability to show that this water which was analyzed did in fact come from the place where it purports to have come from.

Tracing produced by this witness marked Exhibit C No. 33.

Mr. Corbin: I would like to cross examine upon the book.

Mr. Vredenburgh: I offer that part of the book which covers these analyses.

The Court: You may cross examine as to that, and the book is offered in evidence.

Memorandum book produced by witness, Marked Exhibit C No. 34.

Mr. Vredenburgh: Limiting it only to that part of the book which applies to these analyses.

The Court: Yes, that will so appear upon the record.

Cross Examination. By Mr. Corbin.

Q. What is your age now?
A. Twenty-six.
Q. When these samples were delivered to you then you were twenty-four years, were you?
A. Yes, sir.
Q. When did you graduate from the Massachusetts Institute of Technology?
A. I did not graduate, I——
Q. How long were you there?
A. I was there two years previous to the work for Mr. Whipple.
Q. When did you leave there?
A. I left there in 1905. I returned there for another year.
Q. This was in the middle of your studies there?
A. It was in the middle of my studies there, but my work there bearing on this subject was all done previous to my work for Mr. Whipple.
Q. You had been in the Massachusetts Institute one year for study before the making of these analyses and you went back there for one year's study in something afterwards?
A. No, sir, I was in the Massachusetts Institute of Technology two years previous to making these analyses, and I returned there afterwards.
Q. This was your first work after your studies in the school outside, was it?
A. It was my first work outside of the school.
Q. You personally made these bacteriological examinations of Jersey City water did you?
A. I made these bacteriological examinations of Jersey City water personally under the directions of Mr. Whipple.
Q. You say under his directions, was he always present when you made them?
A. Not always, but frequently.
Q. When you gave bottles to Constable every

day between two and three o'clock, how many did you give?

A. I could not answer that question; I gave sufficient bottles for the samples which were to come in.

Q. About how many would you give a day, one or two?

A. For the daily samples, I think there were three.

Q. Not always the same, necessarily?

A. Not always the same. You mean the same number?

Q. Yes, the same number.

A. Not always the same number, it depended on the number of samples which were ordered to be brought in by Mr. Whipple.

Q. And next day at the same hour he would come back with some samples?

A. Yes, sir.

Q. Not necessarily the same number always that you had given out the day before?

A. Yes, sir, I think invariably the number was the same.

Q. Did you make any entry of these samples when they came in?

A. If you will allow me I will change that last statement.

Mr. Vredenburgh: Certainly.

Witness: There were certain of these bottles that were sent out by messenger to the man in the field for special samples.

Q. Who was the man in the field?

A. Harold Bouton.

Q. And you say it was sent by express?

A. Bottles of some kind were sent by express.

Counsel objects to the evidence.

By the Court: The witness requested permission to correct a prior statement that had reference to these particular bottles, it was not Mr. Corbin's desire to lead him off, but the witness's desire to be accurate.

By Mr. Vredenburgh: I think the witness fell into error.

Q. You say somebody sent you the bottles?

A. Some were sent by messenger or by express.

Q. From the man in the field, who was Mr. Bouton?

A. Yes, sir, as soon as the samples were taken, these bottles, as I understand it, were turned over to Mr. Constable; at any rate Mr. Constable delivered the bottles to me.

Q. Some of the examinations you made of the Rockaway river where the water entered into the reservoir came in that way to you?

A. The examinations I made of the Rockaway river water was from water in bottles which were given to Constable by me on certain days, and on the following days those bottles were returned to me by the Constable.

Q. What was the other water that came to you as you have described through a messenger, and through Mr. Bouton?

A. Other waters that were ordered for samples.

Q. From where?

A. Various places on the river.

Q. Any of it from this river?

A. Yes, sir.

Q. And Constable brought them all to you?

A. He brought all the bacteriological samples to me.

Q. What way did you have of identifying the bottles, one from another?

A. Bottles had light labels on each bottle, and those were filled out in the field when the samples were taken.

Q. Filled out by whom?

A. By the man that took the samples.

Q. Filled up with what?

A. With the place at which the sample was taken, the date, the hour, and the man's initials.

Q. Did you make any record of that?

A. Yes, sir.

Q. You spoke of this book being a record?

A. Yes, sir.

Q. Has this book any such data in it?

A. You will see that the samples are referred to by numbers.

Q. Is there anything in this book to show the dates when anything came to you?

A. No, sir.

Q. Or anything to show where the samples came from?

A. No, but those numbers refer to another book.

Q. Where is the other book?

A. I have it.

Q. Have you it here?

A. Yes, sir.

Q. Then these numbers are transcribed from another book that has the data in it?

A. Yes, sir.

Q. The only identification you have in this book is this list of numbers on the left?

A. Those numbers, yes, sir.

Q. When Mr. Constable came in with his bottles in the afternoon, how did he have them, in his pocket?

A. No, sir, the bottles that Mr. Constable brought in were packed in a tin case, and the tin case was in an ordinary suit case, and packed in the suit case was also a receptacle for taking ice.

Q. The ice wasn't in the tin box?

A. It was not in the box with the sample, it was packed outside of it.

Q. And the box and the ice were in the suit case?

A. Yes, sir.

Q. Did you ever notice the condition of the ice whether it was melted or not when it got to you?

A. At times it was, at times it was not.

Q. Did you take the temperature of the samples when they arrived?

A. I did not always, I did at times.

Q. Have you any record of those temperatures?

A. No, sir.

Q. The value of the bacteriological analyses is absolutely dependent upon the temperature, isn't it; if the temperature was very high it would be worthless, wouldn't it?

A. If it was excessively high it would be.

By the Court:

Q. What do you mean by excessively?

A. Why, it would not do to take bacteriological samples and leave them sitting out in the hot sun, for instance.

Further Cross.

Q. Well, if they remained very warm, in a hot train, for four or five hours, they would be worthless for your purpose?

A. If there was not some precaution taken for keeping them cool, yes.

Q. Did you observe whether these samples were taken the day before, or the same day they reached you?

A. The same day they reached me.

Q. Was that so in all cases or most cases, or some cases?

A. That was so in all cases. These samples I gave, as I have said before, the bottles to Mr. Constable, on certain dates, sterilized bottles the following day. He went out in the morning with those bottles and brought them back in the afternoon.

Q. Well, they reached you twenty-four hours after you had given out the bottles?

A. Well, much less than twenty-four hours.

Q. Well, you stated that he came in every day between two and three.

A. Oh, I beg your pardon. I understood your question to refer to the taking of the samples.

Q. You assume that he took them on the same day he gave them to you?

A. I know he did.

Q. You did not see him taking them?

A. I know only from the dates.

Q. From the labels?

A. Yes, sir.

Q. Did you observe what hours in the day he took them, how early in the day?

A. I cannot say off hand what hours.

Q. Nor can you say the temperature at which they reached you?

A. I can say this, in regard to the temperature—that at any such times as I did take the temperature of the sample when it came in, it had, I think in no case, ever raised over three degrees, and probably not over two.

Q. Raised over three degrees from what?

A. From the temperature entered on the label, as taken at the time the sample was taken.

Q. If the sample had been left lying at the station at Boonton for a while, without being artificially cooled, lying there an hour or two, it would not have been of much value for your purpose, even though the temperature was reduced afterwards?

A. Well, not if they had been allowed to raise their temperature an excessive amount, as I said before.

Q. The temperature should be maintained substantially as low as when the sample is taken or lower, and lower in summer, until the analysis is made, should it not?

A. Approximately so, yes.

Q. If the temperature does go up, do not these bacteria which your analysis discloses multiply very rapidly in a few hours?

A. That depends upon the sample of water.

Q. But it frequently is the case, is it not?

A. I say that depends upon the sample of water.

Q. Take ordinary river water, such as you were examining, in a few hours, with a high temperature, the bacteria would multiply to a very great extent, wouldn't it, in a hot day?

A. That would be true more at certain times than at others.

Q. But it is the fact at times?

A. Yes, sir.

Q. Suppose you should take a pail of water out of the river at Boonton, July or August, and set it out in the sun, and leave it there four or five hours, what would be the result as to the bacteria?

A. If you should take a pail of water from the river at Boonton and set it out in the sun it might increase.

Q. Might increase a thousand fold, might it not?

A. I should not want to say how much. It is an indefinite question to answer.

Q. They would increase many fold under such conditions, wouldn't they?

A. I should think they might.

Q. Now, the preservation of the temperature, and the preservation of the quality of the water as taken, are both essentials to the accuracy of your kind of analysis, are they not?

A. Certainly.

Q. When you get a sample of water for such analysis, if you should happen to put your fingers or your hand into the sample that would render it worthless for the purpose of bacteriological examination, wouldn't it?

A. It would, certainly.

Q. If the cork were not kept clean and a dirty cork were put into the sterilized bottle, that would render the sample valueless for your purpose?

A. As a matter of fact we don't use corks, we use glass stoppers.

Q. Well, if the stopper was dirty when it was put in, that would make it worthless, wouldn't it?

A. If it was dirty when it was put in it would be worthless.

Q. And if you touched the cork with your finger, so that the part you touched came in contact with the water, that would render the sample valueless for your purpose, wouldn't it?

A. It certainly would.

Q. The baccilus-coli could be carried by the finger to the cork and so communicate it to the water in that way, couldn't it?

A. It might be.

Q. Now you said, I think, that in these analyses of yours, you found the baccilus-colon or coli—which way do you speak of it in the singular or plural?

A. Coli.

Q. In the water, how did you find it?

A. That was found by what is known as the presumptive test.

Q. Presumptive test—describe it?

A. A presumptive test consists in taking certain quantities of water and placing them in fermentation, together with the media which is the broth, and the result of the test is the production of gas, certain percentage of carbon oxide and acid formation in the media.

Q. Is that all of your test?

A. That is the test I made, that is, I have not stated the quantities of water which were used; those are shown here on this sheet.

Q. Let me see your sheet, please?

A. (Same handed to counsel.)

Q. B. coli?

A. Yes.

Q. This baccilus is usually spoken of as B. coli?

A. Yes, sir.

Q. On this sheet, Exhibit C 33, I notice that under B. coli you have—wherever you have anything there, a cipher or a plus mark?

A. Yes, sir.

Q. What does the cipher indicate and what does the plus mark indicate?

A. A plus mark indicates the presence of the coli in those quantities of water which you see at the top of the column.

Q. Well, at the top there is "C. C."

A. Cubic centi-meter.

Q. And the cipher mark?

A. That indicates the negative result.

Q. In many cases it is never entered?

A. That indicates there are no tests B. coli made on that day.

Q. During July no test appears to have been made, nor in June,—to August 10th. You had no apparatus there for B. Coli.

A. We had not the apparatus at hand.

Q. There was none in Mr. Whipple's laboratory at that time?

A. Not at that time.

Q. And from August 10th, you had the apparatus?

A. We had that apparatus, and as you see there, the results.

Q. What the Chart indicates is that on certain days you found, and certain other days you did not find B. Coli, is that it?

A. That is what is indicated by that.

Q. When you found gas present in the fermentation tube, you put down that there were B. Coli present?

A. It depended upon the quantity of gas found.

Q. What quantity of gas did you find present to declare there was B. Coli present?

A. Between twenty-five and seventy per cent. of the closed arm of the tube.

Q. Does that mean that the organisms are necessarily B. Coli?

A. That alone does not mean it.

Q. What else did you have to test it by?

A. I tested for the percentage of carbon di oxide

Q. Does that necessarily indicate the presence of B. Coli?

A. Not in itself alone.

Q. Do the two together necessarily indicate it?

A. I think the two together are strong indications of B. Coli of the proper quantities and percentages.

Q. Are they positive indications or only presumptive indications?

A. Those are known as the presumptive test of B. Coli.

Q. Then you don't know for a certainty that any B. Coli was present in those tests, do you?

A. As far as the examination which I have made there on that sheet is concerned, I don't know further than the presumptive test.

Q. And you have stated all the tests you had for that purpose?

A. I stated all the tests that were made.

Q. You went no further?

A. No further.

Q. Could not organisms which are not B. Coli produce exactly the same reactions and effects in your tubes?

A. There are organisms which might produce gas, certain quantities, but I base my results, positive or negative, for B. Coli, upon the personal inspection of the detailed results obtained, that is to say, the total gas, as I have mentioned before, the percentage of that total gas which is carbon di oxide in the acid formation; those taken together I believe to be a good indication, as far as the presumptive test goes of B. Coli.

Q. Are there any other organisms which will produce precisely the same reactions which you obtained in B. Coli?

A. I don't think that we would get precisely the same reactions.

Q. Would you not get substantially the same from other organisms?

A. Well, I should hardly expect to.

Q. Can you on your oath state that you found any B. Coli in these samples?

A. I can only state what I have already stated in regard to that. That goes as far as the presumptive test goes, further than that I did not go.

Q. Then you don't know that B. Coli were present in that water?

A. I cannot state it any further than that table states it.

Q. Now you have at the foot of your sheet a tracing exhibit C 33, average number of bacteria for entire period, 37,892, that is the number of all kinds of bacteria you found in a given quantity of water, isn't it?

A. Those numbers refer to the counts on gelatine.

Q. To the counts upon the gelatine?

A. The total counts on the gelatine of all bacteria.

Q. In what quantity of water?

A. Well, that depends on the—I could not state from that table just the quantity of water; I will say, however——

Q. Is not that——

Mr. Vredenburgh: Let him answer.

Q. Go on.

A. I will say, however, that the quantity from my personal knowledge of the samples which I had already had from that source—I made my dilutions with water, such that I should get not over, say two hundred upon a plate—the count.

Q. Does not this average number have reference to some given quantity of water, a centi-meter or meter or something?

A. It was all measured in centi-meters, but—yes, that average number, I see your point, that average number is the number per cubic centi-meter.

Q. There are various kinds of bacteria in water are there not?

A. Certainly.

Q. Most of them harmless?

A. That depends upon the water.

Q. They are found—well, are not most of them harmless; I will repeat that question.

A. Well, I don't know that I should want to say that most of them are harmless.

Q. Would you say that a majority of those are harmful to health?

Mr. Vredenburgh: That is another question.

Mr. Corbin: Yes, that is the second question.

Mr. Vredenburgh: You say "those."

Q. (Last question read.)

A. Those what?

Q. Bacteria.

A. That I found in that——

Q. Yes.

A. I could not say from the count.

Q. All water exposed to the air has bacteria in it, has it not?

A. All water has bacteria in it.

Q. And the growth of bacteria in water that has been filtered and purified is particularly rapid when it once begins, is it not?

A. Well, I never have made any personal experiments upon water a long time after filtering; I have, in my present position, occasion to analyze filtered water daily.

Q. Is it protected filtered water or that which has been exposed to the air?

A. The water which I have occasion to analyze is water in an underground, covered receptacle.

Q. Protected from the sun?

A. It is protected from the sun.

Q. And somewhat from the air?

A. Somewhat, still it is thoroughly aerated.

Q. You find bacteria in it?

A. I find very few bacteria in it.

Q. How soon do you analyze it after it has been filtered?

A. Well, I analyze it anywhere perhaps from thirty minutes to thirty hours.

Q. Don't you know, that waters which are naturally very pure, when exposed to the sun and air develop bacteria more rapidly than the waters which ordinarily flow in streams?

A. I think that might be possible.

Q. Ground waters which are pumped out of artesian wells and are very pure when elevated to the surface develop bacteria very rapidly when exposed to the sun and air do they not?

A. It is also possible.

Q. It is true is it not?

A. I do not know that I want to put myself on record as saying that it is true.

Q. In this bacteria which you found in the Rockaway river water, did you find anything harmful except the B. Coli?

A. No, sir, that is the only thing I have there in the paper at all.

Q. That germ B. Coli is not harmful, in itself?

A. It is not, no, sir.

Q. It is found in every human intestine, is it not?

A. Yes, sir.

Q. Now referring again to your book, can you tell by looking at this book which of these numbers, samples, came from the Rockaway river, and which did not?

A. Not by looking at that book alone.

Q. In what way can you tell?

A. I can tell by referring to my index book.

Q. Will you show us that?

A. I have it here, yes, sir.

Q. Was this kept by you?

A. Yes, sir.

Q. This is the book you referred to a while ago as the one in which you entered samples when they came to you?

A. Yes, sir.

Q. Do the numbers in this book correspond with the numbers in the other?

A. Yes, sir.

Q. Here you seem to have set down the date of collection. That means the collection of the sample, I suppose?

A. Yes, sir.

Q. As you found it on the label?

A. Yes, sir, that book is entered from the label on the bottle.

Q. What does this word return mean—date returned?

A. Let me see it, please.

Q. (After looking) That is Rec'd, received.

Q. I thought it was Ret'd?

A. No, rec'd.

Q. Received by you?

A. By me.

Q. You didn't put down the hour when it was received, only the day of the month?

A. I believe the hour was not put down.

Q. And in many cases the hour of the collection of the sample does not seem to be recorded either, does it?

By Mr. Vredenburgh: I object, may it please your Honor, to any examination of this witness, as to any other waters where they enter the reservoir.

By Mr. Corbin: Do you want to confine my examination to the Rockaway river?

By Mr. Vredenburgh: Yes, where it enters the reservoir.

A. I could not say without going through the book, there may have been one or two.

Q. Did you analyze all the samples that were brought to you, or only part of them?

A. I analyzed all the bacteriological samples brought to me.

Q. Never rejected any for any cause?

By Mr. Vredenburgh: What do you mean by that?

By Mr. Corbin: Rockaway river samples.

By the Court: The witness can understand, that unless the question shows otherwise, that it refers merely to an examination of the water of the Rockaway river, as it enters the reservoir.

Q. I see you have entered here Rockaway river mouth, or mouth of Rockaway; that I suppose refers to the place Mr. Vredenburgh has been speaking of?

A. It refers to that point, yes, sir.

Q. Where the river empties into the reservoir?

A. Yes, sir.

Q. Then you may consider that I am asking you about that. Did you analyze every such sample, or reject any for any cause?

A. I don't think there were any rejected.

Q. This book shows numerous samples from other places they were received?

A. Yes, sir, that is my index book of all samples coming to the laboratory.

Q. Did you spend your time there every day?

A. Yes, sir.

Q. And you were the bacteriologist during the bacteriological work?

A. Yes, sir, I was directed to do that.

Q. When a sample came in how long was it before you analyzed that sample?

A. At once.

Q. Always the same day?

A. Yes, sir.

Q. Did you finish your examination of the sample the same day as it came in?

A. Well, the bacteriological examination extended over the full period.

Q. How long?

A. 48 hours.

Q. When would you begin it?

A. I began the examination of the sample at once as soon as it was indexed.

Q. You put it in the incubator?

A. Yes, sir.

Q. Now, you said in regard to C 33, the tracing that you made recorded only the presumptive tests, I see at the bottom of it this line "percentage positive test for B. Coli"—then follows some figures?

A. That word positive refers to positive presumptive tests; it does not refer to anything not on that sheet.

Q. I will read it to you: "Percentage of positive tests for B. Coli, .01 CC 53"; what does that mean?

A. That means that there was 53% of the sample analyzed; B. Coli—did you say .01?

Q. Look at it for yourself?

A. (After looking) That means that 53% of 100 cubic centi-meters of the sample tested by presumptive tests for B. Coli were positive.

Q. What is C C?

A. Cubic centi-meter.

Q. What is .01?

A. That means 1/100th of a cubic centi-meter.

Q. That is in 100 examinations made of 100th part of a cubic centi-meter, you say you observed by your presumptive tests a plus quantity in 53% of that?

A. That would be in 100 examinations, I do not know that there were 100 examinations made, but that was the percentage.

Q. What is the next line?

A. Percentage positive tests for B. Coli 1/10th CC which is 69.

Q. That is in a larger quantity?

A. Yes, sir, 10 times as much.

Q. And in the 3rd line?

A. That is percentage, positive tests for B. Coli in 1 CC, which is 94.

By the Court:

Q. I don't understand that, why the percentage of B. Coli would not be the same in every case, in a large quantity there would be more coli, but it seems to me the percentage in every case ought to be the same.

Q. I will endeavor to explain that to you, if you take a smaller quantity 1/100th CC of coli, you might get a certain number of such samples positive, but yet at the same time if you took 1/10th CC of the same water, you might get another positive.

I will correct that statement by saying that if you take a small quantity of water, say 1/100 of a centimeter and get a negative result you may take one-tenth of a centi-meter of the same water and get a positive result. The 1/100 being a smaller quantity than the 1/10 there is a chance that in taking a smaller quantity you might not get an organism while in the larger quantity you would.

Q. Then you mean that organisms are unequally distributed through the water, is that it?

A. No, I do not mean exactly that.

Q. Well, then I do not understand it at all.

Mr. Corbin: It necessarily comes to that as a matter of logic it comes to that.

Witness: I do not think so.

Further Cross Examination.

Q. You often do, in bacteriological analyses, find negative results in a very small quantity and positive results in a larger quantity?

A. Certainly.

Q. And still more positive results in a still greater quantity?

A. In a still greater quantity.

Q. One of the rules laid down is, is it not, that if in quantities of a certain amount negative results are obtained the water is good even though positive results are found in greater quantities, that is so is it not?

Mr. Vredenburgh: I object to that, he is asking his opinion and this witness is only called here to tell that he furnished a certain table from which his master is to draw the conclusions your Honor wants to find out. Now it is proposed to make this man a witness as to matters concerning which the former witness, who has been withdrawn, should testify to.

The Court: I think that the cross examination would be proper if for no other reason than to show how far this witness on the stand is a competent bacteriologist, I think that his knowledge of the subject is necessarily a matter of cross examination, because a man's knowledge on a subject like this will necessarily affect the character of his examination; the more he knows the more likely his examination is to be accurate and the less he knows the less likely it is to be accurate. I think on that ground it is cross examination, if not on any other, but I should imagine it was cross examination on other grounds. You may proceed.

A. There are certain limits, yes.

Q. The percentages you have put down here (referring to schedule in evidence) are greater according to the greater quantity of water you examined are they not?

A. Naturally so, yes, sir.

Q. Are they always so?

The Court: Well, it is not naturally so; it is unnaturally so, as I should judge. The percentages must be the same. Of course I don't mean to contradict the witness, but when he says it is naturally so it seems to me that to the uninstructed mind it would appear to be unnaturally so, that is, in view of what the witness says in regard to the unequal distribution of the organisms. I suppose it will be cleared up in the course of the examination.

Q. In your figures you say the test for B. Coli of one hundred to the cubic centi-meter shows 53% and then you said that meant positive results in 53% of the examinations you made; how many examinations did you make of that quantity of water.

A. I could not say how many, but they are shown there on the sheet.

Q. Of that quantity?

A. Yes, it shows the quantity.

Q. We can count them here?

A. Yes, you can count them from the sheet.

Q. Speaking roughly you made them in about one-half the days of August and pretty nearly all those of September, is that so?

A. I should say so, looking at the sheet.

Q. There are something like thirty or forty examinations anyhow.

A. I should say about forty.

Q. What kind of weather was it in the last part of August and the first of September, 1904, if you remember?

A. Well, I could not give you that from memory, and I have not the——

Q. Do you remember whether it was hot or cold?

A. As I remember it was pretty warm weather.

Re-Direct Examination.

Q. In answer to a question on cross examination you said that under certain conditions the bacteria in water would increase quite rapidly; do you mean that under these conditions the B. Coli would increase quite rapidly?

A. Well, I don't quite remember what you refer to now.

Q. I will not press that question then. I understood you to say both these books are in your handwriting, the index book and the other?

A. They are, sir.

Mr. Vredenburgh: The other witness, Mr. Constable is here and I should like to call him now.

Thomas W. Constable, sworn for the Complainants.

Direct Examination. By Mr. Vredenburg.

Q. Where do you live?
A. Brooklyn.
Q. Who are you employed by?
A. The E. Frank Coal Company.
Q. In what capacity?
A. Stenographer and office assistant.
Q. Were you employed by Mr. Whipple in July and August, 1904?
A. Yes, sir, I was.
Q. When were you employed by him?
A. In the beginning of July.
Q. Did you obtain samples of water for him from the Rockaway river?
A. Yes, sir.
Q. Near Boonton?
A. Yes, sir.
Q. State when you first did that.
A. I went up with Mr. Whipple on July 19th to Boonton.
Q. Where did you go?
A. To the river at Boonton.
Q. Whereabouts?
A. I went to the mouth of the river, the mouth of the Rockaway river, where it—just before it empties into the reservoir.
Q. The Boonton reservoir?
A. Yes, sir.
Q. What did you and Mr. Whipple do there?
A. We collected samples of water.
Q. How did you collect them, did Mr. Whipple collect them or did you?
A. He collected them that day.
Q. What did he do?
A. We both went down on the rocks and out as far as we could so as to get the running water and

there we took samples of water in such a manner as to get a fair sample of the water.

Q. How did you do it, explain how you did it; what do you mean by "fair," explain how you did it "fair."

A. The bottle was dipped in the water so that the mouth pointed in the direction the water was flowing so as to get as little of the top surface of the water as possible and it was dipped down quickly into the water.

Q. Which way was the mouth turned, upstream or downstream?

A. Downstream.

Q. How many bottles were there?

A. We collected one bottle for bacterial analysis and one bottle for chemical analysis.

Q. How did they differ to the sight, in looking at them how did they differ?

A. The bottle for chemical analysis was a large bottle holding about two quarts, the bottle for bacterial analysis was a sterilized two-ounce bottle with a tinfoil on the stopper to protect it.

Q. After that day what did you do as to collecting samples, tell us where you got the bottles, how many you got, what you did and what you did with the bottles after you got water in them?

A. I received the required bottles at the laboratory in the Polytechnic Institute from Mr. Dayton and put them in a case for that purpose and the following day went direct from home to Boonton and there went to the mouth of the Rockaway river and——

Q. How near to the same place that you and Mr.——

A. Yes, sir.

Q. How near that?

A. So that I could get the running water, and I went out on the rocks so as to be able to do that and there dipped the bottles into the river pointing downstream so as to get a fair sample of water, as I was instructed by Mr. Whipple.

Q. Then what did you do?

A. Then I took the temperature of the water and the date and the place and wrote it on a label and wrapped it around the bottle.

Q. How did you put it on the label?

A. With a pencil, and on the label I also put my initials.

Q. Then what did you do with that bottle—those two bottles?

A. I took them with me to the railroad station where I had left my case and there got ice and put it in a canister for that purpose, and put the bacterial sample in a tin can and put ice next to it so as to keep the bacterial sample cool; and the chemical sample was also put in the case.

Q. What time of day would that usually be?

A. Usually about ten o'clock.

Q. Then, how soon did you carry these to the laboratory in Brooklyn?

A. As I had to go to the Jersey City reservoir before going to the laboratory, I usually got to the laboratory about two or three o'clock in the afternoon.

Q. What did you do with the bottles there?

A. At the laboratory?

Q. Yes.

A. I gave them to Mr. Dayton.

Q. Did you always deliver them the same day that you took them from the river?

A. Except one day.

Q. What day was that?

A. I do not remember the date, but it was caused by an accident I had on the train; in rounding a curve the train was going very swiftly and the case fell over and one of the bottles broke, it was the chemical sample, and the next station was Paterson. There I got off and waited for a train which was not due for quite a while and going back to Boonton, I took a sample again, being about from two to three hours later than the usual time, and when I got the next train to Jersey City and took the Jersey City sample and then went over to the laboratory, but it being about—well, it being after seven o'clock, no one was in there, and I took the samples home. During all this time the samples were next to the ice, being kept at the correct temperature. The following morning instead of going direct to Boonton, I went to the laboratory and gave them to them and then went on to Boonton.

Q. How long did you continue to do that?

A. Through July and August.

Q. Until, when, what date in September?

A. I do not remember the exact date, but I can tell by a book.

Q. The index book?

A. No, sir. The expense book I had. I believe Mr. Whipple has it here.

Q. See if it is in the bag.

A. No, sir, it is not in there; but as I had a commutation ticket, I should judge that it was the 31st of August.

Cross examination by Mr. Corbin:

Q. How old are you?

A. Sixteen.

Q. You are now sixteen?

A. And seven months, yes, sir.

Q. And you were fourteen years old and something when you took these samples?

A. I was just fifteen.

Q. Had you done any work anywhere before?

A. No, sir.

Q. You had just come from school?

A. Yes, sir.

Q. Where were you at school?

A. At the Commercial High School in Brooklyn.

Q. The instructions which Mr. Whipple gave you on that day when you went together to Boonton on July 19th were the only instructions you had about this taking of samples?

A. I was always cautioned by Mr. Boughton, who I sometimes saw at Boonton.

Q. That was after July 19th?

A. Yes, sir.

Q. You never had taken samples before?

A. No, sir.

Q. When you went to a laboratory of an afternoon, how many of these sample bottles would be given to you at a time?

A. Just enough to fill the case.

Q. How many?

A. Five.

Q. Always five?

A. Yes, sir, but I did not use them all.

Q. How many samples would you take?

A. I have a table here which shows how many I should take and I can refer to that.

Q. Did you take the same number every day?

A. I always took the same number of bacterial.

Q. That is what I am asking you about, the bacterial?

A. Yes, sir.

Q. You would have five bacterial bottles with you?

A. Yes, sir.

Q. How many samples would you take?

A. Two.

Q. What did you do with the other three bottles?

A. I kept those in case of accident.

Q. They were kept in your case?

A. Yes, sir.

Q. And then when you gave up two to Mr. Baton, he would give you two more?

A. Yes, sir.

Q. So you always had five in your case?

A. Yes, sir.

Q. And of those five you would pick out two and use them?
A. Yes, sir.
Q. And put a label on them and number them?
A. Yes sir, not number them; I put my initials on them.
Q. What station did you get out at when you went out to get the samples?
A. Boonton.
Q. Of the Lackawanna Railroad?
A. Yes, sir.
Q. Which one of the stations there?
A. Lackawanna station.
Q. Well?
A. Passenger station.
Q. There are two, are there not?
A. No, sir.
Q. There were at that time, weren't there?
A. No, sir; they were building a new one, I believe.
Q. At that time you had to cross the river before you reached the old station, didn't you; the train crossed the river?
A. Yes, sir.
Q. And you leave your dress suit case there—it was a dress suit case, wasn't it?
A. Yes, sir.
Q. How many of the little bottles did you take out to carry down to the river to get the samples?
A. Two.
Q. You would not carry the whole five?
A. No, sir.
Q. No extra one, in case of breakage?
A. I only took one bacterial at the Rockaway River.
Q. One there, is that so?
A. Yes, sir.
Q. And the other one was taken somewhere else?
A. Yes, sir.

Q. You put that in your pocket and put the big two-quart bottle under your arm, and went down to get the sample——

Mr. Vredenburgh: He didn't say anything about his pocket.

Q. Well, did you put it in your pocket?

A. I believe I did.

Q. Where would you go first to get the sample you spoke of getting some other samples?

A. At the mouth of the Rockaway River.

Q. That is the first one you took?

A. Yes, sir.

Q. How many bottles would you take along with you?

A. I would take three, including the chemical bottle?

Q. You would take two little ones and one big one?

A. Yes, sir.

Q. And you went to the mouth of the Rockaway River and took that sample on the rocks first?

Mr. Vredenburgh: He didn't take three bottles down there.

Q. Where would you go to next?

The Court: He took two small bottles, as I understand it.

Q. First you went to the mouth of the Rockaway and took a little bottle and filled it, and put it in your pocket?

A. Yes, sir.

Q. Did you fill two at the mouth of the river?

A. One bacterial.

By the Court:

Q. You took two and filled one?

A. Yes, sir.

Further cross:

Q. Did you fill the big bottle there too?

A. Yes, sir.

Q. And then where did you go?

A. Back to the railroad station.
Q. What?
A. I went back to the railroad station.
Q. Before you filled up the third bottle—or where did you get the third bottle filled?
A. At Jersey City.
Q. Not at Boonton at all?
A. No, sir.
Q. Did you ever take any samples there at any place except at the mouth of the Rockaway River?
A. Yes, sir.
Q. Where else?
A. At the bridge near the silk mill, just above the silk mill and below the silk mill, and also a sample of water that is used to turn the wheel of a mill.
Q. Those you took on these same trips?
A. No, sir, not regularly; those were extra samples.
Q. But when you did take them they were on the same trips?
A. Yes, sir, when I was at Boonton.
Q. When you got out at the station and took out your bottles to go down to the mouth of the Rockaway, what way did you go—which way did you walk down?
A. I don't remember the names of the streets.
Q. You walked back across the river and down towards the dam?
A. Yes, sir.
Q. Then when you got down near the dam you turned into the field so as to get to the place where the river empties into the reservoir?
A. I took the road that goes to a place I believe it is called Parsippany.
Q. Oh, you took the Parsippany road?
A. Yes, sir.
Q. Then you did cross the river itself?
A. Yes, sir, over that bridge near the silk mill.

Q. Then where did you do gown the bank to get to the river?

A. Just above the bridge, I believe, which is called Long Bridge or High Bridge.

Q. That is where the men fish, from the bridge?

A. Not on the bridge, but near there.

Q. You went above that?

A. Yes sir, because under the bridge the water was not flowing.

Q. The dam sets it back there?

A. Yes, sir.

Q. And you went up the side of the river until you got to where it was flowing?

A. Yes, sir.

Q. Which side of the river did you take your sample from, the side towards Parsippany or the side towards New York?

A. The side towards New York.

Q. How long would it take you to go down and get your sample and get back to the railroad station again?

A. Three-quarters of an hour.

Q. How long would you have to wait for the train after you got back to the station?

A. The train left at 11.34.

Q. What time did your train arrive at Boonton?

A. 9.08.

Q. So that you had about 2½ hours in Boonton?

A. Yes, sir.

Q. Now these sample bottles had glass stoppers in them, didn't they?

A. Yes, sir.

Q. When did you take the stoppers out to get the water?

A. Not until I was at the Rockaway, by the running water.

Q. Then you took out the stopper?

A. I took off the tinfoil, then took out the stopper, not until I was ready to take the water.

Q. What did you do with the stopper when you took it out of the bottle?

A. I held it by the top, it was what they call a mushroon stopper; and by the other hand I held the bottle.

Q. The other hand you held the bottle; how did you grasp it?

A. By the body of the bottle.

Q. You held it under the water how deep?

A. About my wrist.

Q. With the mouth pointing down stream?

A. Yes, sir.

Q. And the stream flowing?

A. Yes, sir.

Q. So that the water flowing flowed over your hand in getting towards the mouth of the bottle?

A. Yes, sir.

Q. Then you brought it up and corked it, I suppose?

A. Yes, sir.

Q. How did you cork it, what did you do?

A. I put the stopper back, then put the tinfoil around it, then put on the label.

Q. And put it in your pocket?

A. I put some coarse paper—wrapped some coarse paper around it because the bottle was wet; I didn't want to wet my pocket, and then I put it in my pocket.

Q. How long did you hold the bottle under water when filling it?

A. Until the bottle ceased to rise.

Q. Just long enough to fill it full?

A. Yes, sir.

Q. Then brought it up as you have stated?

A. Yes, sir.

Q. Now, you had two and a half hours' time; did you stay by the water side?

A. Once in a while.

Q. Did you fish in it?

A. About three or four times.

Q. Did you catch anything?
A. No, sir; I didn't, but I saw others.
Q. Did you sit in the shade or out in the sun when you were fishing?
A. When I was under the bridge it was shady, but the other places I don't believe it was.
Q. It was hot?
A. Yes, sir.
Q. Now, when you took your sample back up to the railroad station where you had this dress suit case—where did you leave that dress suit case?
A. With the expressman.
Q. Then you put the bottles in that in a tin box.
A. Yes, sir; a tin box.
Q. Where would you get your ice from?
A. Sometimes I got it from an express agent, sometimes from the Mansion House, I think it is.
Q. That is the hotel?
A. Yes, sir.
Q. How much ice did you get?
A. About a quart.
Q. What did you put it in?
A. In a tin can.
Q. Did you sometimes fail to get any ice?
A. No, sir.
Q. Always got ice?
A. Yes, sir.
Q. How was the ice, in a lump or cut up?
A. Broken so that I could put it in a can.
Q. In small, fine pieces?
A. No, sir, about three inches square.
Q. Did the can have a big mouth?
A. It was a quart milk can, or about a quart and a half milk can.
Q. Where did you put the ice, in the dress suit case?
A. Next to the tin box that had the bacteriological samples in.

Q. That is, the rest of the five sample bottles were all in the same suit case?

A. In the same tin canister.

Q. One or two bottles full, and the rest would be empty?

A. Yes, sir.

Q. And the big bottle of water, where was that?

A. That was put in the most convenient part of the case that it would go in.

Q. This tin canister that contained the sample bottles and the can containing the ice, did one go inside of the other or were they side by side?

A. Side by side.

Q. What kind of cans were they?

A. One holding the ice was a milk can.

Q. Round or square?

A. Round—and the one holding the samples was round, like cans they use for holding tea or coffee or sugar.

Q. After you put that in the dress suit case what did you do with the dress suit case?

A. It was left in the express room.

Q. Left in the express office?

A. Yes, sir.

Q. Then you went to New York and carried the dress suit case to Brooklyn?

A. Yes, sir.

Q. Now, on those occasions when you went to get some samples from the silk mill and other places, which would you get first, the one down by the mouth of the Rockaway or the others?

A. I don't remember.

Q. But you got them all on the same trip?

A. Yes, sir.

Q. How many times did you get them from places other than the mouth of the Rockaway?

A. On the average about once a week.

Q. Two or three samples sometimes?

A. One from each place.

Q. And two or three places?

A. Yes, sir.

Q. What were you doing in Boonton during the two and a half hours you were there?

A. Sometimes I walked around the village, but usually I stayed at the station.

Q. That is all.

Re-direct.

Q. Did you go there the following year, 1905, in the summer with another boy?

A. Not in the summer, no, sir; I went in the spring once.

Q. Who did you go with?

A. A young man named Kearney.

Q. Is that the young man (indicating a youth in the back of the room)?

A. Yes, sir, that was some time in the spring, 1905, in May, I think.

Q. May, 1905?

A. Yes, sir.

Q. What did you do with him?

A. I instructed him to collect samples of water at Bootnon and Jersey City.

Q. Well, you did at Boonton?

A. Yes, sir.

Q. You instructed him to get samples of water at Boonton?

A. Yes, sir.

Q. Did you go with him to a place where you had gotten samples?

A. Yes, sir.

Q. Did you show him how to do it?

A. Yes, sir.

Q. Just as you had done it?

A. Yes, sir.

Q. And just as you have told us here you showed him how to do it?

A. Yes, sir.

Q. What have you to say as to showing this boy Kearney how you took the samples in the bottles whether the mouth of the bottle should be held up stream or down stream; you said when you took your samples you held the mouth of the bottle down stream?

A. Yes, sir.

Q. And you said you instructed this boy Kearney to do the same?

A. Yes, sir.

Q. He says he held the mouth of the bottle up stream?

A. Yes sir; I instructed him to take them down stream so that he would not get more of the surface waters than was practically possible.

Q. Which samples did you instruct him to take that way, all of them or only one?

A. All of them.

Q. How did you take the temperature?

A. I had a thermometer with me.

Q. Did you take the temperature of the stream or take the temperature of the water in the bottle?

A. I took the temperature of the place in the water where I took the sample.

Q. You took the temperature of the river water?

A. Yes, sir.

Q. You put your thermometer in the river?

A. Yes, sir.

Q. And whatever the thermometer indicated the temperature was you wrote down on this tag?

A. Yes, sir.

Q. Did you take the temperature of the river before you got the samples or afterwards?

A. Afterwards.

Edward Kearney sworn for Complainant.

Direct examination by Mr. Vredenburgh:

Q. Where do you live?

A. 738 W— avenue, Brooklyn.

Q. How long have you lived there?
A. Thirteen years.
Q. How old are you?
A. Fifteen.
Q. When were you fifteen?
A. I will be fifteen March, next month.
Q. Do you know Mr. Whipple?
A. Yes, sir.
Q. Were you ever in his employ?
A. Yes, sir.
Q. When?
A. From May 13 to June 17, 1905.
Q. What did you do in his employ?
A. Went to Boonton and collected samples, and at Jersey City, too.
Q. Did you go up to Boonton to collect samples there?
A. Yes, sir.
Q. Just describe to us what you do; who gave you the bottles first?
A. I went to the Brooklyn Polytechnic Institute and got the bacteriological and chemical bottles there from Mr. Mayer, and took them home; the following day I went to Boonton, right from my home, and got the samples up there; then I went to Jersey City, and from Jersey City I went back to the Polytechnic Institute and returned the bottles.
Q. Was there any occasion when you did not return the bottles to the institution on the same day when you got them from the river?
A. No, sir, they were always returned the same day.
Q. Where did you get your bacteriological samples?
A. At the bottom of the road above the high bridge.
Q. At Boonton?
A. Yes, sir.
Q. How did you get there?

A. The D., L. & W. R. R.
Q. By train, of course?
A. Yes, sir.
Q. When did you get there?
A. About 9.04 is the 8.15 train from Hoboken.
Q. And then you would go and get your samples?
A. Yes, sir.
Q. How many samples of bacteriological water did you get there?
O. One bacteriological.
Q. How did you take it from the river?
A. I took it from the running stream.
Q. How did you hold the bottle, with the mouth up stream or down stream?
A. With the mouth up stream so I could get running water.
Q. You say the mouth of the bottle was up stream or down stream?
A. Up stream.
Q. What did you do after you got the water?
A. I put the cork in the bottle, wrapped tinfoil around it, then wrote out the time, temperature and date, and put a tag on it, wrapped it in a piece of paper and put it in a canister.
Q. What have you to say with respect to the method in which you understood that you were to take the samples from the river?
A. Well, the stream was running, and I was told to take the way the water was running, and the water was running towards me, so I had to head the bottle before me.
Q. Which bottles did you take the samples in, in that way?
A. I took the both of them.
Q. May I ask you over again which way was the mouth of the bottle pointed, was it pointed up stream from which the water was running, or down stream, when you took the samples?
A. It was pointed up stream.

The Court: Now, as I understand, did you take the samples in September, 1904?

Witness: No, sir.

The Court: Then there is a gap.

Mr. Corbin: This is 1905.

The Court: Yes, he says May, 1905, and the other boy speaks of August 31, 1904, so that there must have been some one else who took it between that date and the time they stopped.

Mr. Vredenburgh: There wasn't any taken, except in September.

The Court: Who took it in September?

Mr. Vredenburgh: Those taken in September I have not offered yet, may it please your Honor, and unless I find the boy that took it in September—I haven't the boy that took it in September here today.

The Court: Well, it is on that statement in September.

Mr. Vredenburgh: Yes, and I only offer that part of the statement which deals with August, unless I connect the other; I am trying to connect it.

Q. You took these samples in the way you have mentioned, from the water, and then where did you take the bottles to?

A. I took them back to my case at the depot.

Q. That day did you deliver them at the Polytechnic Institute in Brooklyn?

A. Yes, sir.

Q. To whom did you deliver them?

A. Mr. Mayer, the chemist.

Q. Is that the gentleman to whom you delivered it? (At this point Mr. Mayer stood up.)

A. Yes, sir.

Q. Did you in all cases deliver it to him?

A. Yes, sir.

Q. Have you told us how long you continued to do it?

A. From May 13th until June 17th, a little over a month.

Q. That is all.

Cross examination. By Mr. Corbin:

Q. You never had done any work of this kind before, had you?

A. No, sir.

Q. And your instructions were received from Mr. Constable?

A. Yes, sir.

Q. He went with you the first time?

A. Yes, sir.

Q. Mr. Whipple gave you no instructions?

O. Only at the laboratory Mr. Mayer gave me a few—how to take the water.

Q. How many small bottles would you have with you?

A. Five small bottles and two big bottles.

Q. You wouldn't fill the five in one day, would you?

A. No, sir.

Q. How many?

A. Two small ones and two big ones.

Q. This one small one from the Rockaway River, the other one in Jersey City?

A. Yes, sir.

Q. Where did you fill the big ones?

A. One big one at the Rockaway River, and one in Jersey City.

Q. They were always in your dress suit case, the five small bottles?

A. Yes, sir.

Q. And when you delivered one to Mr. Mayer in Brooklyn, he would hand you another empty one?

A. Yes, sir.

Q. And you would take your dress suit case home?

A. Yes, sir.

Q. You say your train got to Boonton at 9.06; when did the train depart which took you back?

A. 11.34.

Q. Where did you spend the two hours and a half between?

A. Sometimes at the station and sometimes up on Main street.

Q. Did you fish, too.

A. No, sir.

Q. Did you take samples at any other places on any of these trips to Boonton?

A. At Boonton.

Q. When you went down to the river to take the samples, your little bottles were corked with glass stoppers?

A. Yes, sir.

Q. And first you took out the glass stopper, did you?

A. Yes, sir.

Q. Then what did you do?

A. I took the bottle by the body and held the glass stopper in one hand and the bottle in the other hand.

Q. And the mouth pointing up stream?

A. Yes, sir.

Q. How deep did you put it into the water?

A. Up to my wrist.

Q. How long would you hold it there?

A. Just long enough to fill it.

Q. And the stopper was in your other hand, of course?

A. Yes, sir.

Q. When it was filled you took it out and corked it?

A. Yes, sir.

Q. Then what did you do with it?

A. Took the tin foil and put it around it and wrote out the time, temperature and date.

Q. How did you take the temperature?

A. I had a thermometer with me and put it right in the place where I took it out of.

Q. You put that in your pocket?

A. Yes, sir.

Q. When you took the tin foil off the stopper, what did you do with the tinfoil before you put it back again?

A. Put it in my pocket so that I would not forget it, and put it right on again.

Q. After you got the stopper in you took the tinfoil out of your pocket and put it on again?

A. Yes, sir.

Q. Then you put the little bottle in your pocket?

A. Yes, sir.

Q. Would you sit by the river side sometimes?

A. No, sir; go right back.

Q. Where was your suit case?

A. Right at the station.

Q. Outside or inside?

A. Inside in the express room.

Q. Did you get ice every time?

A. Yes, sir.

Q. Where did you get it?

A. Some times at the Mansion House mostly, and then at the station.

Q. The Mansion House is a hotel up the street?

A. Yes, sir.

Q. Some distance from there?

A. Yes, sir.

Q. How far?

A. About a quarter of a mile.

Q. Would you take your can up there and fill it with ice?

A. Yes, sir.

Q. Did you take the water up there with you?

A. No, sir, I left it there, only took up the can.

Q. How long would you be gone?

A. About fifteen minutes.

Q. Where was the little bottle of water in the meantime?

A. In the suit case locked up.

Q. Then when you got back with the ice and packed up to go home what would you have in the suit case?

A. I would have the ice, the bottle, the bacteria bottle, five bacteria bottles, one filled and two big two-quart bottles.

Q. And these five bacteria bottles, one of which was filled, were all in a tin can?

A. Tin canister, yes, sir.

Q. As you got those little bottles they had no label or anything on them, had they?

A. No, sir; I had the labels.

Q. And would you put those on yourself?

A. Yes, sir.

Q. Labels put on with mucilage?

A. No, sir.

Q. How did you fasten them to the bottle?

A. Tied them on.

Q. Tied with what?

A. A piece of cord—an elastic right around the bottles.

Q. Was this an ordinary dress suit case, such as is used for clothing?

A. Yes, sir.

Q. And these two cans and these two big bottles were all in there loose, then?

A. Yes, sir.

Q. There were two cans and two bottles—did the four fill the case up, or was there more room in there?

A. They just about filled it up.

Q. Two tin cans set side by side and then the two big bottles?

A. Yes, sir, they had paper around them so that they would not crack—the bottles.

Q. You put paper around the big bottles?

A. Yes, sir.

Q. That is all.

Mr. Vredenburgh: I would like to ask Mr. Constable a question, may it please your Honor.

Thomas Constable recalled.

Further direct examination. Mr. Vredenburgh.

Q. Mr. Constable, in your cross-examination you said something about—I understood you—about fishing. Did you fish before you had taken the bottles up to the depot and placed them in the dress suit case, or after?

A. I collected the samples first and then wrapped them around in this paper, and with the thermometer put them next to the rocks at the bank, in a crevice where the water would not get at them, and where it was damp and cold, and it was cold because I had the thermometer with me, and I could tell that it was not over seventy degrees.

Further cross.

Q. While you were fishing, then, your samples or little bottles were on the ground, on the bank next to the cold rocks, is that it?

A. Yes, sir.

Q. About how many times did you fish?

A. Three or four times.

Q. That is all.

Andrew Mayer, Jr., sworn.

Direct examination. By Mr. Vredenburgh.

Q. Mr. Mayer, you are living where?

A. 191 St. Mark's avenue, Brooklyn, New York.

Q. You have been a resident of Brooklyn how long?

A. Since 1889.

Q. What is your profession?

A. Chemist and basteriologist.

Q. Who are you working for at the present time?

A. I am at present chemist with the National Lead Company of New York.

Q. Did you work for Mr. Whipple?

A. I did.

Q. When were you employed by him?

A. From the first part of June, 1904, until November, 1905.

Q. What was your employment there?

A. During the first part of my occupation with Mr. Whipple I was chemist alone, and during the latter part of my time with him I was chemist and bacteriologist also.

Q. Now, during 1904 did you perform any of the analyses upon this water that you have heard spoken of, taken from the river at Rockaway, where it empties into the Boonton reservoir?

A. Yes, sir.

Q. What part of it did you do?

A. I did the chemical and physical examinations.

Q. And during the year 1904?

A. Yes, sir.

Q. And during the year 1905, what did you do?

A. During the year 1905 I performed not only the physical and chemical examinations, but also the bacteriological examinations.

Q. Now, will you please state from whom you obtained the water to make your chemical analysis?

A. I obtained water to make my chemical analysis from Mr. Baton.

Q. And the water you say you obtained from whom?

A. From Mr. Baton.

Q. The witness before you, here?

A. Yes, sir. I should like to explain that it was in 1904 that I obtained the samples from Mr. Baton.

Q. And in 1905 who did you obtain them from?

A. I obtained them from the boy who brought the samples.

Q. This young Kearney, who was just a witness?

A. Yes, sir.

Q. What did you do as to giving him bottles—the bottles that he took to get the samples in?

A. During the first part of the time when he was collecting the samples, I gave the bottles to him, that is what I was going to say, that we had a specially constructed closet free from dust, where we kept these, and I saw that he took them out of them, but in reality during the first part I gave them to him myself, until he learned where that closet was.

Q. These bottles were sterilized by who, during 1905?

A. By myself.

Q. And when they were given to him they were fully sterilized?

A. Fully.

Q. And would he return them the same day or the same day that he took the samples?

A. Yes, sir.

Q. So far as you know.

A. Yes, sir, so far as I knew.

By the Court:

Q. Well, would he return the five bottles he says he had five bottles, or would he return only the one that was filled?

A. He would return only the one that was filled, your Honor—rather there were two that were filled, bacterial bottles.

Further direct.

Q. How long would the sterilized bottles remain sterilized, if not used?

A. That is, before he took them—before he used them?

Q. No, after he took them; he took five bottles?

A. Yes, sir.

Q. And he only used one?

A. Yes, sir.

Q. Or two?

A. Yes, sir.

Q. Now the other three would remain sterilized —perhaps he would not use those again. Now how long would those bottles remain sterilized if he did not use them?

A. The understanding was, if I remember correctly, that those bottles were to be held in reserve until one of the regular bottles was broken.

Q. Well, suppose they were held in reserve, how long could they be held in reserve before they became unsterilized, if I may use that word?

A. I should say that they could remain unsterilized almost indefinitely, certainly for a considerable time.

Q. Do you mean unsterilized or sterilized?

A. I beg pardon, I mean sterilized.

Q. When you once sterilized them and put them in this suit case, they would remain sterilized for an indefinite length of time, would they?

A. Practically. I should like to explain: They were carefully wrapped in newspaper after sterilization, carefully wrapped in newspaper and put back in the canister and left for reserve.

Q. Do you remember any time during 1905 that the boy used any other bottle than the one that he used each day?

A. No, sir, I do not remember any such.

Q. He did not have to use any of the three that were put there to be used in case of accident?

Objected to as leading.

The Court: Put the question in this way: How were the bottles distinguished, the three that were in use and the other two, how were they distinguished in the canister?

A. As they were being held in reserve, I always endeavored to have them wrapped up more securely than the others, that is to say, we were more careful in the wrapping, to bring the newspaper at the sides and bend it up so that you could readily distinguish, so far as I remember, between those which were held in reserve and those which were to be used.

Q. What was to prevent him from taking one of the three out rather than the one that you expected him to take out. They were altogether in one compartment, and all wrapped in this newspaper?

A. Yes, sir, but wrapped in different ways; the bottles which were to be held in reserve, the newspaper extended beyond the ends of the bottles, and was then folded up, as I remember. The bottles which were to be used were not so folded up, simply wrapped around with newspaper to protect them from breakage; that is my recollection of it.

Further direct.

Q. Now, when he brought the bottles back to you, would there be any number upon it?

A. No, sir, no number.

Q. Would there be a label upon it?

A. Yes, sir.

Q. And on the label would be written what, as you recollect it?

A. On the label would be written its appropriate title, that is, the place from which the sample was taken, together with the date of taking, and approximately the hour at which the sample was taken.

Q. When you received it what would you write on the box or on the label?

A. I would simply give the label an appropriate serial number corresponding to the number in our index book.

Q. (Showing witness book.) Are the entries there in your hand writing during the time that you acted as bacteriologist?

A. Yes, sir.

Q. And they are transferred to this other record. I show you the second book, is that also in your hand writing—and I only refer now to the reference to the samples of water taken from the Rockaway River at the place where it enters the Boonton reservoir?

A. Yes, sir, that is in my hand writing.

Q. Those are in your hand writing?

A. Yes, sir.

Q. Under whose direction did you make these examinations?

A. Under Mr. Whipple's directions.

Q. What did you do as bacteriologist with these samples?

A. As bacteriologist, I determined the number of bacteria per cubic centimeter, made a presumptive test for bacillis coli and also made the test more certain by sub-culture work.

Q. I show you a table marked "Table No. I" and ask you whether you recognize that table as being the result of the work done by you as bacteriologist on these samples?

A. Yes, this table is the result of my bacteriological work on these samples.

Q. I notice that the table reads "Result of physical and bacteriological examination of samples of the water from the mouth of the Rockaway River at Boonton, from May 13 to June 17, 1905." Won't you change that so as to read correctly; in place of "mouth" say "where it enters the Boonton reservoir," if that is the fact?

A. Yes, that is the fact; these samples were taken as I understand it from the place of entrance of the Rockaway River into the Boonton reservoir.

Q. Make that table read correctly in that respect.

A. Very well. (Witness proceeds to follow counsel's instructions.)

Q. This table is taken from where?
A. This table is taken from my record books.
Q. Have you your record books here?
A. Yes, sir. (Witness produces a book.)
Q. Is this table taken from that book?
A. Well, part of it is?
Q. What part of it?
A. That part relating to the bacteriological test.
Q. That table shows also the chemical test, does it not?
A. It shows the physical and some of the chemical tests, yes, sir.
Q. The bacteriological tests are taken from that book?
A. Yes, sir.
Q. Is the microscopical test upon it, too?
A. The microscopical test is not here.
Q. The bacteriological test is taken from that book?
A. Yes, sir.
Q. The part of it that is at the foot of the table that reads as follows: "Summary. Average turbitity: average color," who made that?
A. That was made up in Mr. Whipple's office.
Q. Did you make it up?
A. No, sir, I checked it, I didn't make it.
Q. You checked it?
A. Yes, sir.
Q. Is it accurate?
A. It is.

Mr. Vredenburgh: I offer that statement in evidence.

Mr. Corbin: It is like the other, you prove only part of it; the physical part you do not prove, it is only the bacteriological part of it that has been proven.

Mr. Vredenburgh: Yes, I did.

Mr. Corbin: I did not understand that. He said a portion of it he put in his book.

The Court: What he did not do himself he said was checked by him; what he means by "check" I do not quite understand.

Q. What do you mean by "check?"

A. I mean this, that the table was made out in Mr. Whipple's office and then I went over there and carefully compared for each date, the result obtained in the book with the result as recorded in the table and saw that they were identical, so that I know the table is accurate.

Q. The check was with regard to what was written at the bottom, averages?

The Court: I do not understand what part was checked and what was his own work. He said that some part of it was checked but he does not say what he checked.

Q. I nderstand you did the whole work shown on this table yourself?

A. Yes, sir.

Q. But as this is a copy from your records and you did not make the copy, but you checked the copy with the record after the copy was made, is that it?

A. Exactly.

Q. So that the whole showing on this sheet is made by you?

A. And checked by me.

Q. Well, the work shown upon it?

A. Yes, was done by me.

Q. And that work was entered in a book and that book you produce here, is that right?

A. Yes, sir; there were several books; I kept a book for bacteriological work and a book for chemical work.

Mr. Corbin: Did he make the physical and chemical tests?

Witness: I did.

By Mr. Corbin:

Q. You made everything on there?

A. Yes, sir.

Q. All examinations shown there?

A. Every one.

Mr. Vredenburgh: I offer that table in evidence.

Marked Exhibit C No. 35.

Further Direct Examination.

Q. Your chemical analyses in 1904 and also your chemical analyses in 1905 are where?

A. Those analyses are in the books which I kept especially for that purpose.

Q. Are they here?

A. They are not here, no, sir.

Q. Is there any part of the chemical analysis on this table which has just been offered and marked Exhibit C No. 35?

A. Yes, sir; for 1905.

Q. For 1905?

A. Yes, sir.

Q. I hand you several books and ask you whether among those books you find the book containing the chemical?

A. Yes, sir.

Q. So that you have the original record there of all of this table Exhibit C 35?

A. Yes, sir.

Mr. Corbin: The witness is producing a large number of books none of which are being offered, and I think they should be identified. There is no way of my testing this without having an opportunity of seeing them.

They should at least be marked for identification.

The Court: If they are marked they should be marked in the cause and not for identification. They are a part of the case.

As I understand, these tables are to a certain extent copies of the books, the books being the source from which the tables are taken. These are either compilations from the books or copies or matters contained in the books and in either event they are necessarily a part of the table.

By Mr. Vredenburgh: Then, your Honor, I shall mark them. I will offer in evidence only those portions which concern the water taken from the Rockaway River at its entrance into the Boonton reservoir.

By the Court: Of course you are entitled to have all other parts of the book sealed up, if you want it.

By Mr. Vredenburgh: Well, I take it when I mentioned it in this way, that the other side won't force me to go into anything else.

By Mr. Corbin: You don't want to go in the question now of the analyses made at the dam in Jersey City during this same period?

By Mr. Vredenburgh: I am only dealing with one thing now, and I don't want to get it mixed up with something else.

By Mr. Corbin: Well, as I understand it, these books contain the Jersey City sample as well as those from the Boonton River.

Index book marked C 36.

Q. What is the next book you have there?
A. The chemical book.
By Mr. Corbin:
Q. Chemical what, analysis?
A. Yes, sir.
Chemical book marked C 37.
Q. What is the next book you have there?
A. Bacteria book.

Bacteria book marked C 38.

Q. Where is the physical book?
A. Physical examination is set down in the index book.

Q. For what period?

A. For both periods, work done in 1904 and 1905. The physical tests are set down in the index book for both years.

By Mr. Vredenburgh: Is it the understanding of the Court that these last books I have offered are marked for identification, or as exhibits in the case?

By the Court: Exhibits in the case.

Q. Mr. Mayer, please state whether your bacteriological analysis carried the examination for B. coli to other tests besides presumptive tests spoken of by Mr. Baton?

A. They did.

Q. What did you do?

A. A sample after proper dilution with distilled water, was placed in a fermentation tube containing lactos broth and neutral red, after 48 hours' incubation at 37½ degrees centigrade, a little of this broth was removed with a stero platinum needle, and the further tests carried on under that.

By Mr. Corbin: A platinum needle?

A. Stero platinum loop.

By the Court:

Q. Do I understand these different ways reached the desired end are done separately, and that the result is the combined result of the two methods of investigation?

By Mr. Vredenburgh:

Q. You heard the question, what is your answer?

A. May I see that paper, please?

(The same handed to witness.)

A. This table here contains only the result of the presumptive tests, and does not contain the result of the further tests which I carried out.

Q. You are referring to C 35?

A. Yes, sir; it does not contain the further tests.

Q. Now, when you made these additional tests, did you find that the result of those additional tests varied in any way the result of the presumptive tests that are on the table?

By Mr. Corbin: I object to that question.

By the Court: Ask him how the tests made by the second method he has described compared with the tests first made.

Q. How did the tests made in this additional way that you have described compare with the tests made by the presumptive method?

A. In many instances they confirmed themselves upon the presumptive tests.

Q. And in the other instances how?

A. In the other intsances they did not confirm.

Q. How many such instances were there?

A. I cannot recall, I shall have to look at my records.

Q. Well, please take your records and tell us how many confirmed and how many did not.

A. May I have the bacteriological book?

(The same was handed to witness.)

RECESS.

AFTER RECESS.

Andrew Mayer, Jr., resumes the stand.

Further Direct Examination. By Mr. Vredenburgh.

Mr. Vredenburgh: If the Court please, I find in looking through my book that I have this book of the Census of 1905.

Marked Exhibit C 39.

Q. Mr. Mayer, the averages and printed matter on the bottom of that table—did you examine to see whether they were correct or not?

A. According to my best recollection I did so.

Q. Were they?

A. Yes, sir.

Mr. Vredenburgh: I offer that table in evidence.

Mr. Corbin: That is the type-written table; I think it is already marked, Mr. Vredenburgh.

Mr. Vredenburgh: Perhaps it is.

Q. As I understand it, Mr. Mayer, the marks that you put on this tablet indicate the number of samples in which you certainly found B. coli?

Objected to as leading.

Q. Well, change the question and say: What do the marked—samples marked items, which you have just marked on this table indicate?

A. Those marks indicate that the average tests which I made confirm the result of the presumptive test.

Q. How did you mark them?

A. Two lines parallel and two lines parallel at right angle, criss cross.

Q. With pencil or ink?

A. I marked them in pencil.

Cross Examination. Mr. Corbin:

Q. What is your age?

A. Twenty-six.

Q. Where were you educated?

A. Worcester Polytechnic Institute, Worcester, Massachusetts.

Q. Did you graduate from there?

A. Yes, sir.

Q. When?

A. 1901.

Q. Where did you learn to make bacteriological examinations?

A. I had nine months' practical instructions under Mr. Whipple before making any, and bacteriologic was a part of my college course.

Q. How long had you been with Mr. Whipple before you made these bacteriological tests in May and June, 1905?

A. I had been with Mr. Whipple a year.

Q. But your previous work had been in physical and chemical examinations, so far as Jersey City water was concerned?

A. No, sir. I had, under his instructions, for nine months previous to the 1905 work, I had done bacteriological work.

Q. But not on Jersey City water?

A. On Jersey City water, yes, sir.

Q. During what period?

A. During the summer of 1904, during the summer and fall.

Q. Well, that 1904 work only lasted from July 19 to August 31st, didn't it?

A. Yes, sir.

Q. That is all the samples they had, and you say you helped in that work?

A. No, sir, I assumed work on my own hook, so to speak, under Mr. Whipple's direction, so as to become acquainted with the methods.

Q. And in May, 1905, you took this work into your own hands?

A. Yes, sir.

Q. And you did then the work which the previous year had been done by Mr. Baton?

A. Yes, sir.

Q. On this Exhibit C 35, I see you have made eleven criss cross marks, such as you mentioned.

A. Yes, sir.

Q. And in those you say you found confirmatory evidence in your secondary examination of the presence of B. coli, which had been indicated by the presumptive examination, is that it?

A. Yes, sir.

Q. Now, in giving out these little bottles for obtaining samples, you say they were kept in a closet which you had for the purpose in Brooklyn?

A. That is true.

Q. And for the first few days you gave the boy the bottles with your own hands—you handed them to him, did you?

A. That is true.

Q. And after that he went to the closet himself and got them, knowing where they were?

A. Under my observation.

Q. While they were in the closet were they wrapped up in newspapers?

A. No, sir; protected only by tin-foil.

Q. And when he would take one out and go with it, he would wrap it up in newspaper?

A. Yes, sir, that is so.

Q. Is there any particular sterilizing property in a newspaper?

A. Not that I know of, no, sir.

Q. Is there any advantage in using newspaper over using wrapping paper?

A. No, sir, except that it is cheaper.

Q. And when the boy went out, or when you gave him these to go out, either you or he would wrap up the bottles in any newspaper that happened to be on hand in the office?

A. Yes, sir.

Q. And all the bottles given by you to him and taken by him were wrapped up in that way?

A. All the bacterial bottles.

Q. These were all newspapers that were at the office taken there from day to day, I suppose?

A. Yes, sir.

Q. When these samples came back to you did you take their temperature?

A. No, sir.

Q. Then there is no record of the temperature —no record of the temperature of the samples as they came to you?

A. No, sir.

Q. Why didn't you take them?

A. The samples had been left next to the can containing ice in the canister in which they were next to the can of ice, and as they were always cold to the touch, I did not consider it necessary to take the temperature.

Q. The sample bottles were in one round canister, and there was another round canister for ice. in the bag, is that it?

A. The round canister for ice, was more properly speaking, a milk can with a top to it, a lid fitting quite tightly.

Q. Is it not customary for bacteriologists to take the temperature immediately upon receiving samples?

A. Do you mean immediately after for their use for bacteriological purposes?

Q. No, I mean upon receiving it?

A. It would be a source of error to plunge a thermometer into a sample until it was plated or otherwise treated.

Q. But you could take the temperature of the vessel itself in which it was contained?

A. Yes, sir, but not with perfect accuracy.

Q. And after you had taken out the portion which you required for your experiment you could have taken the temperature of the residue?

A. Yes, sir, although the temperature taken then would be somewhat higher than the temperature when it was received.

Q. Well, if you took it at the same time as it was received, it would not vary much.

A. Not if taken at once.

By the Court:

Q. Is there any difficulty taking the temperature of very small quantities of a particular sample without putting the thermometer into it?

A. It would not be accurate.

Further cross.

Q. There are sterilized thermometers, too?

A. A thermometer can be sterilized, yes.

Q. How long after the samples were returned to you would it be before you made your experiment?

A. Almost immediately I should say, practically always within half an hour.

Q. Were you in every case present when the boy came back with the bottles?

A. I don't remember any case in which I was absent.

Q. You gave out the bottles wraped in newspaper, did they come back wrapped in newspaper?

A. Yes, sir.

Q. You say that first you made a presumptive test indicating the presence of B. coli and then you endeavored to make that more certain by sub-culture work. Describe the sub-culture work that you did?

A. From the fermentation tube which I used, in making the presumptive test I took, with proper precautions, a small loop full of the broth; this I mixed thoroughly with some sterile distilled water with a sterile loop; I then took some of this mixture and made a plate of it with lactos litmus agar. These plates I incubated at 37½ degrees for twenty-four hours. At the end of that time I carefully examined the cultures present in and on the surface of this agar; I picked out at least two colonies, sometimes three, and inoculated each colony into a fresh fermentation tube containing lactos neutral red broth. That is one test. That same colony was then inoculated into a tube of culture gelatine, the culture gelatine was kept for a week and the fermentation tube kept at 37½ degrees centigrade for forty-eight hours.

Q. Well, is that all?

A. Do you wish the indications which I considered?

Q. Yes.

A. The baccillis coli when the color of the broth in the closed arm of the fermentation tube was a fluorescent yellow color while the color of the open arm remained red, when I got the proper acid reaction on litmus paper, when the tube contained the proper amount of gas, the proper percentage of which was carbon dioxide, and when the gelatine failed to liquify within one week, I considered that this was a confirmatory test of the presumptive test.

Q. Is this procedure which you have described sufficient to identify B. coli?

A. I consider it so.

Q. Can you say positively that in any one of these cases you found baccillus coli?

A. I cay say positively that according to my judgment I found it, yes, sir.

Q. How do you know it is B. coli?

A. Because no other baccillus liable to be found in water will give all those reactions.

Q. There are other organisms that will give similar reactions, are there not—all of them?

A. Not that I know of.

By the Court:

Q. Then you never knew of the presence of the baccillis by seeing it?

A. No, sir.

Q. That is by finding it under microscopic examination even after all this cultivation has taken place?

A. I should say, your Honor, that in some of these samples this broth was examined microscopically by Mr. Whipple and he found organisms which correspond in every case to the baccillis coli and in some case we even went further with these preliminary tests, but my general course of procedure was such as I have outlined.

Q. So far as you are concerned, then, your examination did not go to the point of actually seeing these organisms under the microscope, but merely to the point of being made aware of their presence by other indications?

A. In several cases, your Honor, I did make microscopic examinations and found bacteria which resembled in their appearance B. coli, but that was not part of my general procedure.

Q. Are they capable of being discovered with certainty under the microscope?

A. That is whether you can tell with certainty from that test alone?

Q. No. I say are they capable of being discerned under the microscope?

A. Yes, sir.

Q. You can see them under the microscope?

A. Yes, sir, they are actually visible.

Q. And you can see them so clearly that they are distinguishable from all other sorts of——

A. No, sir, there are many other forms of bacterial life which resemble B. coli in their external appearance under the microscope, so that we cannot say from that test alone that such and such bacteria under the microscope are B. coli.

Q. I suppose in the case, for instance, of the malaria germ you can tell from its form that it is a malaria germ—you know it certainly, don't you?

A. No, sir. The malaria germ, according to the latest idea, is not a bacteria.

Q. But you can see it under the microscope so that it is distinctive and distinguishable from all other germs and whatever you may call them?

A. No, sir.

Q. That is not so?

A. No, sir, there are so many germs which resemble each other under the microscope that you cannot look at any germ and pick it out and say, "This is so and so" simply by a microscopic examination.

Q. Is that also true of typhoid germs and——

A. Yes, sir, that is true.

Q. And diphtheria germs?

A. Yes, sir.

Q. Then you cannot distinguish them under the microscope?

A. You can simply say, "This looks like a diphtheria germ."

Q. But you cannot be sure that it is?

A. No, sir.

Further Cross Examination:

Q. Then under the examinations which you made you cannot say any more than that these that developed might have been B. coli, you cannot say that they are, can you?

A. I cannot swear positively that they are, no, sir.

Q. This sheet that you produce seems to show twenty-nine examinations with the plus sign; that means where you found a positive result by the presumptive method, does it not?

A. Yes, sir.

Q. And in those twenty-nine you have marked eleven where you thought that was confirmed by your sub-culture?

A. That is true.

Q. And in the residue of cases it was not confirmed, is that right?

A. In the residue of cases I failed to confirm it.

Q. The second method which you have described is also known as presumptive, it is not?

A. The second method is also known as a presumptive method?

Q. Yes, your sub-culture method is a presumptive method so far as B. coli is concerned, so far as you went with it.

A. In so far as I cannot absolutely swear to the presence of B. coli, I should say it was presumptive.

Q. You did not go with that method any further than you have described to us, did you?

A. Not in the general run of the examination, although in several instances I did go further.

Q. It is very often carried much further by bacteriologists, is it not?

A. What do you mean by much further, please?

Q. Well, the experiment is proceeded with to a further extent, I cannot describe the methods to you, sir, I am not sufficiently a chemist.

A. Sometimes there are other tests made, yes, sir, in connection with those I have spoken of.

By the Court:

Q. According to your theory they are all presumptive at best, even the microscopical is merely presumptive?

A. What I mean is, you take a bacteriologist who has had long years of experience in this work, a man who can be called an expert of the first rank, and let him perform all the tests of which he is aware and if they all come out positive I think he would be justified in saying definitely and positively that B. coli was present. That we can actually distinguish the germs themselves under the microscope, that is not so. As one man has put it, we see it with the eye of the mind.

Further Cross Examination:

Q. You did not proceed to make the test known as producing indol, did you?

A. Yes, in some cases.

Q. But you have not reported that here?

A. That was not my general course of procedure.

Q. Nor the coagulated milk test?

A. I did that in some cases.

Q. The result does not show?

A. I did not put that record down.

Q. Whether it was positive or negative you could not then say?

A. I have it in the book.

Q. Nor the test of producing nitrates and nitrites?

A. I did not do that, no, sir.

Q. Are you aware that the Massachusetts Board of Health recommends these three tests to ascertain whether B. coli is present.

A. When did they recommend it?

Q. Are you aware that they have done so by their reports?

A. Yes, sir; I am.

Q. Why didn't you do it?

A. Can you tell me the date of their recommendation?

Q. I cannot tell you the date.

A. In the work of the laboratory we did not have time to do all we desired, and we considered that the tests that I have made were sufficient for our purposes.

Q. Your purpose was to find something wrong about this water supply?

A. My purpose was to ascertain whether B. coli is present in the water.

Re-direct.

Q. You made all the tests of the water that Mr. Whipple told you to make?

A. I followed Mr. Whipple's instructions in every particular.

Pangton Pearse, sworn for Complainants.

Direct Examination. By Mr. Vredenburgh.

Q. You reside where?

A. Roxbury, Massachusetts.

Q. Who are you employed by?

A. At present or do you mean at the time I made this investigation?

A. At present I am employed by the city of Columbus, in connection with their sewerage work and water purification.

Q. What is your business?

A. Sanitary and hydraulic engineer.

Q. Where have you acted as such?

A. I have been employed as assistant engineer on the commission for an additional water supply for New York City. I was assistant sanitary engineer at Augusta, Maine, in the investigation of typhoid fever epidemic in the Kennebec Valley; I was assistant engineer and expert to report on the purity of the water supply of Cleveland, Ohio.

Q. Have you ever been in the employ of Mr. Whipple?

A. I have at various times during the past four years.

Q. Were you in his employ from July 14, 1904, to September 6?

A. Yes, sir.

Q. What were you doing then for him?

A. I was investigating the water shed above the Boonton dam.

Q. What was the scope of your examination?

A. I personally inspected the towns of Boonton, Rockaway, Dover, Luxemburg and Hibernia, and as much of the outlying rural district as I had time for, and I made such tests, and took such samples as seemed necessary.

Q. Did you furnish any information that is shown upon the map before us, used by Mr. Whipple?

A. Yes, sir.

By Mr. Vredenburgh: I offer that map in evidence.

(The same is marked Exhibit C 40.)

Witness: It is called Sanitary Map of the Rockaway river water shed.

Q. During this time Mr. Pearse did you live anywhere in the water shed?

A. Yes, sir; I lived at Dover and at Boonton. Do you want the exact dates?

Q. Yes.

A. I resided at Dover from July 25, to August

19, 1904, and for about two weeks thereafter at Boonton.

Q. While you were there did you notice what is called the Morris street sewer?

A. I did.

Q. When did you see that?

A. I saw that very frequently during the two months, and particularly on July 27, 28, August 9th, 17, and 25th, 1904.

Q. Did you also notice it on February 21, 1906?

A. Yes, sir.

Q. During the time that you saw it did you ever see that sewer when it was not discharging fecal matter?

Objected to as leading and improper.

Q. When you saw that sewer what was it discharging?

A. It was always—— (Interrupted.)

By the Court:

Q. Was it discharging anything?

A. Yes, sir, there are two sewers there, one that usually discharges clear water, the northerly one; and the southerly one is always discharging what I call sewerage, it appears to contain a great deal of waste from sinks and such matters, and at times I have noticed fecal matter in it and water closet paper.

Q. Where was that being discharged into?

A. Discharged into the Rockaway river.

Q. How often did you see it discharging such matters?

A. Why certainly on two days and possibly more.

Q. Did you notice it on February 21, 1906?

A. I cannot say positively that there was fecal matter, but I saw every indication.

Q. Did you notice it then, did you go there and look at it?

A. Yes, sir, I went there and looked at it.

Q. What was it then discharging?

A. It was discharging a great deal of greasy water, apparently from some household waters, and there seemed to be particles of fecal matter, but they were so small I cannot say definitely.

Q. Did you ever maqke any test to see whether it was connected with water closets in the town?

A. I have.

Q. When did you make those tests?

A. I made some on August 17, 1904, and also on August 25th.

Q. Just describe the tests you made?

A. Why the tests I made was to go into the houses and pour either bluing or urine into the water closet and flush the closet freely, and then I would observe the sewer out-let until I got an indication.

Q. What was the result of the test?

A. The result was that I found there were four closets that were clearly connected with that sewer.

Q. Which four were they?

A. I found one in a block on East Blackwell street, which contained the store of Paulasky, and the office of Doctor Hunt, Pulasky's store was a clothing store—I think there is a closet there on the second floor that I got positive tests from, and another closet in the building which I was unable to test.

Q. How long did it take the bluing to get from the water closet, when you poured it in, to get to the river?

A. It took six minutes.

Q. You say there is another water closet in the same building—where?

A. On the third floor.

Q. Now, did you try the water closet in the Mansion House?

A. Yes, sir, I did.

Q. What is the Mansion House?

A. The Mansion House was a hotel at that time kept by George Richards, on the corner of East Blackwell and Sussex streets.

Q. What size and what kind of a hotel is it—what size?

A. I should say it was a good sized country hotel, apparently accommodates forty or fifty guests, and at the time I was there it seemed well filled.

Q. Now, how many tests did you make in the Mansion House?

A. I made two.

Q. When?

A. One on August 18th, 1904, at 4.15. The color came out then in half an hour, and on August 25th, the same year, I noticed it at 1.15 and got an indication at 2.35.

Q. Go to another part of the city, Robert's block, did you make any tests from there to see whether any water closets were emptying into the river?

A. I did.

Q. Well, what tests did you make?

A. I used some blueing in the closet which was in the Roberts apartments, right there on Mercer street, and that came out in five minutes. That was on August 18, 1904.

Q. Did you make another test there?

A. Yes, sir, I made two; one about fifteen minutes later, and it came right through in the same time.

Q. Now, go to the post office block—did you make any tests with any water closets there?

A. Yes, sir, I tried the closet in the shoe store there, right next to the post office in that block, on August 18th, at 6.15, in the evening, and the color appeared ten minutes later at the mouth of the sewer.

Q. Did you make any examination of the electric light station?

A. I did.

Q. When did you do that?

A. On August 18, 1904, about four o'clock.

Q. And on which side of the river is that, the same side as this Morris street sewer or on the other side?

A. That is right across the river, from the Morris street sewer.

Q. On the opposite side of the river?

A. Yes, sir.

Q. Well, did you into the closet of that electric light station?

A. Yes, I tested the closet of that electric light station, and I found that the blue came right through, and I might mention that on another day, I cannot give the exact date, I also saw fecal matter in that brook.

Q. Now, go to the Eye and Ear block, corner of Bergen and Blackwell street, and tell us about the closet there?

A. There was a water closet there in the easterly tenement of the block there, on the corner of Bergen and East Blackwell street, which emptied into a drain discharging under the Eye and Ear office, and this I dosed with the dye on August 25, 1904, and I think it was at 10.05 in the morning, and in three minutes the color came around through the stones; the mouth of that drain was practically concealed.

Q. In what way?

A. By a pile of stones.

Q. Was the mouth of it in the river?

A. Yes, sir, concealed by stones.

Q. Now, go to 99 Blackwell street?

A. There was a closet there in Mrs. Smith's apartments; this was connected with a six-inch tile drain and discharged into the river under red bond, and on August 17th, in company with Mr. Whipple, I think this closet was dosed with blueing, and in less than five minutes the color appeared at the mouth.

Q. Now, the City Jail, what have you to say as to that?

Mr. Corbin: Is that what you called the Prison the other day?

Witness: I think it was referred to as the Prison, yes.

A. It is right by the foot bridge that runs across the canal. This is in the stone building along side of the foot bridge across the canal, and I went inside there, on February 21, 1906, and examined the sewage arrangement, and I found there was a trough in the concrete floor which discharged directly through the iron pipe on to the bank, there was a mass of frozen fecal matter on the bank, I tried it with some bluing, flushed freely with water, and it went right through on to the bank.

Q. Now go to the Dover Steam Laundry, where is that situated?

A. Near the D. L. & W. Railroad crossing.

Q. How far down the river from this Morris street sewer?

A. About a thousand feet above the Morris street sewer, just below the canal lock, the upper canal lock in Dover.

Q. Did you see where the waste water from the washers went?

A. Yes, sir, it was discharging very freely into the canal there from the bank, and I went in to examine the wash room, and put some dye into the outlets with the flush, and it came right through into the canal, it took about eight minutes for the color to appear.

Q. Well, the canal empties into the river—does the canal empty into the river anywhere near there?

A. The canal empties right into the river, practically eight hundred feet, I should say, below that discharge, the canal and river are one.

Q. Now, go to the Richardson & Boynton stove works, where is that situated?

A. That is situated on the north bank of the river about a half mile above the town of Dover, and I made an examination of the premises there, and found that they had a urinal between two of their shops that was directly over an open ditch about six hundred feet from the river, and this ditch flowed directly into the river.

Q. Do you find how many operators there were employed there?

A. About 427, I think.

Q. Where was the privy of that place?

A. They had a privy right along side this ditch; the privy consisted of a building with an open back in it which they had put a night soil curb, and the night soil was scattered all around the curb and some were outside the building and no care taken to protect it from draining into the ditch.

Q. Now the Abbatoir there at Dover, where is that situated?

A. That is situated to the north-east of the Town proper.

Q. Now just state fully about that, will you, what is the condition of the sanitary condition of that?

A. Why they had an old cellar there that they used as a place for the hogs into which they threw offal from the slaughtering to the hogs to eat, and that was dripping with this foul leeching which worked its way down alongside the brook which came under the building itself, and they had manure scattered all around the place, and then the blood from the killing ran down a ditch into a field and gradually seethed itself away out and a good deal of the drainage from the place worked its way into the brook?

Q. The brook ran into the river?

A. Right down into the river.

Q. Now, did you compare the sanitary condition of Dover on February 26th, 1906, with its sanitary condition in 1904, when you were living there, as you say, for some weeks?

A. I will correct that date, February 21st.

Q. On the 21st, did you compare it?

A. Yes, sir, I did.

Q. Well, having compared it, what have you to say as to at which time the condition was worse, from a sanitary stand point?

A. It struck me it was worse now.

Q. You mean in February?

A. In February, 1906.

Q. Why?

A. Well, as I went along there seemed to be a good deal more debris and swill and stuff thrown out along the bank, and there were traces of slops that I hadn't seen before—new places, and other general indications which I always used to find out what is going on.

Q. Did you notice the block between Bergen and Union street, with reference to the privy, did you notice it or look at it?

A. I looked at it, and so far as I could——

Mr. Corbin: At what time?

Q. At what time did you look at it and examine it as to privies?

A. You mean on February 21st?

Q. Well, did you count the number of privies on that block, within twenty feet of the river?

A. Yes, sir, there were seven of them, and three of them were in very bad condition, practically open pits that were draining directly into the river, and were full of water when I seen them and leeching out freely.

Q. Are you speaking of the condition that it was in two years ago, or in February 21st of this year, are you now speaking?

A. I think it is the same.

Q. Now go below the Blackwell street bridge on that block, below the bridge, how many privies are there there within a few feet of the river?

A. Why I found ten within fifteen feet of the river.

Q. In what condition were they?

A. In a very poor condition. In two of them slops were always thrown, which leeched off into the river.

Q. Did you see the brook?

A. There is a little brook there on the north-east bank of the Rockaway river, and I saw one privy there within 20 feet of the brook, and another right near a feeder of the brook, but the time I saw it in 1904, the feeder was dry.

Q. Now take the Ford brook—Ford's pond brook, Ford's brook runs what distance about before it reaches the river?

A. I should say it ran about 3/4 of a mile from the pond down through the town of Dover into the river.

Q. What was the condition of that brook when you saw it in 1904?

A. That was in fair condition; I saw 3 large manure piles draining into it, and a couple of slops discharging from sinks of houses, and I found 2 privies within 6 feet of the brook draining into it.

Q. Did you notice or not any sewer funges or sewerage along that bank?

A. I cannot state definitely now.

Q. Now, go if you will to the Ulster Iron Company's works, do you know where they are situated?

A. They are situated right in the town of Dover, just above the junction of the river and the canal.

Q. What date was this?

A. I saw that in 1904 and 1906, and there it was situated about 30 feet from the sluice or mill pond; they employ about 150 men.

Q. Now go to the city of Rockaway, or town of Rockaway; has that a public water supply, do you know?

A. I think they have, but they have no system of sewerage.

Q. Is there any sewerage from that pond which gets into the river?

A. Nothing except the Liondale print works.

Q. Wasn't there a bottling establishment there, didn't you examine that?

A. I examined the bottling establishment on one of the tributary brooks, there was a very loosely built privy within 50 feet of the brook and leeching into it.

Q. When was this?

A. In 1904.

Q. Did you examine how many privies there were in the village of Hibernia?

A. Yes, sir; I spent a couple of days there, July 26 and 27th, 1904, and examined the town or village very thoroughly.

Q. How is it situated with reference to being washed into the brook?

A. Oh, it is very rocky ground up there, with a rapid run off after storms, and there are a number of deep ditches and drains where the run-off had been from the various privies and stuff that I saw.

Q. How many privies would you say were there so situated that in case of rain a portion of the contents of them would so run off?

A. I should say about 100.

Q. Did you notice a beer garden in the upper part of the village?

A. Yes, sir.

Q. How was the privy there?

A. Why, at that time in 1904 they had an open packing crate in behind one of their barns about 30 feet from the brook which was used very freely, and fecal matter was lying on the bank, and there was no sign put there to attempt to restrain the men from polluting the bank wherever they pleased, and they put urine and excrement there.

Q. Was it so situated that in case of rain it would get into the brook?

A. It certainly was.

Q. You are now speaking of the examination you made in 1904?

A. Yes, sir.

Q. Have you been there since?

A. No, sir.

Q. Now coming to Boonton again, tell us about the canal as to what it receives in the way of wash?

A. It receives the street wash at the upper approach, and also the slops from the gutter in the streets there, and at the time I made my minute examination in 1904, I found 11 families who made a practice of throwing all their slops right into the gutter, and the conditions apparently are the same although I cannot vouch for that.

Q. Now, as to the drain that runs to the lower canal, did you notice what device there was in that in case of heavy rain?

A. Do you refer to what is called the overflow?

Q. Yes, in case of heavy rain?

A. Yes, sir.

Q. What is it?

Q. Why, there was a concrete place right opposite the entrance to the Brook street brook, as it comes down under the retaining wall, and I have seen indications there that it had jumped that place in heavy rain storms and had washed the silt and gravel away below the canal.

Q. Was it intended the water should run over there in case of storms or should not?

A. Apparently to my mind it was so intended.

Q. As what?

A. As an overflow.

Q. If it does overflow where does the overflow run to?

A. It goes down into the head race of the Copper Lord farm.

Q. And that gets into what river?

A. Gets into the Rockaway river.

Q. Above or below Boonton reservoir?

A. Above.

Q. How far from the reservoir?

A. I should say about a mile.

Q. Now did you make any tests to see whether any water closets were connected with that overflow?

A. Yes.

Q. What tests did you make?

A. I put some bluing into the closet of the Mansion House there in August, 1904, at noon, and it came out in 10 minutes right onto the sewer running down the incline plane.

Q. Well, is that a sewer or drain running down?

A. Well, it is an open ditch, concreted.

Q. Now, at Liberty street in the city of Boonton, what did you observe?

A. There are a couple of catch basins at the corner there that discharge into a ditch and into this same incline plane sewer, and in 1904, I found there were 4 houses from which house slope were drained right into the street and ran down into that drain.

Cross Examination. By Mr. Corbin.

Q. In whose employ were you in 1904, when you made this examination?

A. I was in the employ of Hazen and Whipple.

Q. Was there anybody with you?

A. Yes, sir.

Q. Who?

A. Mr. Harold Boughton.

Q. Of Jersey City?

A. Yes.

Q. You say at Murray street there are two sewers, do they both come in from the same side of the river—at Dover?

A. Yes, sir, they are both together, and the pipes practically touch each other.

Q. How big are they?

A. I think they are twelve-inch cast iron pipes.

Q. One of them you say usually runs clear?
A. Yes, sir.
Q. Do you know where that comes from?
A. I traced that up and found that it came from the elevator of the Richards Block, I think, a hydraulic elevator.
Q. Hydraulic?
A. Run by water.
Q. And you say on the southerly one you saw indications of sewage?
A. Yes, sir.
Q. You saw waste from sinks, that is from household sinks you mean?
A. Household sinks.
Q. And at times you saw something in the river near which looked like fecal matter and water closet paper there which you judged came out of that sewer?
A. I saw it coming out of that sewer.
Q. When?
A. I think one of the days we made a closet test, I am not absolutely certain but I think on both days and other times.
Q. That is on those two days in 1904?
A. Yes, sir.
Q. But you do not pretend that in February, 1906, you saw any such matter there?
A. I say it was small, broken up, and therefore I——
Q. You say you could not——
Mr. Vredenburgh: Let him finish his answer.
Q. Have you anything more to say about that?
A. Yes, I say it was so small that I cannot say absolutely that it was fecal matter, but it had every indication of being fecal matter.
Q. You saw greasy waste there you say?
A. Yes, sir.
Q. Now you say you made tests on August 17th and 25th, 1905, to see if any closets connected with that sewer and you say you found four?

A. Yes, sir.

Q. You did not make any tests in 1906 to see whether they did or not?

A. No, sir.

Q. And the first one of the four you mentioned was the store of Pulaski, was it not?

A. Yes, sir, in that building.

Q. Were you aware that your report was followed a few days later by a joint test by the representatives of Jersey City and the water company of that place and that it entirely failed to give any such result?

A. Why I heard something to that effect, a rumor, nothing definite.

Q. You were not there?

A. I was not there, no, sir.

Q. Were you aware that a similar joint test was made a little later at the Mansion House which you have mentioned and that it entirely failed to give any such results?

A. I will make the same answer, I was not there.

Q. You heard of it?

A. Just a rumor, I was not there, I was out west.

Q. Were you aware that a similar joint test was made in the Roberts Block which you have mentioned, a little later and that it also failed to give such results?

A. Same answer.

Q. You heard it was done, but you did not see it?

A. I just heard a rumor that it had been tried.

Q. Were you aware that a similar joint test was made at the post office block in the place you have described a few days after your examination and that it showed similar results?

A. I make the same answer.

Q. Don't you know that from the post office block it would be necessary for the sewage to flow uphill to go where you say you saw it come out?

A. No, sir, I do not know it.

Q. You are not aware of that. Were you aware that a similar test was made at 99 East Blackwell street shortly after your test and that it showed no such results?

A. The same answer as previously, I was not there.

Q. You heard such a test was made with such a result?

A. No, I didn't hear any such a thing.

Q. What did you hear?

A. I did not hear anything about that.

Q. Were you aware that your inspection was followed at the Richardson & Boynton works by a joint inspection by the city's representatives and the Water Company's representatives, with a favorable report and no fault found with it?

A. No, sir, I am not aware of it.

Q. You did not hear of that?

A. No, sir.

Q. Was it Dr. Hunter's office that you spoke of?

A. It was on the second floor I think right next to Dr. Hunter, yes, sir.

Q. What?

A. It was right next to Dr. Hunter's office.

Q. Were you aware that a joint test was made there by representatives of the city and of the water company shortly following yours and showing no such results as you found?

A. No, sir, I was not.

Q. At the abbatoir in Dover is there any liquid drainage of any sort going into any running water there?

A. Not directly.

Q. That is if it gets there at all it must soak under the ground?

A. It can go there in time of rains.

Q. You have spoken of things that would happen in times of flood or high rains, repeatedly; there are times when that whole valley is covered with water in times of freshet and flood, are there not?

A. Not to my personal knowledge.

Q. You have not seen it?

A. I have merely seen——

Q. Have you studied that valley enough to know it as an engineer?

A. Exactly what do you mean by that question?

Q. Is that valley flooded in times of spring freshets.

A. I have told you not to my personal observation.

Q. You spoke of the iron works there. Don't you know that that entire property has been under water in times of high freshets?

A. I judge that it would.

Q. You have spoken of some privies on the banks of the river, some feet away?

A. Yes, sir.

Q. Do you know that in times of spring freshets and floods the entire lots of those premises are covered with water at times, and the streets in front of them?

A. I think I have seen a photograph of the town of Dover that was taken by one of the local photographers showing that portion of the town under water.

Q. You have never seen the water shed in time of flood or freshet have you?

A. No, sir, only in the summer, and this year.

Q. Can you mention a single privy, either in Dover or Boonton that enters directly into the Rockaway river or any of its tributaries or anywhere in the entire watershed?

A. Exactly what do you mean by "empties"?

Q. Dropping into the stream?

A. Do you mean directly over the stream?

Q. Reaching the stream in any way except by washing across the land or percolating over the soil?

A. I have seen some flowing over the soil.

Q. Where?

A. On the banks at Dover.

Q. Just name them.

A. They are on that place that I mentioned. Between South Bergen and Union streets; they were full of waters and slops at the time I saw them in 1904 which was running over the ground into the river.

Q. Over the ground?

A. That was in dry weather.

Q. In 1904 you saw them on what streets?

A. Between South Bergen and Union streets.

Q. That is, washing over the surface of the ground when they were full?

A. They were full at the time I saw them, full of water.

Q. You did not see them in 1906, did you?

A. Well, it is all frozen up.

Q. You did not see anything of the kind, did you?

A. Not flowing over the ground.

Q. You mentioned Ford's Pond brook running through part of Dover, is there anything there excepting what is inevitable to a brook flowing through a populated town like that, is there any direct connection with any sewer or water closet or anything of the kind?

A. There is no direct water closet connection there, but there is a good deal of pollution that is not inevitable.

Q. You mean people do things in the way of throwing things in it that they should refrain from?

A. Yes, sir, and there are manure heaps there and other things which should have been kept off.

Q. You saw manure piles on the banks by stables?

A. On the banks.

Q. That was in 1904?

A. Yes, sir.

Q. Did you see any in 1906?

A. I did not. In respect to Ford's Pond brook, at the mouth, conditions at the mouth were just the same.

Q. You have spoken of Hibernia, can you name a single specific case of pollution of the water at Hibernia?

A. Yes, sir.

Q. What was it?

A. Drainage from the mines.

Q. Have you been in those mines?

A. I have not.

Q. Do you know anything about their level?

A. I do.

Q. They are lower than the river, are they not?

A. Yes, sir, but I——

Q. And the water is pumped out of the mines by steam pumps, is not that so?

A. I have seen the pumps working.

Q. And you say that the water pumped out of the mines is a source of pollution to the river, do you?

A. Yes, sir.

Q. How do you know it?

A. Why, from general observation of the work.

Q. Yet you have never been into the mines to see where the water comes from?

A. I have seen the men going down and I have seen the water coming out.

Q. You have seen the miners going down?

A. Yes, sir.

Q. Do you know anything about the sanitary arrangements in the mine?

A. No, sir.

Q. What do they mine there, what metal?

A. I am told that they mine iron ore.

Q. Don't you know?

A. I judged it was iron ore.

Q. You spoke of the conditions around the beer garden at Rockaway, and I think you said around the barn?

A. Excuse me, that was at Hibernia.

Q. At Hibernia?

A. Yes, sir.

Q. It was the habit of the men there to urinate on the ground and to drop excrements on the ground that you observed?

A. Yes, sir.

Q. Is not that to be observed at the back of every farmer's barn in New Jersey?

A. There is probably.

Q. Coming now to Boonton, you spoke of a drain which runs down from the upper canal alongside of the inclined plane, does it not—or in the inclined plane?

A. You refer to above, where the plane stops.

Q. Well, you spoke of a drain that ran down the side of the inclined plane, as I understood you?

A. Yes, sir.

Q. There is a drain there that is built of concrete?

A. Yes, sir.

Q. And that drain, at the lower end empties so that the water ordinarily runs into the Rockaway river below the reservoir, does it not?

A. It empties into the canal.

Q. And that empties below the reservoir?

A. At ordinary times.

Q. What is it you say flows into that concrete ditch?

A. The Brook street brook, so-called.

Q. That is a natural brook, is it not?

A. Not to my knowledge.

Q. There is a good deal of storm water comes there in time of rain?

A. There is a good deal of storm water, yes, sir.

Q. How big is that concrete drain?

A. I should say it was about two feet in diamtere and I think it is almost semi-circular.

Q. Do you know of a single privy or water closet pipe that empties into that Brook street drain?

A. Yes, sir.

Q. Where?

A. At the Mansion House.

Q. Your observation of that was in the summer of 1904?

A. Yes, sir.

Q. Don't you know that that was cut off and abolished soon after that time?

A. No, sir.

Q. And at the time you made your inspection did you not know that it was even then out of use and had been for sometime?

A. You mean in 1904?

Q. Yes.

A. I personally used the closet.

Q. You put glue in it?

A. I put my own excrements into it.

Q. How did you get into the closet?

A. I used it, walked right in.

Q. Was it not locked up?

A. No, sir.

Q. You got a key to go in didn't you?

A. No, sir.

Q. That semi-circular drain two feet in diameter empties into the canal at the lower end you say?

A. Yes, sir.

Q. That ordinarily, when there are no heavy rain or storm waters, carries all that flows through it into the canal below, does it not?

A. Yes, sir.

Q. In times of heavy flow and heavy rains or freshets then that ditch overflows and the flood waters may go into the Rockaway river so as to reach the reservoir, is that it?

A. Yes, sir.

Q. And it apparently is designed for that very purpose, is it not?

A. It seemed to be.

Q. Is not that perfectly good engineering practice with regard to such drains as that?

A. That is good practice.

Q. The drain two feet in diameter and built as you have stated of concrete, will carry not only all that is there ordinarily, but all the ordinary high water of the brook as well, would it not?

A. It might if it were properly placed.

Q. Is it not properly placed?

A. The two flows meet at an angle and the stuff can jump from the Brook street brook into this catch basin and then it leaps right over that incline plane and down through a gorge that it has made for itself.

Q. Have you ever seen it do so?

A. I have never seen it done, but I have been there in the morning after a heavy rain and the silt and stuff was freshly disturbed by the water.

Q. Where is it those two flows and this phenomena is observed?

A. Right at the end there where the Brook street brook comes down.

Q. In a device of that sort the ordinary rains, and all the rain until it became quite heavy, would be carried by the ditch, would it not?

A. Yes, sir.

Q. And when the flood has become great and there was a great rush of water, the surplus water would go over into the river?

A. Yes, sir.

Q. Do you know of any other connection, than the Mansion House on the Brook street drain which tends to any pollution?

A. I have tested none.

Q. Your observations there were all made in 1904, were they?

A. Yes, sir.

Q. You spoke of 11 families in Boonton being observed to throw their slops in the gutters and you said the conditions are now about the same; to what points do you refer?

A. Why there is a bunch of houses just to the south of the upper bridge in Boonton, up above the gorge, tenements.

Q. Can you mention or do you know of a single source of pollution of this water supply in Boonton to-day and if so what is it?

A. I have not examined Boonton with sufficient detail to-day to answer that question.

Re-Direct Examination.

Q. You said that this overflow to take the storm waters and which would carry them down into the reservoir was good engineering practice; do you mean to infer that if you have to drink that water or that your children have to drink that water, that it is good sanitary practice?

A. No, sir, it is very poor sanitary practice.

Re-Cross Examination.

Q. Do you mean that by that arrangement the Jersey City water supply is polluted in your judgment?

A. Yes, sir.

Q. What experience have you had in such matters?

A. Well, I made a very thorough examination of the Kennebec river water shed with reference to the typhoid epidemic in Augusta and testified there. I also examined part of the water supply for the City of Brooklyn, N. Y., and also in Columbus, Ohio.

Q. Where there have been typhoid epidemics you have been sent out by this firm of Havens and Whipple to look into the conditions?

A. I was hired by the Augusta Water District people.

Q. You spoke of mine water which you thought polluted the upper Rockaway.

Q. Are you not aware that the water is drunk constantly by the men there.

Objected to as incompetent.

By the Court:

Q. Have you ever seen them drinking the water?

A. No, sir, I have never seen them drinking the mine water.

Harold Bouton, sworn for the Complainant.

Direct Examination. By Mr. Vredenburgh.

Q. What was your employment in 1903?

A. Up to 1903 I was in the employ of the Jersey City Water Supply Company.

Q. In what capacity?

A. I had been in different positions; at one time I was Assistant Chief Engineer of the company, and later I was special Chief Engineer—laterly that.

Q. And you reside in Jersey City?

A. Yes, sir.

Q. You have resided there how long?

A. All my life.

Q. During 1904 you were employed by whom?

A. I was in the employ of Hazen and Whipple for the greater part of three months during the summer.

Q. And during that time where were you living?

A. I lived at Dover from about the 15th or 16th of July until about the 16th of August, after that time I was in Boonton, my residence was in Boonton until about the middle of September, when I moved down to Jersey City.

Q. During that time did you make an examination of this water shed?

A. I did, a great part of it.

Q. Did you assist in getting up the map which has been offered in evidence as C 40?

A. Yes, sir.

Q. During that time did you take samples of water?

A. I did.

Q. Tell us about the samples and how you took them—for what purpose did you take the samples?

A. As far as I know they were examined after I had taken them and disposed of them in the way we had arranged; they were expressed, the larger ones were expressd to Brooklyn, to the Polytechnic Institute, and the smaller ones I delivered to a messenger who proceeded with them from the point of delivery. They were taken in a systematic way.

Q. I will ask you about that more in detail, but first I want to ask you about the water inspection, how was that made?

A. The water inspection?

Q. Yes, outside of the town what did you do?

A. Oh, I drove about the water shed with a horse and wagon and checked the detail maps; I carried detail and general maps of the territory which was included within the lines of the watershed and checked up as I went along; if there were new buildings or new houses, dwellings or anything that was of importance I noted it at the time on my map and proceeded to examine each place for any nuisance or to enable me to classify it according to the plan which we had. I made personal examinations of each place.

Q. At Boonton, how about the surface flow?

A. I made a study of the surface flow during a very heavy rainstorm, at least of that part of the town east and north of the river.

Q. Yes.

A. And was enabled, because of the heavy flow to determine pretty definitely the run-off as it made its way to the——

Q. Well, I want to ask you about the run-off from the lower canal, the lower level canal?

A. Yes, sir.

Q. Near the foot of the incline, near this open drain, is there any entrance from that canal which leads to the Rockaway river above the Boonton reservoir?

A. There is.

Q. Did you make any investigation to see whether whatever came into that canal from this drain went back into the Rockaway river above the reservoir?

A. I did.

Q. When, and what test did you make to ascertain that?

A. I think I—I have observed the water going through several times, I noted, but particularly I think on the 31st of August, and some time about the 9th of September.

Q. Now, what did you do on the 31st of August?

A. I used some floats.

Q. What do you mean by a float?

A. Why a short—I took pieces of stick and tied a stone to the end, so that they would float perpendicularly, the stick would be submerged to a certain depth, and observed the direction that they took. These sticks I placed in about fifteen or twenty feet from the entrance to this race-way, and all that I did were carried to the mouth of this race-way.

Q. Where does the race-way—into what does that race-way empty?

A. That runs down through the mills there and finally into the river, above the dam.

Q. Above the Boonton reservoir?

A. Oh, yes.

Q. Were there any winds or advantageous——

A. No, the surface of the lower level at this point was very smooth indeed; no wind at all.

Q. Now at a point—did you make any investigation to see what distance the water from the canal was drawn down through this race-way?

A. Well, that day I put these floats in, as I say, I think it was fifteen or twenty feet from the mouth, but later, not on that day did I notice about any floats, not any further, but I did days later when I tried this. The exact dates I don't recall, I think the 9th—the 8th or 9th of August, and twice during the succeeding week I again used these floats, and——

Q. In September did you use them, too?

A. Yes, in September, I mean in September, I mean the 8th or 9th of September, and the succeeding week; thirty-six feet was——

Q. Now how near is the mouth of that drain, as it empties into this canal, from this race-way, from the beginning of this race-way?

A. Well, you know there is a point of land that reaches out into the lower level and separates the mouth of the drain or at least the lower end of the drain where it enters the lower level from this smaller section of the canal, you might say that makes a sort of a bay.

Q. As the water runs—assuming that it runs from the mouth of this drain to this race-way, what would be the distance it would have to run?

A. Well, it would have to go around a circle.

Q. Yes.

A. It would be, I should say forty or fifty feet.

Q. Well now, continuing the discharge from this drain, in a straight line from its mouth, and down the lower level of the canal, how near would it pass to this race-way?

A. It would not pass the race-way; you see there is a tongue of land that separates that.

Q. I see. Now, did you notice at any time at this overflow, any water passing over the overflow and into the raceway that leads to the Rockaway river above Boonton Reservoir?

A. Yes, sir, I did.

Q. When was that?

A. I think it was Wednesday the 14th of September, in the evening.

Q. Well now, just tell what happened?

A. Well, it had been a very rainy day, it had rained very hard and that evening, at about 7.30—it had been in showers and after a very heavy continuous shower I was located at this point watching it, and the water jumped from the mouth of the Brook street outlet across this overflow, and so on down into the canals leading through the mills, and then to the river.

Q. Now, did you make any examination at Boonton of the undertaker's place where the bodies were washed?

A. Yes, sir, I did.

Q. Did you ascertain where that water went?

A. Well, I was told that it was thrown out of the window in the basement onto the steep bank leading to the lower level canal.

Q. Now, did you examine the Boonton gas light improvement?

A. I did.

Q. What happened there, what was there about that?

A. There was a closet in the basement. I tested that with urine and found evidences—immediate results on the steep bank without, at the mouth of a twenty-inch tiled drain that was connected with a stone drain which ran down Main street, Boonton; this discharge is right on a steep bank above the lower level canal.

Q. Now, did you test any other water closets?

A. I did.

Q. What other ones?

A. I tested the closet above Corwin's bakery, with urine, and within five minutes the green color showed at the rocks below the house just at the canal—lower level canal. I tested the closet in the apartments over Benjamin Greenman's clothing store, which is the building beneath which the Brook street brook goes, the last building, and got immediate results there, that is, within five minutes.

Q. Did you make any tests at Dover?

A. I did.

Q. Now I ask you about the dates. I will ask you if you remember the 10th of September, 1904, making any tests at Dover?

A. Yes, I think that was Saturday.

By the Court:

Q. Was this made in company with the last witness?

A. No, I was alone at that time. On Saturday, the 10th of September, I went to Dover, started at, I think, No. 18, I don't know about that exactly, Main street, in Dover.

Q. Blackwell street?

A. Blackwell street, yes.

Q. 16 or 18?

A. 16. The first, 16 or 18, on the corner, the first one. I tried the top apartment there, and I put urine in the closet and went to the mouth of the Morris street sewer and at the mouth of the lower pipe, that is the down stream pipe, after. I do not recall the exact time, 15 or 20 minutes, the water commenced to turn green, and in a little time had taken on the color of the urine, and continued to give that color for a considerable time.

Q. Did you notice the odor?

A. There was a very foul odor, yes.

Q. Where was the foul odor?

A. At the mouth of this down stream pipe.

Q. Have you noticed the discharge of that sewer or pipe, more than once?

A. Very many times, yes.

Q. What is the normal color of the discharges from that?

A. It is a color that is about that of wash water, sort of a milky, soapy looking discharge, at times containing matter and tissue paper.

Q. When you say matter, what do you mean?

A. Well, from the smell of it and the looks of it I should think it was sewerage, fecal matter.

Q. Now, do you recall No. 10 East Blackwell street?

A. Yes, sir.

Q. First floor above Livingston?

A. Yes, sir, I do.

Q. What did you do there?

A. I deposited coloring matter in that.

Mr. Corbin: When, Mr. Bouton?

Witness: On Saturday, the 10th of September.

Q. That is a sink, is it not, there?

A. Yes, I think that is a sink; they said they had no closets, no baths there, and I observed the change of color, and eventually darkening and brightness of the color at the same point as the last one.

Q. Do you remember the name of the owner of that property?

A. No; there is a row of houses there; I don't know who they belong to, but I tried one after the other; I don't know who owns those.

Q. Now do you remember 14 East Blackwell street, over Mr. W. B. Woodhull's grocery store?

A. Yes, sir.

Q. Where is the closet there?

A. I think that is in the top apartment.

Q. Did you examine that also on the 10th of September?

A. Yes, sir.

Q. 1904?

A. Yes, sir.

Q. Did you make any test there by blueing or anything else?

A. Yes, sir. I put coloring matter in that, with the same results.

Q. What was the result?

A. Down stream discharged in the Morris street sewer.

Q. At the river?

A. Yes, sir, right by the river.

Q. What was the next one, No. 12?

A. Yes.

Q. Did you examine No. 12?

A. Well, I made the same operation and got the same results.

Q. Where was the water closet there?

A. Well, one of those closets was on the first floor above. I don't recall whether that was the one or not.

Q. You don't remember whether there is any closet in that building now or not, do you?

A. No, sir, I don't.

Q. Now, go to No. 12.

A. Yes, sir.

Q. The sink there, do you recollect testing the sink there?

A. Yes, sir.

Mr. Corbin: He has testified about that one, Mr. Vredenburgh.

Mr. Vredenburgh: No. 10 I say.

Mr. Corbin: Well, he has testified about that; he said there was a sink, no closet and change of results; he didn't know the name of the parties.

Q. Well, take No. 8. Did you find any sink there?

A. I think I did, yes.

Q. And you also tried that?

A. Yes, sir, I used the coloring matter and got the color at the south of the down stream pipe discharged.

Q. Now, do you remember Henry Moses' furniture store?

A. Yes, sir; I think there was a closet in the back of that store, and I tried the blueing and that color did not come very dark; the water turned a slightly bluish color, but the evidence was not quite as satisfactory as the others, although the water certainly changed color slightly. The others were very evident, indeed.

Q. Now, the 12th, do you remember being there on the 12th?

A. That is Monday.

Q. Monday, September 12th?

A. Yes, I went to several of these places.

Q. Who were you with then?

A. I was with Mr. Gibson, the representative of the Water Company.

Q. Did you go to the grocery store? There was a grocery store there, do you remember?

A. Yes, I think we went to the grocery store.

Q. Have you any clear recollection of what you found there?

A. As I recall, the only place that we found that day to give these evidences was a small apartment in the Eye and Ear block, where the old lady lived.

Q. Now, the last witness mentioned that you were with him during those tests; do you remember being with him?

A. I was with him in some of his testings, yes, I was.

Q. Do you remember going to the stove works?

A. I do.

Q. I won't repeat those other places. When you were with Mr. Pierce, you saw him make the tests which he has described here?

A. Some of them, yes, and sometimes some of the tests—we made one in Boonton, at Booth place, on Liberty street, that is the one we suspected connected with the Brook street brook; we put in the coloring matter, or I put the coloring matter in, and he told me that he saw the color at the outlet. Some of the other places, I think at 99 South Blackwell street, we together there put the color in and saw the color at the canal or at the rocks of the river.

Q. That is all.

Cross Examination. By Mr. Corbin:

Q. You are the son of Mr. George T. Bouton, clerk of the Board of Street and Water Commissioners, who testified the other day?

A. Yes, sir.

Q. Referring to the situation at Boonton, the place you have been describing to us as the lower level of the canal below the inclined plane?

A. Yes, sir.

Q. And there are factories there of the Cooper Lord estate and others?

A. Yes, sir.

Q. And they have canal race-ways alongside of the canal, haven't they?

A. I think the race-ways that they have of that kind are—well they have, yes, along down past the inclined plane, and from the upper level.

Q. And from the upper level canal itself is used as a race-way in places?

A. Yes, sir, I think so.

Q. The place you speak of on the lower level, the water from this concrete drain to go into the river at all would, as you say, have to run around a sort of a circle, wouldn't it, and come back with a sort of a back flow, to get into the river?

A. It would.

Q. And your observation was with the chips?

A. No, not with the chips.

Q. Well, with the floats?

A. Floats, yes.

Q. With the floats; that in this very heavy rain, the water did flow so?

A. Yes, sir—not in very heavy rain, I didn't see that.

Q. I thought you did?

A. I beg your pardon, at times in ordinary conditions.

Q. Now, Mr. Bouton, you are aware that gates have been placed there for the very purpose of preventing this thing which you speak of, since that examination, are you not?

A. Yes, sir.

Q. The water cannot go that way now, can it?

A. I think it can.

Q. Not unless there would be a flood?

A. Yes, sir, I think so.

Q. You think it can go there yet?

A. Yes, sir.

Q. Then the gates you think are not effective?

A. I think there is a hole in the dam below.

Q. What dam do you refer to?

A. The place where these gates are.

Q. You mean there is a leak there?

A. I don't know what it is, I think there is some opening in this dam.

Q. The design of the gates is to prevent just the kind of flow you speak of, isn't it?

A. It is at the surface, yes.

Q. You think there is an opening under them, or a leak under them?

A. Yes, sir.

Q. Have you ever made any tests to prove any such thing?

A. I saw the boiling of the water at a point two or three feet down stream from this, which came from beneath.

Q. When did you observe that?

A. On the 21st of this month.

Q. You think there is either a leak or an opening there somewhere which would still allow this back flow, which you have described?

A. Yes, sir, I do.

Q. That is the only reason you have to suppose —that you saw this boiling there?

A. Yes, sir, that is the only reason.

Q. Now, of this pollution which you have mentioned, so far as you have mentioned, at Boonton, is tributary to the lower levels I understand you, if it gets into any level?

A. Yes, I think it is, yes.

Q. Now, at Dover, it was you, was it not, who went, on behalf of the city, with Mr. Gibson on behalf of the Water Company to make some tests, after the first test reported by Mr. Pierce, wasn't it?

A. Yes, sir.

Q. Isn't it a fact, Mr. Bouton, that when you together came to make those tests that they failed except the case of the poor old lady who lived about six months up in the Eye and Ear building?

A. It is a fact, yes.

Q. And that water closet which was discovered was immediately abated, wasn't it?

A. Well, I don't know whether it was—orders were given, but whether they were followed, I don't know.

Re-direct Examination:

Q. How do you account for it if they were stopped that day, they seem to be flowing there now?

A. I think they had been warned.

Q. What?

A. I think they had been warned or spoken to from the time I tested them on Saturday until the time we tried them on Monday.

Q. You were there on Saturday?

A. I was.

Q. And they were flowing, and then on Monday they were not flowing?

A. That is so.

Q. And you thought that between that time somebody had warned them?

A. I did.

Re-cross Examination:

Q. Didn't you make the same test on Monday as you did on Saturday?

A. Yes, sir.

Q. And in your blueing and your water?

A. Yes, sir.

Q. And watched the drain where you supposed the outflow was, below?

A. Yes, sir.

Q. And yet you couldn't get any results?

A. Yes, sir.

Q. What makes you think they had been warned?

A. I was so told.

Q. What could they do if they had been warned?

A. I don't know just how the thing was fixed, but I think that those houses are connected to some system of cesspools that can be controlled.

Q. Well, have you ever made any investigation which gives you any details about it?

A. Well, I understand there are cesspools there; the people living in those houses told me so, some of them; I don't remember their names.

Q. If you have any evidence of that sort, we will be obliged if you will disclose it in the fullest manner, either here or otherwise?

A. I say I cannot say that, but the experiments that I made Saturday and saw myself, and were tried in exactly the same manner on that Monday and would not come, and what I learned between those two dates from men telling me, and other people——

Q. Just tell what you did learn, we would like to know it?

Mr. Vredenburgh: Well, let him complete his answer first.

Mr. Corbin: I understood he did answer it.

By Mr. Vredenburgh:

Q. Complete your answer, from what people told you and something else, complete the answer, whatever you were going to say when the second question was asked?

A. From what I heard I formed that conclusion.

By Mr. Corbin:

Q. Tell us what you heard and who you heard it from?

A. When we tested that lady's apartments, Mr. Gibson was with me at the time; she said that she had been away when Mr. Gibson, and some Mr. Searing, I think that was the name, I am not sure about that second name, had been there on Saturday, and that she was sorry she had been away, and she had not been able to have the plumber or somebody come in the meantime to fix it. I tested other places with Mr. Gibson during that week. Oh, while I was working on Saturday morning there was a man stood by the bank over near by me watching me, for very nearly two hours.

Q. Who was he?

A. I don't know who he was, but I think he worked in the shoe store, in the Post Office block. I saw Mr. Gibson that Saturday morning; he was about the banks, on either side, while I was testing, and he saw my operations that morning; I think he did, and this man said, and this man said, "You have got a very foxy man." I said what do you mean by that.

Q. Cannot you tell us who said that?

A. I don't know his name, really.

Q. Well, go on.

A. I said, "What do you mean?" Well, he said, "This chap has been running about the river bank and has been around town telling these people to close up their places, and the following week while I was testing in Boonton, when we got to Dickinson, that is out in Rockaway valley.

Q. Well, I think you better confine yourself to what you know about Dover, now.

A. Well, that is all I know about Dover.

Q. Now, Mr. Gibson, whom you have mentioned, is the chief inspector of the Water Company, who is employed in that business, solely, of inspecting and looking out for pollution of water sheds?

A. So I understand.

Q. How long did you continue in the employ of the city inspecting, after the day you were up there?

A. You mean at Dover?

Q. Anywhere?

A. I continued—I did testing and different kinds of work for that firm until about the first of October, I think.

Q. Your suspicions being thus aroused, didn't you follow that matter up at Dover at all?

A. I had no means of following it.

Q. You did not in fact follow it up?

A. What do you mean by following it up?

Q. I mean to find out where the pipes from those water closets actually emptied?

A. No, sir, because I was refused admittance to some of those buildings. Mr. Gibson and I went in and they would not let us in.

Q. That is when you and Gibson were together?

A. Yes, sir.

Q. Who refused you?

A. At least one of the ladies in the block of 10, 16, 18—whatever the number is, and the place in the Post Office block where they would not give me permission to go, at least Mr. Gibson and myself, until we had gone to see Mr. Baker, I think it was Baker who owned some of those buildings, and he eventually did give us permission to go, at least, to the shoe store, or whatever store it is.

Q. Have you stated all the evidence you had which so aroused your suspicions?

A. At that point, yes.

Q. These houses you have mentioned are separate houses, are they not?

A. No, sir, several in a block.

Q. Well, you are speaking now of Nos. 10, 12 and 16?

A. No, sir, that is one row.

Q. Well, 99 East Blackwell street?

A. That is one or two together.

Q. Well, it is not connected with the 10 and 12?

A. Oh, no.

Q. It is a different part of the town, is it not?

A. Yes, sir, down below one or two small buildings I think, there at Jay street, 99 and 99½, I think next door to one another.

Q. You never did, as a matter of fact, follow it up to see where these people's closet arrangement actually did empty?

A. I endeavored, but there is an alley back there and most of the privies back there, or some of them, I think some old privies now abandoned since, very modern improvements put in some of those houses down there, and I endeavored to find, if I could what there was, but of course I couldn't find it without I dug up the whole place.

Q. And you think from what you have stated that there was some secret method by which they could discharge sewerage in either one of two places?

A. Yes, sir.

Q. Have you ever found anything since that tended to confirm that?

A. No, sir.

Q. If anything comes to your mind will you let us know?

A. Yes, sir.

Q. Do you suspect anything of the kind in Boonton?

A. Yes, sir, I do; you mean secret business?

Q. Yes.

A. No, but I suspect they had been informed.

Q. You speak of the water boiling up at this dam in the lower level at Boonton, on which side of the dam did it boil up?

A. On the down stream side. The water was running, it had formed a sort of a little bay in between this raceway and the dam; there is a sort of a bay, closed now of course by this dam, and the water seemed to be running out down stream, and this boiling spot was placed in a diameter, I should say, of two or three feet, and came from a depth, as you could see, and that is what lead me to that——

Q. And running into the canal raceway?
A. Running into the lower level of the canal.
Q. Do you know of any single place of pollution of the river or its tributaries at the present time?
A. Yes, sir, I do.
Q. Name it?
A. Yes, sir; the laundry and jail, at Dover.

Re-Direct Examination:

Q. Mr. Corbin said something about your being in the employ of the city?
A. Well, I was employed by the city through Hazen & Whipple, I wasn't employed directly.
Q. You were employed by Hazen & Whipple?
A. Yes, sir.
Q. When you went up there with Mr. Gibson you had no authority to go by the city up there?
A. No other than the authority conferred on me through Hazen & Whipple.
Q. Mr. Whipple employed you to inspect it, and you went with Mr. Gibson, and that is as much as there is in this idea that the city and Gibson had made any examination?
A. Yes, sir.

Re-Cross Examination:

Q. Mr. Whipple was the expert at that time employed by the city to examine the works?
A. Yes, sir.
Q. That is all.

Adjourned until Monday, February 26th, 1906, at 10 o'clock in the forenoon, at the Chancery Chambers, Newark, N. J.

IN CHANCERY OF NEW JERSEY.

Between
THE MAYOR AND ALDERMEN OF JERSEY CITY,
Complainant,
and
PATRICK H. FLYNN
and the
JERSEY CITY WATER SUPPLY Co.,
Defendants.

Fourth Day.

Before His Honor Vice Chancellor STEVENS.

MR. VREDENBURGH, MR. MCDERMOTT and MR. RECORD, Counsel for the Complainant.

MR. CORBIN and MR. EDWARDS, for the defendants.

Transcript of shorthand report of the evidence given on the trial of the above stated cause, on Monday, the 26th day of February, A. D. 1906, at the Chancery Chambers, Newark, New Jersey.

George C. Whipple resumed the stand.

Further Direct Examination. By Mr. Vredenburgh.

Q. Mr. Whipple, I show you C. 35 and a copy of C. 34, have you those exhibits before you now?

A. I have C. 35, and C. 34 is this one (indicating).

Q. Now you have there the two tables; what had you to do with the examination which led to those two tables, exhibit C. 34 and C. 36, is it?

A. Yes, sir, C. 33 and C. 35. The analyses of which these tables are the record were made under my direction. I was present in the laboratory during a considerable part of the time when they were made, and it was my custom to fully know what the chemist and bacteriologist were doing, and to see that they followed out my directions as to methods, etc., and furthermore I frequently went over their results; I went over all the results practically, to see if I could detect anything that was wrong.

Q. Well, now, when you say that you went over the results of them, that is not quite clear; won't you please explain what you mean by going over the results?

A. I would look over the clerical work of their records.

Q. Yes.

A. And I would sometimes count the bacteria on the plates, as a check, or to verify the results obtained by the bacteriologist. I would observe the tests for the colon baccilus to see whether their measurements were correct.

Q. What do you mean by observing the tests?

A. Virtually making the test after them, so far as I could.

Q. What is making the test for B. coli?

The Court: What would you do yourself?

Q. Yes.

A. One part of the test consisted in measuring the amount of gas which collected in the closed arm in the closed tube; that amount of gas was recorded as a percentage. I would measure the percentage after the bacteriologist had done so, to see that his measure was correct. The results, as stated here, represent the prediction, whether positive or negative, as to the presence of the colon baccilus based on the results which he obtained, and I would take his results and see if the prediction was in accordance with the rules I laid down.

Q. Now please explain what you mean by looking at the amount of gas in one arm of the tube—what does that mean?

A. Simply a part of the test which we make to indicate whether or not the colon baccilus is present in the sample of water tested.

Q. If the colon baccili is present, what has the gas to do with that?

A. Simply this, that when present we expect that the amount of gas which will collect in the closed arm will lie between certain limits.

By the Court:

Q. Where does the gas come from?

A. The culture media which we use in making the test contains sugar dextus or lactus, and the action of the bacteria or the action of the colon baccilus on the sugar is to break up the compound, and one of the products is the gas which collects in the closed arm.

Q. Well, what is that?

A. The character of the gas depends upon the bacteria present, and one of the tests for the colon baccilus is to ascertain what the gas is composed of. In the case when the colon baccilus is present we usually find that the gas consists approximately of one-third carbonic acid and two-thirds hydrogen. In other cases it was no doubt present in small quantities, but those are the modern ones.

Q. Now you spoke of a limit of gases between certain limits. Please tell us what those limits are?

A. The limits which I have been in the habit of using are 25 to 70 per cent. of the total volume enclosed in the arm.

Q. What do you mean by 25?

A. That is the amount of gas formed, representing 25 per cent. of the volume of the enclosed arm which originally contained the culture media.

Q. And when you say 70, what do you mean?

A. That the amount of gas formed in the enclosed arm.

Q. Then, if you found it contained less than 25 per cent. of gas or more than 70 per cent. of gas, your conclusion was that the colon baccilus are not present?

A. We throw out that on the basis on this presumptive tests, yes, sir.

Q. If the gas is between those degrees or limits, your conclusion is that the colon baccilus is present?

A. Yes, sir, so far as that part of the test is concerned.

Q. Now, you were telling us what you did with reference to the original examinations, the results of which are upon this table and upon this tracing. Will you proceed?

A. I thought I had answered the question, perhaps fully, as far as the analyses were concerned.

Q. Do I understand you to say that on every occasion which is upon this tracing or on this table you did observe gas?

A. Not in every case, no, sir. I simply stated that it was my custom to be in the laboratory as much of the time as I could spare, which was three or four times of a week for a number of hours each day, and to give as much time to looking after the working going on there as I could.

Q. Now, the physical tests, what did you do as to those?

A. I frequently and in fact almost invariably, looked at the samples to see whether or not the results put down as to turbidity and color were approximately correct. I am sufficiently familiar with the scales, so that I could detect any serious error almost at a glance. It is also my custom——

Q. One minute. The physical examination consisted of what?

A. To a determination of turbidity and color, and the odor of the water.

Q. Any other way than by sight and smell?

A. The turbidity and color were measured by comparing the samples with arbitrary scales which are in common use by water analysists. The odor was taken merely by smelling the samples, both cold and after heating to a point near the boiling point.

Q. Why was the odor taken at both of these points?

A. We took the odor at the room temperature, and also after heating to a point near the boiling point, and then allowed it to cool, and the record refers to the stronger of those two odors.

Q. Which is the stronger of those two odors?

A. As a rule the odor of the water after heating was stronger than the other, but that was not always the case——(Interrupted).

Q. What is that?

A. Speaking generally, was.

Q. What does that show it would be stronger after heating than it was at the temperature of the room. What does that indicate?

A. Simply that the heating process drives off the gaseous constituents, which usually are odoriferous, and which contain the odoriferous substances; and as we do that with a beaker, with a cover to it, it is somewhat easier to estimate from that test whether or not these odoriferous substances are present.

Q. What do these odoriferous substances have to do with the pollution of the waters?

By the Court:

Q. I don't quite understand what you mean as to use of the scale, measuring the odor whether it is greater or less. One man may smell one thing, and another man may smell some other thing, better than that. What is your standard?

A. Your Honor is quite right, there is no standard. You are quite right in stating that it is more or less an arbitrary matter, but after having tested odors of a great many thousands of samples, a person comes to have a scale of his own, and all the men working in that laboratory, come to have the same scale—in time they come to have the same scale. On this sheet I have the odors recorded by letter and number. We use the numbers 1, 2, 3 and 4 to indicate the intensity of the odor.

We mean by No. 1, very faint; by No. 2, what we call faint; by No. 3, distinct; and by No. 4, decided; the terms of which, of course, cannot be accurately estimated.

Q. What about your letters?

A. They are abbreviations. The letter V stands for vegetable; that means the water has a vegetable odor; M means that it has a mouldy odor, or an odor that usually suggests some decomposition, either decomposing vegetable matter or decomposing animal matter—it is the odor of decomposition as near as we find it. We make no attempt to define it any further.

Further Direct:

Q. As to the presence of pollution in water by which of these arbitrary tests is it found?

A. Well, that would depend, to a considerable extent, on th nature of the po lution, using it in its most common sense to test for colon bacillus, the number of bacilli is sufficient, and to some extent by odor. Under certain circumstances turbidity or color may indicate pollution, but ordinarily not

So far as odor is concerned, waters which are contaminated are very liable to have a mouldy odor; vegetable odors may be present in pond waters which are not contaminated, but the more a sample is contaminated the more likely it is to have a mouldy odor and when we find a mould odor constantly present, indicating decomposition, that is a strong indication that the water is contaminated.

By the Court:

Q. Contaminated by anything but vegetable substances? All vegetable substances, I suppose, decay after a while and the decay is productive of a mouldy odor; now if you have a mouldy odor, does that indicate anything more than the decay of vegetable substances such as grow in water?

A. Vegetable substances may cause mouldy odors, but they are more likely to cause odors which can be defined somewhat more accurately than by that term. The vegetable matter such as we get from swamps gives what we call a vegetable odor and which we can identify perfectly well and which does not have the mouldy odor accompanying it. Algae of various kinds, which grow in water, and which are vegetables, may give odors which may be described more accurately by such terms as aromatic or fishy or grassy and when these algae die they, too, may cause mouldy odors. But when we get a water unaccompanied by algae giving mouldy odors constantly then that is some indication that the water is contaminated.

Q. I suppose any water is contaminated in a certain sense which is not pure; water may be contaminated, for instance, by the presence of carbonate of lime; it depends upon the point of view from which we look at it, and this contamination is contamination, I suppose, from the point of view of its effect upon health?

A. I have tried to made distinctions between some of those words which are commonly used.

Further Direct Examination:

Q. What do you mean when you use the word "contamination" as you did a few moments ago?

A. I was going to describe that. The word "contaminated" to my mind indicates a water which is polluted with fecal matter either from a human being or from animals. I try to draw in my own mind a distinction between pollution, which may be somewhat of a general word, and contamination which I like to limit for the purpose of clinical discussion to waters which are polluted with fecal matter.

By the Court:

Q. Then when you use the word "contamination" during the discussion of this matter we are to understand that you mean contamination caused by fecal matter, either animal or human, is that it?

A. Yes, sir, When I use it. I must admit that is not a generally accepted definition, as your Honor will readily understand from the way in which you just used it.

Further Direct Examination:

Q. Was this test as to odor, contained on this table and this tracing, made by you?

A. The observations which are recorded here were made by Mr. Mayer, as he testified; I went over nearly all of the samples and corroborated them.

Q. The other physical tests of sight, such as turbidity, have they anything to do with contamination as you used that word?

A. Only this, that contamination may make the water slightly turbid, but there are many other things which might also render it turbid so that test is by no means conclusive, in fact is of but little value as an indication of contamination.

Q. What is the difference between turbidity and color as you use those terms?

A. When we speak of turbidity we mean the effect produced by particles of matter held in suspension. When we refer to color we refer to the appearance of the water caused by some substance in solution.

By the Court:

Q. A chemical?

A. Something dissolved; that is, we may have a perfectly clear water which has a color, we may have a colored water which contains matter in suspension to make it turbid, like clay, for instance.

Further Direct Examination:

Q. When you refer to odors, mouldy or vegetable, and so on, has that reference to organic or unorganic matter in the water?
A. Organic.
Q. On what do bacteria in water live?
A. They live to a great extent on organic matter.
Q. How many analyses of water have you made?
A. I did not understand your question; do you mean in reference to this investigation?
Q. No, generally.
A. I don't know. I figured it up a few years ago and it was something like fifty thousand; I don't know how many I have made since.
Q. You have been making these analyses of water how long?
A. Since 1889.
Q. Do these exhibits show the number of bacteria in the water?
A. Yes, sir.
Q. And who determined the number of bacteria?
A. Mr. Daton, during 1904 and Mr. Mayer during 1905.
Q. What have you to do with that, if anything —determining the number?
A. I occasionally counted the plates after the bacteriologist had done so, as I have already testified.
Q. And when you did count them, what was the result of your count?
A. A substantial agreement with the figures recorded.
Q. Perhaps you might tell us what you mean by counting the plates?
A. I mean this, that in making the determina-

tion or making the tests to find how many bacteria were present, we mix a known quantity of water with a certain amount of a culture media; this mixture is poured into a flat plate and there is allowed to harden, and it does harden because it contains a gelatinous substance—ordinary gelatine. After this mixture has been poured into the plate and allowed to harden, the plate is put into an incubator where the temperature is maintained at approximately twenty degrees centigrade, that is an ordinary room temperature, and after a period of about forty-eight hours the plate is removed and examined; if bacteria are present it will be found that each one has formed a colony of larger or smaller size, visible to the naked eye. The number of those colonies on the plate is counted, and this number is considered to represent the number of bacteria present in the quantity of water used. If we use one cubic centimetre of water, then the number of colonies would represent the number of bacteria per cubic centimetre. Sometimes, however, when we suspect that the number are likely to be large we will use a smaller quantity of water, say, one-tenth of one cubic centimetre, or perhaps one one-hundredth of a cubic centimetre, but in stating the results we always reduce them for purposes of record to number per cubic centimetre.

By the Court:

Q. When you speak of a colony, do you mean by that word an indefinite number of baccilli?

A. I mean a very indefinite number. The size and appearance of the colony counts for nothing in the ordinary bacterial count, as we make it here, because the size of the colony will depend upon the character of the bacteria; some will form a colony about the size of a pin head; others may form a colony half an inch in diameter, but the theory is that one colony, whether it be large or small, starts from a single bacteria.

Further Direct:

Q. And the colony counts for a single bacteria in the count?

A. It is so counted.

By the Court:

Q. How large is this plate?

A. The plate is about four inches in diameter, they vary somewhat in different laboratories, but that is approximately the average figure, and they are covered, I may say, with a second plate in order to prevent any bacteria from the air falling into the gelatine while it is being incubated.

Further Direct:

Q. Now, Mr. Whipple, you have used the words cubic centimetre of water; will you please tell us what is the quantity of water in a cubic centimetre, by reference to a teaspoon?

A. Speaking very roughly, I might say that a cubic centimeter represents about one-third of a teaspoonful; it takes about two and a half to three cubic centimeters to fill an ordinary teaspoon.

Q. Now, one-tenth of a centimeter of course is one-tenth of that amount, but when you get to one-hundredths of a centimetre, as I see on your paper reference is made, can you indicate to us what the size of that is in any way?

A. Well, it would be a fraction of a drop; there are perhaps twenty-five drops in a teaspoonful—twenty-five drops in a cubic centimetre, if I am not mistaken.

Q. So that one-hundredths of a cubic centimetre would be about one-fourth of a drop?

A. Substantially that, yes, sir.

Q. Now, you have been speaking, I think, of both these exhibits; I do not see upon the exhibits the chemical analysis.

The Court: Before you leave the subject upon which you are now, you better let the witness state the significance of chlorine in water.

Q. Please explain what is the significance of chlorine in these analyses?

A. The presence of chlorine in water stands for salt; in ordinary cases, common salt, and the reason we test samples of water for chlorine is because the sewage, the waste particles of the body and the household waste are very likely to contain salt, and if we find large amounts of salt in water then that, to a certain extent, is an index of contamination, and it should be remembered that all natural waters, especially near the sea coast are likely to contain some salt blown in from the ocean, that amount will decrease as one goes inland, and therefore, in interpreting the results of the chlorine test it is necessary to deduct from the figures found an amount which would represent what may be called normal chlorine for the region from which the samples of water were collected.

By the Court:

Q. I don't understand why, if you regard salt as an indication, why you don't give the percentage in salt instead of in chlorine cases?

A. We don't, for this reason, that the chlorine is not present as common salt, which is sodium chloride; we might have magnesium chloride, and in fact do have it when we have salt blown in from the sea, so that it is an easier matter, chemically, to state our result in terms of the chlorine which is the essential constituent of the salt, than it is to make the unimportant distinguishing marks of distinction between magnesium chloride and sodium chloride, etc. What we are really after is the chlorine part of those compounds.

Q. If sodium chloride indicates the presence of matter that come from a human being, and magnesium chloride indicates the presence of a compound that comes from the sea, is not it misleading to ascertain merely the amount of chlorine?

A. Well, the distinction is in reality not as simple as the way in which you have stated it, for sea water contains, very largely, sodium chloride, and it may also contain magnesium chloride, so also the salt we use in our household sodium chloride, and it also may contain some magnesium chloride. So as a practical chemical matter it would be impossible to make such a distinction a basis in interpretation of contamination upon that fact, and therefore we simply take the simplest way of getting at the total amount of chlorine which is present.

Q. Well, now, you have not told us what percentage of chlorine in this particular locality you regard as abnormal?

A. No, sir, I have not yet stated that, and I am not able to state it with exactness, but from the analyses which I have made during the last year or two of this water shed, and from the analyses which I had previously made in various parts of the State of New Jersey, I am led to believe that the normal chlorine on the water shed of the Rockaway River above Boonton lies somewhere between one and four-tenths to one and six-tenths parts per million, and perhaps one and a half.

Q. Per million what?

A. Per million by weight.

Mr. Corbin: Four-tenths part in a million parts?

Witness: Yes, in a million parts of water, one million parts of water by weight will contain one and a half parts of chlorine normally, that may be taken as an average figure.

Q. Have you there the amount of chlorine in the water of the Rockaway River, as it enters the Boonton reservoir?

A. The figures for the chlorine expressed in parts per million by weight appear to vary on these tables from three to five and six-tenths; the average figure does not appear to be stated here.

Q. The chemical tests, other than chlorine, are in the books that were offered, the exhibit numbers I do not remember.

A. I think they were.

Q. Have you gone through all the tests now, physical, or chemical, or microscopical and the bacterial, and told what you had to do with them?

A. I have not described all the detail of the chemical tests.

Q. Well, were they done in your laboratory?

A. They were also done in my laboratory.

Q. Under your direction?

A. Yes, sir.

Q. By this last witness, Mr. Mayer?

A. Yes, sir.

Q. And they are all here?

A. Yes, sir.

Q. What bearing have these chemical tests on the question of the contamination of the water?

A. Some of them would have practically no bearing at all, as for instance, the hardness of the water.

By the Court:

Q. The water mostly flows over granite rocks, does it not?

A. Very largely, yes. There are other chemical tests which might or might not furnish corroborative evidence of contamination, but as they also involve other conditions, as for instance, the amount of vegetable matter derived from the natural water shed or from growths of algae which might grow in the water, their importance is relatively small, compared with the bacterial results; the determination of chlorine is perhaps the most significant determination of the chemical analysis.

Q. From these analyses and the examinations in these four respects which I have mentioned what result did you reach with respect to the waters in the Rockaway river where they enter the Boonton reservoir?

By Mr. Corbin: That is objected to as incompetent and irrelevant.

Objection overruled.

Q. (Question read.)

A. That the water was contaminated.

Q. To a small extent or a serious extent?

By Mr. Corbin: That is objected to as leading.

By the Court: Ask him to what extent and how.

Q. To what extent?

A. I should say to a considerable extent for the reason that the number of baccilli was very large for a river of this character, and that the number of coli present was very large, and incidentally, that the amount of chlorine was above normal for that region, as I have estimated it, and also because the water has continuously a mouldy odor.

Q. Mr. Whipple, I understand you to have testified that the water in the Rockaway River where it enters the Boonton reservoir, from your analysis, is considerably contaminated; and I understand you also to testify that from your inspection of the contamination entering the river at Boonton and at Dover, your conclusion was that the water which entered the reservoir was contaminated. I wish now to ask you which, in your judgment, is the more conclusive test upon that question?

A. I think, all things considered, that the evidences of the inspection are more important than the evidences of analyses taken by themselves.

Q. Mr. Whipple, something has been said about the typhoid fever germ. Scientifically, that is known as what?

A. It is frequently spoken of as bacillus typhosus, or bacillum.

By Mr. Corbin:

Q. Called B-typhi, I suppose?

A. B-typhi is a way of speaking of bacillus typhi, but I think under the terms of typhoid bacillus it is more frequently used as I have spoken of it as the scientific term.

Further Direct:

Q. Typhoid bacillus or B-typhi is a bacillum which causes typhoid fever in man.

Q. Now, first as to its size?

A. Its microscopical size, in width it is somewhere about 1-25th thousandth of an inch, and several times as long as it is wide.

Q. Have you ever studied it?

A. I have.

Q. Have you examined to some extent its longevity—its length of life?

A. Yes, sir.

Q. Now return to its size; how many of them could be in a spoonful of water—in a glass of water, without it being possible for the eyesight to detect them?

A. I suppose there might be millions there. We know where large numbers are present such water may have a very slight opalescence.

Q. Does their presence in almost countless numbers affect water either by sight or smell or taste, so far as you know?

A. No, sir, not unless present in enormous numbers, so that they would show by their mass; individually not giving any such evidence as you speak of.

Q. Then water that appears perhaps as entirely wholesome for drinking purposes by sight and by taste and by odor may contain this bacillus?

A. Yes, sir.

Q. Where are they generally found, where do they live?

A. As far as we know their most important habitat is in the intestines of some human being.

They may live in milk or various culture medias we may have in our laboratories; they may be made alive in water; they have been found in oysters, etc. They may live for some time outside, but the human body is the most common habitat, speaking generally, that is human intestines.

Q. What is their general method of conveyance from one human being to another?

A. That depends a good deal upon the circumstances, but water certainly plays a very important part, and all things considered is perhaps the most important agent in transmitting that disease from one person to another. I would not limit transmission, however, to water.

Q. Now, do they multiply by spores or fission?

A. As far as we know, they do not form spores, but do multiply by fission—by division.

Q. When they multiply by division, do they divide between the head and the tail, or how do they divide?

A. As far as we know, there is no head or tail to them, for they are simply elongated—you might say cylindrical in shape, but much like a sausage.

Q. Now, when they divide, do they divide at one end or the other end or in the centre?

A. They divide near the centre, that is to say one sausage becomes two, and I may add each half will then grow to be the size of the original.

Q. When they pass from a diseased person, in what excrementa do they pass?

A. In the feces, frequently in the urine, sometimes even in perspiration, and in the saliva.

Q. When the pass in the urine, do they pass there in numbers.

A. Often in very large numbers.

Q. Well, if I may call it or characterize it as an orginary passage of urine, how many would there be in an ordinary passage of urine?

By the Court: Do you mean from a person having typhoid fever?

Q. Yes, from a person having typhoid fever, how many of such bacilli would pass?

A. That is a matter which must vary a great deal, according to conditions. Some cases no typhoid bacilli at all are found in the urine, but when they are found, they are usually found in very large numbers, and those numbers run up to millions and millions. I have seen urine from a typhoid fever patient which certainly contained a billion in the discharge.

Q. An ordinary discharge?

A. Yes, sir.

Q. You say a billion in an ordinary discharge?

A. What I saw, certainly.

Q. Now, one other question; do the typhoid germs continue to pass from a patient after he is apparently well of the disease?

A. They often do, that is especially true when the urine is affected, and in cases where no urinary disinfectant has been used.

By Mr. Corbin: I object to this, the witness is not qualified to speak on this subject as he is not a physician.

Objection overruled.

A. I think I did answer yes to that, although I described some of the symptoms.

Q. Do they stop passing from the person who has been sick sooner from the bowels or sooner from the urine?

A. I think it is generally considered that when they are present in the urine they persist there longer than in the bowel discharges.

Q. How much longer about?

A. I do not know exactly, but I think several weeks is sometimes stated as being the limit.

Q. Several weeks after what?

A. After the person has apparently recovered, has recovered enough to be up and around.

Q. I meant how long after they had ceased passing from the bowels?

A. Well, I think the same answer would be approximately correct.

Q. You have said how they multiply in the human system; do they multiply in ordinary water in that way?

A. As far as our experience goes and our knowledge goes, the typhoid baccilli do not multiply in ordinary water, or that is to say, ordinary drinking water.

Q. Do they multiply in sewage water, water polluted by sewage?

A. I know that they will multiply in sewage which has been sterilized; their behavior in raw sewage we know very little about, but so far as we do know, we do not believe that they multiply, to any great extent at any rate, in sewage.

Q. So far as your judgment goes, would they multiply in the waters of the Rockaway River as you have seen it?

A. Judging from my studies I should say no.

Q. As to their longevity, will you please state how long you know that they will live, from your cultivation of them?

A. From the results of my personal studies, which were conducted in laboratory, on a laboratory scale, I have known them to remain alive in water for upwards of two months?

Q. What is the generally accepted theory as to their longevity, in your profession?

A. That some of them may remain alive for several months, but in order to answer that question with any degree of accuracy you would have to state something with regard to the conditions under which they existed; for instance, the character of the water, the temperature, the exposure of the water, and a number of conditions would have to be taken into account.

Q. Have these experiments developed where the running water is, because of its being running water, at all destructive to them?

A. So far as running water, as distinguished from standing water, goes, there is little reason to believe that the motion of the water itself tends, to any great extent at any rate, to reduce the number of typhoid baccilli that might get into it.

Q. Was any examination made into that, of the waters that pass over Niagara Falls, was there any authenticated examination?

A. Not to my knowledge so far as bacteria goes. I know of chemical analyses that have been made above and below the Falls, showing very little change in the character of the water; but there are many factors involved in the chemical aspects of the problem which would not be involved in the bacterial aspects of the problem.

Q. Are there other germs transmitted by water which affect the health of mankind?

A. Yes, sir.

Q. State them?

A. There is, for example, the baccillus of Asiatic cholera or the baccilli which cause dysentery.

Q. Dysentery?

A. Yes.

Q. What else, is there the diarrhoea germ?

A. Yes, using that term in a broad sense as in proving very many forms of diarrhoeal troubles.

Q. Do you know of any example which demonstrates that fact?

A. We have a number of instances on the continent where Asiatic cholera was caused by drinking infected water.

By Mr. Corbin:

Q. That is the European continent you mean?

A. I mean Europe, I will say, and some instances might be named in this country where dysentery or diarrhoea was apparently caused by drinking contaminated water. One of these was at Burlington, Vermont, which was studied by Prof.

Sedgwick a number of years ago, and which was more recently studied by N. M. Baker and others. I know of an instance myself in Maine where a town had an epidemic of dysentery due apparently to, or following immediately after, drinking contaminated river water, their water supply becoming accidentally at the time when there was a fire in the town. It is known also that in Albany after the filter was introduced, not only the number of deaths from typhoid fever was greatly reduced through the improved character of the water, which was the Hudson River, but also the number of deaths from diarrhoeal diseases was even more reduced.

Further Direct Examination:

Q. At that same time did you observe the sickness in the city of Troy?

A. I compiled figures from the report of the New York State Board of Health at that time and the comparison that I made covered a period of I think five years before the introduction of the Albany filter, and five years after; I made similar comparisons for Troy, which was a neighboring city, and where I thought the general sanitary conditions might be very much the same and where, moreover, there had been no important change in their water supply, and I found that there there had been only a slight decrease in the number of deaths from diarrhoeal diseases, while there had been substantially no decrease in the number of deaths from typhoid.

Q. Was that during the same time that there was this decrease in Albany in the diarrhoeal disease?

A. I have referred to corresponding periods, of same years.

Q. How far is Troy from Albany?

A. It is five or six miles up the river, and on the other bank.

Q. Now, what examples can you give us as to the distance typhoid germs will pass in water?

A. I may mention one instance that I investigated two or three years ago, in Maine, where a severe epidemic of typhoid fever in Augusta followed immediately after a similar epidemic in Waterville, which is seventeen or eighteen miles further up the Kennebec River.

Q. When did the epidemic in Waterville arise?

A. That was apparently caused by two cases of typhoid fever on the water shed of their supply, one or two miles above their intake.

Q. Did you make any study of that?

A. I did.

Q. How long were you studying it?

A. Taking these two cities together, I should say a year and a half perhaps.

Q. Well, did you trace the epidemic in Waterville to these two cases that you speak of.

A. I think we traced it to those two cases, there is much positive scientific knowledge to-day about that, and all that testimony was given before the courts at Waterville.

Q. Did you trace it to any privy?

A. Well, the circumstances in Waterville were these, that——

Q. No, answer the question; did you trace it to any privy?

The Court: Let him state the circumstances.

Q. Go on and tell in your own way.

A. Speaking definitely I should have to answer that no. But the circumstances were these, that there were two cases of typhoid fever occurring on the water shed, and it was learned that these persons had used the privies, and that the contents of the privies were spread upon the ground at a time when the ground was frozen; then followed one or two severe rain storms, and about eight or ten days after the rain storms typhoid fever broke out in the city. The conclusion was that the water had become infected at those times.

Q. How near was that place where these were spread out to the river?

A. My recollection is that in one case the place was about a couple of hundred feet from the main stream, and in the other case it was about half a mile from the main stream, but in both instances there are brooks or gulleys which extend to the place, and perhaps within fifty feet of the exact spots.

Q. May I ask you to refresh your memory as to whether both of these cesspools were spread upon the ground or only one?

A. Well, in one case the material was spread upon the garden, in the other case it was put upon a manure pile near the stream, perhaps not deposited exactly on the surface of the ground.

Q. And were either of these cases from public buildings?

A. Yes, sir; one case, the one where the contents were spread upon the ground, was a case of typhoid fever which occurred in the Town Almshouse.

Q. That brook you referred to ran directly into the river or into another stream that entered the river?

A. It ran directly into the river.

Q. And from the mouth of that brook to the water works of Waterville was how far?

A. About one mile, as I recollect it.

Q. Now, was it on the same side of the river or the opposite side?

A. One was on one side and one on the other; the two came into the main stream at substantially the same point.

Q. Well, was the entrance of this brook or the exit of this brook into the main stream on the same side of the river as the city of Waterville?

A. The privy that was infected from the Alms House was on the same side. That which came from the other case came down a small stream which entered the river on the opposite side.

Q. How wide is the river up there?

A. A matter of thirty of forty feet, I suppose.

Q. Is it larger or smaller?

A. That is not the Kennebec River; the supply of water is what is called the Messalonska River.

Q. Was that Messalonska River larger or smaller than the Rockaway River where it enters the reservoir—the Boonton reservoir?

A. It looks to be about the same size. I have forgotten the exact drainage.

Q. Well, now, Waterville is on the Kennebec?

A. It is situated on the Kennebec River, but the water supply is taken from the little stream which enters it.

Q. The city of Augusta is situated also down on the Kennebec River?

A. About seventeen or eighteen miles down stream from Waterville.

Q. Is that on the same side or the opposite side?

A. The same side.

Q. Where does it take its water from?

A. From the Kennebec River.

Q. What is the nature of the stream from Waterville to Augusta—what is the nature of the flow?

A. Somewhat rapid during the upper part, that ·s, a few miles below Waterville, and then the current slows up considerably as it reaches slack water from the dam, which supplies power to the mills in Augusta, and that slack water extends a number of miles up the river; I don't remember just how far.

Q. How soon after the epidemic broke out——

By the Court:

Q. Where is the intake?

A. The intake for Augusta is just above the dam of the Power Company there.

Q. In the slack water?

A. In the slack water, right near the dam, perhaps a few hundred feet above the dam, on the Augusta side.

Further Direct:

Q. How soon after these two cases occurred did the epidemic break out in Waterville?

A. Well, as I remember it, speaking roughly, about two weeks after the first two cases that I have referred to, that is, after the deposit of the infection on the ground.

Q. Two weeks after the deposit of the infection on the ground?

A. That caused a few cases, apparently, in Augusta.

Q. In Augusta, you say?

A. Yes, sir, in both places. Later, when the epidemic broke out severely in Waterville, then the epidemic increased very greatly in severity in Augusta.

Q. Was it the result of your examination that typhoid fever was occasioned in Augusta from either both or one of the two cases, the typhoid fever that you have stated, occurred on this Messalonsky River?

A. Well, we thought at that time that a few of the initial cases in Augusta came from the original infection, but the epidemic taken as a whole did not really start until after the epidemic had begun in Waterville.

Q. These few cases in Augusta occurred what length of time after the cesspools were spread upon the ground?

A. Well, as I recollect it, it was about two weeks; I don't remember just exactly.

Q. How many died from that epidemic in Waterville?

A. I should have to refresh my memory on that. I don't put my finger immediately on the number of deaths, but there were in Waterville, and the suburbs were also supplied with the same water supply, three hundred and seventy-one cases, most of which were probably due to the original cause.

Q. How many in Augusta, about?

A. About three hundred and fifty in round numbers—336 cases, that is not deaths, but cases.

Q. In Augusta?

A. Yes, sir.

Q. And the same number in Waterville?

A. About that—three hundred and seventy-one, I think.

Q. What is the size of Waterville, what is the population of Waterville?

A. In round numbers I think about ten thousand—not quite so many, perhaps.

Q. How many in Augusta?

A. That is a little bit larger.

Q. Now, have you any other cases that you examined yourself which indicates the length of life of this typhoid germ?

A. The case of Bangor, where the conditions were quite similar to those in Augusta.

Q. On what river is the Bangor—and before you go to that, the Kennebec River compares in size with——

A. That is very much larger, I think, about something over a thousand square miles of drainage area, at that point.

By Mr. Corbin:

Q. That is, at the point of Augusta, you mean?

A. Yes, I can give you the figures in just a moment. The total water shed of the river is over 6,000 square miles; it is a very large stream.

Further Direct:

Q. Now, Bangor is situated on what river or stream?

A. On the Penobscot River.

Q. On that point where the Penobscot is, how does it compare with the Kennebec River, at the point where Augusta is situated?

A. Well, I don't know exactly, but it is fully as large.

Q. Now, tell us what happened there?

A. There was an epidemic which occurred there a short time after an epidemic started in the town of Millinockett, something over eighty miles up the stream. This town of Millinockett to which I referred when I spoke of the epidemic of dysentery, which used the river water at a time when it was exceedingly contaminating, due to the use of the water for fire purposes—there was a mill which had a fire connection with the river for fire purposes, and at the time of the fire the pressure of the town supply, which was a supply of good water, was not ample, so that they used the river water to help out, and this was followed by an epidemic of dysentery, so that there were two or three hundred cases in the town, the town being one of a few thousand inhabitants, I have forgotten how many.

By Mr. Corbin:

Q. Dysentery in what town?

A. Millinockett town; I think it is one of those paper mill towns. A few months later they had a second fire, and they again used the river water; this second time its use was followed by an epidemic of typhoid fever, where there were several hundred cases, and a short time after this typhoid fever broke out, not only in Bangor, which used the Penobscot water for the purposes of public supply, but also in one or two smaller places between the two cities named, where they also used the river water, and it was very apparent from the time when the epidemics occurred in these places that the water had become infected by the city or the town near the head waters, and that the infection had passed down the stream into the water supply into these towns.

Further Direct:

Q. Are you acquainted at all with the epidemic which occurred at Mt. Savage on the Potomac River?

A. I know it only by reading of it, and I haven't read the account of it so that I recollect the circumstances very minutely.

Q. Well, are there any other cases that you have personally examined that will give us an idea of the duration or life of this typhoid germ in running water or still water?

A. Perhaps the largest epidemic I ever studied was that in Cleveland, Ohio, which occurred there two or three years ago. These epidemics in Waterville and Augusta occurred during the winter of 1902 and 1903. The epidemic in Bangor occurred, I think, the following year, 1903 and 1904.

By the Court:

Q. In what extremes of heat and cold will the germ live?

A. It will live at the ordinary temperature which we find in our waters in this climate. Freezing will tend to destroy the germ, but some of them are able to live in ice water, and even in ice. Heat destroys the germ, but then it is necessary to heat the water to a point aproximating the boiling point, to utterly destroy it.

Referring to the epidemics of typhoid fever which occurred in Cleveland and extended pretty well over the year 1903, I may say that the water supply at that time there was taken from Lake Erie at a point about one or one and a half miles out into the lake. Since then they have introduced a new supply at a distance of about four miles from the shore, but at the time when the epidemic broke out there had been a severe rain which greatly increased the flow of the Cayuta River, the stream which enters into the lake at Cleveland, running through the city and which receives perhaps half the city's sewage. A study of the typhoid district, taken in connection with the rainfall and the direction of the wind showed that for a number of years the appearance of typhoid had followed certain conditions which called for sewage of the city to pass out into the lake to the intake.

Q. Wind and rain?

A. Wind and rain—any rain which increased the flow of the stream and which was accompanied at the same time by a wind blowing off shore in the direction of the intake, which would cause decided contamination of the water, which contamination was visible not only by analysis, but also apparently in many instances in the typhoid statistics of the city, and it was after one of those severe conditions that the epidemic of 1903 began, and that existed with some variations as to intensity for a period of something over one year, during which there was more than 6,000 cases of typhoid fever in the city; and that epidemic continued to be pretty severe until they introduced the water from the new intake which was four miles out into the lake; within two weeks or so after the introduction of this water the epidemic came to a rather sudden close, and it was very apparent that it had been due to the use of contaminated water taken from the lake at the old intake.

Further Direct:

Q. You have stated in respect to Bangor that the typhoid germ had traveled by water about eighty miles?

By Mr. Corbin: He didn't say that.

A. I stated that the epidemic had occurred up stream in Millinockett, which was over eighty miles from Bangor, and our conclusion was that that was the cause of the epidemic in Bangor.

Q. In what way was it the cause, by water or railroad cars or how?

A. Well, from that, the assumption certainly was that the introduction of it passed down the stream that distance.

Q. Now, if it did pass down the stream, how long would it take for the germ to pass down the stream from where it entered the stream to where it got to Bangor?

A. I could not state from personal knowledge, but we at that time asked the geological survey engineer to give us an estimate of it, and they stated that it was somewhere from five to seven days under the conditions of stream flow, which existed at that time.

Q. Now, have you made any experiments to see what depth the sunlight is injurious to these germs, if it is injurious?

A. I have not so far as typhoid germs themselves are concerned. I have made a number of experiments to show the intensity of the active rays of the sun at different depths of water. I have made experiments with bacillus coli, but never with typhoid bacillus.

Q. Do the rays of the sun affect the germ B. coli?

A. Yes.

Q. How?

A. They are destructive. That is to say, if we had a B. coli in a glass of water and exposed that glass of water to the sun's rays in the window, after a certain time, longer or shorter the sun's rays would destroy them.

Q. About how long?

A. It is a question of hours rather than days I cannot say exactly.

Q. It is a number of hours?

A. Yes, sir.

Q. How far in depth in the water will these rays be injurious to these germs?

Q. I found that below a depth of about two feet, in the particular water where I made experiments, there was no appreciable affect of the sun's rays in the course of one or two weeks. Near the surface, for a depth of a few inches, the effect was noticeable and it decreased as we went down; as I say below two feet there was practically no result.

Q. Was that water which you experimented with any different from the water of the Rockaway river?

The Court: Was it running or stagnant?

A. The experiments were made in one of the reservoirs of the Brooklyn water works where the water was quite a light color and where we would expect the sun's rays, if at all, to penetrate to a considerable distance. The experiment was made by putting B. Coli in equal amounts in different tubes or small bottles and exposing them in the reservoir at different depths, at intervals withdrawing the bottles and testing them to see whether or not the germ was still living.

Q. You have mentioned B. Coli often, you have not yet explained why B. Coli have anything to do with the typhoid germ; will you please explain that?

A. The coli baccillus is a bacterium which is normally present in the intestines of man and of warm-blooded animals and it is for this reason that it is of special importance in the study of the bacteria in water.

By the Court:

Q. Your assistant said that nobody has ever seen one under a microscope and that the fact of their existence is rather a deduction, a scientific deduction from the known or observed facts rather than from any inspection of these baccilli by any of the senses or by any aid to the senses, will you explain, I do not understand that?

A. I will try to make it clear; I did not so understand his testimony. But the facts are these, so far as I know them, that it is possible to see this baccillus coli under the microscope, but it is impossible to distinguish it under the microscope from a number of others. In fact, it looks quite like the baccillus of typhoid fever, so that from that test alone we cannot say we have found the coli baccilli. We use that, however, at times as a part of the test for the coli baccilli; that, taken in connection with certain chemical changes which the presence of this baccilli may bring about in our culture media, that is to say, I have already referred to the effect of the presence of these organisms in causing gas in the fermentation tube. The appearance of the organism in mass can be seen, that is, we can see the organism in our pure cultures in mass; but that appearance, taken by itself, is not characteristic; the appearance of the colonies that form in the gelatine is to a certain extent characteristic, although we cannot determine the presence of coli baccilli alone from that.

Q. Is that because it is so small that it cannot even be seen under the microscope or because its form is exactly like the others?

A. The latter is the idea; it so resembles others that we cannot distinguish it.

This organism causes certain chemical changes in some of our media which we study. For instance it will coagulate milk, cause it to curdle, but others may do that also. It will produce a red color when grown on lactos litmus agar to which my assistant referred. It is by taking the sum total of these various characteristics that we tell whether or not we have really found the organism for which we are searching.

Further Direct Examination.

Q. Has anyone found in water the disease germs such as typhoid, diarrhoea, cholera and the other germs?

A. There have been one or two instances where apparently the typhoid baccillus has been found in water, the cholera baccillus has also been found. Speaking generally, however, our means for making such a determination are so entirely inadequate that we may say that it is not possible to determine the typhoid baccillus in ordinary water. It is not beyond all of our bacteriological tests, but looking at it in a practical way it is beyond them at the present time.

Q. Have you made any analyses of this water to find disease germs?

A. I have not.

Q. Why not?

A. For the reasons stated, that I thought the results would not be valuable.

By the Court:

Q. Do I understand you as saying that you cannot, by any test or experiment detect the presence of typhoid baccillus in water?

A. I say that it is not entirely beyond the bounds of our bacteriological methods to-day. In laboratory work for instance where we study the longevity of the typhoid baccillus in water, if we had no methods of detecting these we could not tell how long they would live, but when we consider the small number of typhoid fever germs that would be likely to be present in any natural water, as compared with the ordinary water bacteria, then our methods are not sufficiently accurate so that we may say that the water does not contain the typhoid fever germ. If we should by any chance, I may say, find that germ our bacteriological methods would be sufficient for us to recognize it, if we applied them all; but the chances of getting it would be, or the chance of missing it—either one—would be such that as a practical test it is not advisable to make the determination.

Q. Is it the same with typhoid germ as with the B. Coli? that the characteristics are not visible under the microscope in such a manner as to enable you to distinguish it from other germs?

A. The two are very similar; we have to use a great many tests in the laboratory.

Q. But you cannot by mere examination under the microscope determine by its form or other characteristics, as you see it, that it is the typhoid baccillus?

A. No, sir, we cannot, from that alone. We know the typhoid baccillus very well and we can see it with the microscope but we know that it is the typhoid baccillus partly from other tests than the microscopical test alone. The malarial germ is somewhat easier to identify microscopically, it belongs to a different order of beings altogether.

Q. They do stand on the same footing then as the B. Coli germs? as far as the microscopical examination goes?

A. Yes, but not so far as the determination in water goes.

Further Direct Examination.

Q. These typhoid germs at certain stages of their life, are they vegetable or animal?

A. Supposed to be vegetable.

Q. Have they the power of motion?

A. Yes, sir. An active typhoid baccillus has a few flagella or hairlike appendages around the body, which, when they move, tend to make the organism move through the water and they will move, in fact, are quite lively as you see them under the microscope, but their actual motion I suppose is of course very small.

By the Court:

Q. Are they of the same specific gravity as the water or lighter?

A. If anything, they are somewhat heavier, and naturally tend to settle.

Further Direct.

Q. Now, to return to the sanitary conditions at Dover, what have you to say as to the danger of epidemic breaking out in Dover?

A. Well, I consider that the general sanitary conditions of the city are such that an epidemic is likely to occur at almost any time—an epidemic of typhoid fever.

Q. What have you to say in that respect of the village of Hibernia?

A. I should say that the conditions there were much more favorable to the occurrence of an outbreak of a typhoid epidemic than at Dover.

Q. Won't you state what you mean by that, what conditions?

A. I found at Hibernia a number of houses somewhat huddled together with bad sanitation, that is, with sanitation generally bad, with many privies exposed to the air, for instance, and with a sinkage sluicing over a part of the ground and going into the small ditches and brooks about there, and should a case of typhoid fever occur in one of those houses and the discharges of the basins enter the privy, it would be somewhat surprising if through the agency of flies the infection was not transferred to some other house or some other patient, or some other of the population there, and it would be a very easy matter with a severe epidemic, to sweep through such a settlement as there exists. The conditions would be somewhat analogous to the conditions in some of the military camps of our soldiers during the Spanish war where typhoid fever did break out.

Q. What sanitary methods should be adopted at Hibernia to prevent the water of the river from becoming contaminated with disease germs?

A. I think the first sanitary reform that is necessary there is to put the settlement in better condition, sanitary condition, so as to prevent typhoid fever from becoming epidemic there, and in order to do that, I should want to improve the character of the privies and cesspools that are there; there should not be a privy there left so that the fecal matter can be visited by flies; that could be prevented to a very great extent by the use of screens and self-closing covers. In the general drainage of the village it can be materially improved by looking after or doing away with the present drainage system, which is really no system at all and substituting a well-defined system of drains, so arranged that the slop water and so forth, can be conducted to some one place, or some two places where the material can be disinfected or properly purified. I found there water coming from the mines, which water was apparently contaminated. That could best be controlled—— (Interrupted.)

Q. I don't understand what you mean by apparently contaminated. I don't quite catch your meaning?

Q. So far as the analysis of the sample of water which I made indicated. I did not enter the mine, but I was informed of the general conditions existing inside by one of the foremen who worked there. If the co-operation of the mine owners could be secured, it is probable that that water might be rendered almost without danger, that is to say, if the actions of the men in the mine could be properly controlled; but even with their co-operation, it is doubtful whether or not it could ever be made absolutely free from danger—it might be done, however.

By the Court:

Q. What might be made free of danger?

A. The water which is pumped from the mine.

Further Direct.

Q. How?

A. It might be made free of danger by sterilizing the water or by filtering it. In two cases at the present time the mine water is used for condenser purposes, and so heated that the danger is very largely eliminated. This perhaps might be done in the third case where it is not done at the present time. In summing up I might say that what is needed there would be a general improvement in the sanitary surroundings of the inhabitants and the sterilization or purification of the drain water and the contaminated water from the mine.

Q. I will ask you a word about Hibernia. The residents of Hibernia are of what character as to length of residence, and as to the intelligence?

A. Well, they are foreigners, a good many Hungarians, I believe. What their term of residence is I don't know, but I imagine like most mining communities they come and go, according to the amount of output that is coming from the mine.

Q. The distance by water, Mr. Whipple, I think I failed to ask you, from Hibernia to——

The Court: Well, you have a map of that, you can estimate it exactly; I suppose that is one of the geological survey maps, and it is conceded by both sides that they are accurate.

Mr. Corbin: Oh, yes.

Q. Now, as to Mt. Tabor, go to Mt. Tabor and tell us what is the chance of an epidemic arising there?

A. Well, judging from the experience of other communities where the conditions are somewhat similar, that is, where you have got a floating summer population, hurriedly brought together for a month or two, there is a good chance for a typhoid epidemic to break out in that settlement. The sanitary conditions are very much better, however, than they are in Hibernia, that is, I found no open privies, or only a few at any rate, where, in Hibernia there are a good many, but they have no sewage system. Some of the sink drains discharge under the ground, and there is, of course, in any community an epidemic likely to be caused by infected milk or infected food.

Q. Well, the residents of Mt. Tabor are they what is known as summer residents?

A. As I understand it is a camp meeting ground where they have a considerable population that stay there for several weeks, and where a great many come for a night or two.

Q. What is the character of the buildings there, are they wood or what?

A. Small wooden cottages.

Q. Do you know whether there are tents there in summer?

A. I think there are a few; I cannot say that I have seen many, I have seen a few.

Q. Now, Mr. Whipple, I will take you to another subject. What are the domestic uses of water, or water for domestic purposes?

A. Speaking generally, you mean?

Q. Yes.

A. Why drinking and toilet uses, cooking, washing clothes, etc.

Q. Well now, it is said that there is a laundry the discharge from which enters the Rockaway river at Dover, what have you to say as to the damage from that?

A. Well, under certain conditions, the discharges from that laundry might be infected with typhoid fever germs, for instance——

Q. Well, how.

A. It is well known that the clothes and bedding, etc., of typhoid fever patients may be infected, and it is a natural inference that the waters in which those articles are washed would also become infected, and if those waters were discharged into the river they might infect the river.

Q. Is there any other danger from the laundry water than that?

A. Not from laundry water, I think, no, sir.

Q. How about the other disease germs?

A. Well, I take typhoid fever simply as an illustration; the same thing might be true of some of the diarrheal diseases.

Q. One question which I forgot to ask you with regard to the water supply at Augusta, do you recall how long previous to this epidemic the water supply had been used, that was being used at the time of the epidemic—about?

A. Why, as I remember it, at least ten years and perhaps longer, I think for a considerably longer period.

Q. Had there been any other epidemic in Augusta during those ten years of typhoid fever?

A. There had been no epidemic nearly as severe as the one that we studied, but all during that time the typhoid fever death rate of the community had been high, and there were one or two years when the rates were higher—when the number of cases was considerably greater than the average, and there were one or two years, I was told, when they had epidemics of what they call winter cholera. I suppose a sort of dysentery or diarrheal disease.

Q. Please tell us with regard to Bangor, how long they continued taking the water from the river for drinking purposes?

A. Well, I think fully ten years, perhaps longer.

Q. How had that been effected as to epidemic of typhoid before that date?

A. Well, typhoid had been very abundant in Bangor before the epidemic, the death rate had been quite high, it averaged high, and there were a good many years when it was higher than the average.

Q. Is that true also of Waterville?

A. To a somewhat less degree with Waterville.

Q. Now assuming that typhoid fever germs are carried by the Rockaway river into the Boonton reservoir, state whether in your judgment the water of the reservoir would be deleterious for drinking and domestic purposes?

A. I should say that the water in the reservoir would be deleterious.

Q. Assuming the typhoid germs are carried by the Rockaway river from the town of Dover into the Boonton reservoir, state whether or not such germs would reach those who drink the water in Jersey City?

A. That would depend upon some conditions, but under conditions which would be likely to happen at times I think some of them would?

Q. Conditions of what kind?

A. When I say conditions, I refer particularly to conditions of rainfall, large flow in a stream, conditions of wind which would tend to drive the water rapidly across the reservoir to the outlet.

Q. There was something said yesterday by the witnesses about the bottles used for samples being held with the mouth up stream or the mouth downstream; will you please explain what the importance is of that, if any?

A. I do not look upon it as a matter of very great importance in any event. As I recollect, my instructions to Thomas Constable, they were such as I ordinarily give, namely, that in collecting the chemical sample the neck should be kept downstream. The reason for that is simply to avoid having float into the bottle some stray pieces of twig or leaves or sea-weed or something which might be unfair.

My practice in doing that, however, is not to place the bottle so that the washings of the hand will follow into it, but rather to put the hand on one side and the object is simply to avoid any extraneous particle of large size getting in.

Regarding the sample for bacteriological examination it makes very little difference because the mouth of the bottle is so large that it is simply dipped into the water and out again almost instantly and it makes almost no difference whether the mouth of the bottle is upstream or downstream. As a matter of fact, the bottle is nearly always held vertically, it is a very small bottle.

A recess was then taken until two o'clock.

Q. Now, Mr. Whipple, I want to take you to the ends of this aqueduct, where it discharges into what may be termed the Bergen reservoir, at least it is so called in the specifications, as the Bergen reservoir; and I ask you whether you made any analysis of the waters discharged there.

A. That was made under my direction the same as the samples which were collected at the point where the Rockaway river flows into the Boonton reservoir.

Q. Who was it collected those samples, the same person?

A. Yes, sir, the witnesses who collected samples from the Rockaway river.

Q. Where did you direct them to collect samples from?

A. From that place where the water empties out of the aqueduct line into the reservoir.

Q. The Jersey City reservoir?

A. Into the reservoir in Jersey City.

Q. And Mr. Constable and Kearney obtained these samples at the same time as they obtained the samples as they have described from the waters of the Rockaway river where they enter the Boonton reservoir?

A. On the same days.

Q. Using the same valise?

A. Yes, sir.

Q. That they spoke of in their testimony several times. Now I present to you tables and ask you to tell what these are. First there is a tracing; tell us what that tracing is?

A. This tracing which I have here has this title, "Results of daily bacteriological examination of the water at the inlet of reservoir No. 2, Jersey City." I understand that the reservoir No. 2, Jersey City, is what you have called the Bergen reservoir, and that the inlet to this reservoir is the same as the outlet of the aqueduct—that is, where the aqueduct discharges?

A. What do you mean by aqueduct?

A. The pipe line which conducts the water from the Boonton reservoir into the distributing reservoir at Jersey City.

Q. About how long is that pipe line, what is the length of it?

A. In the neighborhood of 20 miles, I don't know exactly.

Q. And it is all iron or part tunnel—cement tunnel?

A. It is partly pipe line and partly tunnel, there being several sections of each.

Q. Now, at the outlet of the aqueduct, have you made analysis of samples of waters taken there—where were the samples taken from?

A. At the end of the pipe line which terminates in a sort of gate chamber of either masonry or concrete, I don't know which.

Q. These samples were taken from there?

A. They were directed to be taken where I took the first one.

Q. Describe where you took those samples?

A. On the shore of this reservoir in Jersey I found this masonry structure—a well, it had been built, and into which the pipe line from the Boonton reservoir discharged this water. At one end of this well the water was discharged from the well into the reservoir itself, forming a sort of waterfall into the reservoir, and I took the first sample from the water just as it passed over this ledge, that is, from the falling water into the reservoir.

Q. The tracing that you are reading from shows what?

A. Shows the number of bacteria per cubic centimeter from July 19 to September 30, 1904, and the number of tests of samples for the colon baccillus from August 10th to September 30, 1904. It also shows the average number of bacteria for each of the three months, July, August and September and the per cent. of positive tests for the samples, when tested with different quantities of water.

Q. From what was that tracing taken?

A. These figures were taken from the original records and I think it was made by Mr. Baton, who, after having made it, compared the figures back with those of the original books and found them to be correct.

Q. You have the original books here have you not?

A. The original books are here and I think have already been numbered.

Q. That is a copy of those books that you have here?

A. Yes, these are figures copied from those records.

Q. Where were those analyses made?

A. At my laboratory at the Brooklyn Polytechnic Institute in Brooklyn.

Q. What had you to do with making the analyses?

A. I had the oversight of the work just as in the other cases to which I have testified.

Q. Were they made at the same time substantially with the other samples?

A. Yes, sir.

Q. Samples from the water at Boonton?

A. Yes, sir.

Mr. Vredenburgh: I offer that schedule in evidence.

Mr. Corbin: We object to the tracing unless it is followed up by proof of the proper taking by samples.

Q. Those boys are not here this afternoon, are they?

A. I think not.

Mr. Vredenburgh: We will produce them. Do you want Mr. Baton?

Mr. Corbin: Well, I will ask him this question:

Q. It is understood he (Mr. Baton) carried his tests for B. coli to the same extent and no further than he did in the other cases—the same sort of practice was it not?

A. I can answer that. The tests were made in exactly the same way as those at the Rockaway river. The results referred to here were based wholly on the presumptive tests as far as these records go. In a number of these instances we carried the tests further, more completely, but this paper does not show how all of these tests were carried out.

Q. They were carried out the way you testified the other day?

A. These results were made by the presumptive test exactly in the manner he described.

Mr. Corbin: I do not think we will need to have Mr. Baton produced.

The tracing referred to was then marked Exhibit C No. 41.

Further Direct Examination.

Q. I show you a paper entitled "Table No. 4, Results of Physical and Bacteriological Examination of samples of water from the inlet to the high service reservoir in Jersey City May 13 to June 17, 1905," and I will ask you whether the water as you understand was taken from the same place as the other samples referred to in the former exhibits?

A. I understand that they were, the collector was so instructed—was instructed to collect them at the same place.

Mr. Vredenburgh: Now, I offer that in evidence.

Marked Exhibit C 42.

Mr. Corbin: Same objection.

The Court: Both statements are admitted in evidence on the understanding that the two boys will be produced.

Mr. Vredenburgh: This last one made by Mr. Mayer, is the same admission made as to that?

Mr. Corbin: Well, what has he got to say about that?

Q. What have you to say?

A. The methods of analyses were precisely the same that we used in connection with the samples from the mouth of the Rockaway river; the figures as here stated refer to the results of the presumptive test only. Mr. Mayer took some of the samples through a long procedure, but this table does not indicate upon which of those he did that.

Q. Can you mark those that he did take through?

A. I think, if it comes to that, I should rather have Mr. Mayer testify to his own marking, Mr. Vredenburgh.

By Mr. Corbin:

Q. Well, the figures only show the presumptive test?

A. The figures, so far as introduced, merely show the result of the presumptive test.

Mr. Corbin: You need not bring Mr. Mayer, so far as I am concerned then.

Further Direct.

Q. Does either one of those show the chlorine?

A. I haven't both of them here. This one does not, the one for 1905 does not, and I know the other does not.

Q. Now, will you please tell us what those exhibits show as to the presence of bacteria, and as to the presence of B. coli in the water?

A. Before answering that I want to see the table.

Q. (Same handed to witness.)

A. The table marked C 41, which represents the results of analyses made during 1904, show that the number of bacteria at the point of discharge of the aqueduct, varied at different times from 120 to 2,500 per cubic centimeter.

Mr. Corbin:

Q. The average?

A. The average number of bacteria for the entire period being six hundred and forty-two; it shows that fifty-three per cent. of the samples give positve tests for baccillus coli in one cubic centimeter of water; eighty-one per cent. of the samples tested give positive results when ten cubic centimeters of water were used for the test. Twenty per cent. of the samples give positive tests for B. coli when but one-tenth of one cubic centimeter was used for the test. In the case of the results obtained during 1905 the number of bacteria varied on different days from 210 to 2,400 per cubic centimeter. The average number for the period being 700. Thirty-five per cent. of the samples give positive tests for B. coli, when ten cubic centimeters of the water were used. Four and a half per cent. of the samples tested, give positive tests for B. coli, when one cubic centi-meter was used for the test, and four and a half per cent. of the samples collected gave positive tests for B. coli when but one-tenth of one cubic centi-meter was used for the test.

Q. Is that the same in one cubic centi-meter and one-tenth the same four and a half per cent. in each case?

A. It is; it represents the result of one sample only.

Further Direct.

Q. State what light, if any, Mr. Whipple, is thrown upon the question of the purity of wholesomeness of the water as it arrives in Jersey City, by these analyses?

A. It shows that the water is to some extent contaminated, but in a lessor degree of course than was the case in the water at the Rockaway river where it discharges into the reservoir.

Q. Is or is not that water at all times pure and wholesome for drinking and domestic purposes?

A. Judging from all I know of the situation I should say no.

Q. Mr. Whipple, did you make any report to Jersey City of the results of your examination?

A. I did, yes, sir.

Q. When was that report made?

A. It bears date Nov. 1, 1904.

Q. And that report has annexed to it what tables?

A. 25 tables altogether. Shall I read the tables?

Q. Oh, no, only read the headings.

A. Only the headings.

Q. Yes, just the headings.

A. Table No. 1, population on the Rockaway river, above Boonton.

Table No. 2, population on the Passaic river above Little Falls.

Table No. 3, list of nuisances in the Longwood district.

Table No. 4, list of nuisances in the Green Pond district.

Table No. 5, list of nuisances, Dover district.

Table No. 6, list of nuisances, Hibernia district.

Table No. 7, list of nuisances, Rockaway district.

Table No. 8, list of nuisances, Boonton district.

Table No. 9, analyses of samples from unpolluted sources.

Table No. 10, analyses of streams and ponds more or less polluted.

Table No. 11, analyses of polluted sources.

Table No. 12, analyses, Rockaway river.

Table No. 13, analyses, important tributaries.

Table No. 14, analyses, Boonton reservoir.

Table No. 15, analyses, Jersey City distibution system.

Table No. 16, daily observations, Rockaway river at mouth.

Table No. 17, daily observations, end of aqueduct line, Jersey City.

Table No. 18, daily bacteriological examinations on Rockaway river.

Table No. 19, daily bacteriological examinations, Jersey City.

Table No. 20, microscopical examination Boonton reservoir.

Table No. 21, microscopical examinations, end of aqueduct line.

Table No. 22, microscopical examination reservoir No. 2, Jersey City.

Table No. 23, elevation along Rockaway river.

Table No. 24, elevation of water surface in Boonton reservoir.

Table No. 25, typhoid fever deaths in Jersey City by months.

The above are abbreviated titles. Each table has a somewhat longer title than those that I have read.

Q. Is that all?

A. Yes, sir.

Q. Now, was more than one copy of that report sent to Jersey City?

A. My recollection is that I sent two copies.

Q. Now, have you seen one of those copies in the possession of the defendant here during this trial?

A. I thought so, but I am not sure.

Q. You don't know to your own knowledge whether a copy was sent to them?

A. No, sir.

By Mr. Corbin: I don't understand the significance of this examination. I would like to know for the purpose of cross examination whether you intend to offer it.

By Mr. Vredenburgh: No, I don't intend to offer it.

Cross Examination. By Mr. Corbin.

Q. Are you a member of the firm of Hazen & Whipple?

A. I am, sir.

Q. Makers of filtration plant, and such like work, for water supplies?

A. Not makers of them, we design them.

Q. You are engineers—you are the theoretical man, and your partner is the practical man, is he not?

A. We don't divide it exactly in that way. I give most of my time to sanitary matters, and he to the structural features.

Q. During most of your work you have labored in the laboratory, haven't you?

A. The last part of my time, for the last ten years or more has been laboratory.

Q. These several towns of which you spoke in the first part of your examination when you made examinations or where you made investigations were towns where there had then lately been typhoid fever developed or other sanitary troubles?

A. You refer to those in Maine?

Q. I refer to all the places you mention, and one I think was Waterford?

A. Waterville.

Q. Pittsfield, Massachusetts?

A. Not to my knowledge there, no, sir.

Q. Oh that was the paper mill case. Meridan?

A. I don't think so, no, sir.

Q. Philadelphia?

A. There had been there—I don't know just at that time, but typhoid has been constantly there so long that I might say yes to that.

Q. Santiago?

A. No, except among the troops there; my work had no relation to an epidemic.

Q. Birmingham, Alabama?

A. There had been typhoid fever but I don't know whether epidemic.

Q. Burlington, New Jersey?

A. Not to my knowledge.

Q. With what view were you to examine matters at Burlington?

A. That was in connection with advising them as to what they should do with reference to their supply, whether they should put in a filter plant or drive wells.

Q. Was not there also a place in Vermont?

A. Burlington, Vermont? I don't recollect I ever did any work there. I referred to that in connection with the matter, not as far as I was personally engaged.

Q. You have assisted, your firm has in the examination of various water supplies with a view to afterwards restoring filtration, or filtration plants?

A. Yes, sir.

Q. And your firm has designed such plants?

A. Yes, sir.

Q. That is the principal business of your firm is it not?

A. We make a specialty of water purification and sewage disposal.

Q. This Rockaway water shed, without population, is a very ideal sort of a water shed for a water supply, is it not?

A. The surface water shed is a very good one.

Q. What?

A. Yes, for a surface water shed it is a very good natural water shed.

Q. A good deal of the surface is hilly, is it not?

A. Yes, sir.

Q. And the run-off is rather rapid?

A. Yes, sir.

Q. And there is a good deal of forest?

A. In the upper part, yes, sir.

Q. I think you have not indicated on your map the elevation, have you?

A. No, sir.

Q. Did you examine the Longwood valley in the northwest part of this water shed?

A. I drove out for a short distance, but not far.

Q. Did you examine the——

A. I examined the topographical maps.

Q. Did you examine the reservoir site of five hundred odd acres, which the company conveyed to the city there in connection with this work?

A. No, sir, I did not.

Q. You did not look into that at all?

A. No, sir, not at all.

Q. That part of the water shed is in good condition, as I under stand you?

A. I should say so, yes, sir.

Q. You make no criticism of that?

A. No, sir.

Q. This Hibernia mining town of which you have spoken, that is directly to the north of Rockaway is it not, some miles?

A. Yes, sir.

Q. And not upon the main stream at all?

A. No, sir.

Q. It is upon a small tributary coming down from the north?

A. It is.

Q. In what direction from the village of Hibernia are the mines?

A. They are, I should say, east of a large part of the lower village; there are also mines in what is called the upper village, which would be northeast of the main village of Hibernia.

Q. They run by drifts and shafts into the mountain to the east, do they.

A. Apparently they do, yes, sir.

Q. And I think you said were on a lower level than the village?

A. I don't think I said that, I think somebody else told you that.

Q. But that is the fact, is it not?

A. I judge so.

Q. And the water from those mines only reaches the surface when it is pumped to the surface?

A. I understand that is true in two cases, and I was told that in one case water came out by gravity, but I did not have access to the mines and could not say from personal knowledge.

Q. You spoke this morning of the places where water was pumped out and in two of them you said that the water in the mine was used for condensing and the use of it for condensing made that practically sterilized—that water, did it not?

A. That is what I understood, the sterilization was not complete, but it was effective to a considerable degree.

Q. That would be effective to a degree because the water before condensing has to be heated above the boiling point, is that so?

A. I do not think it would be heated up above the boiling point.

Q. For condensing would it not have to be heated above the boiling point?

A. I don't think so.

Q. For the condensation of water it has to be heated to the steam point, has it not?

A. The steam is condensed, the water in bringing that about is heated towards the boiling point.

Q. But the water would, even so, be brought practically to the boiling point, would it not?

A. It might be brought near it.

A. And in one of those places you understand it was not so used for condensation?

A. I so understood.

Q. What did you suppose there was in an iron mine to contaminate the streams on the surface when the water was pumped out?

A. The thing that I feared was that the excretia of the miners and possibly animals that might be used there would get into this mine water and contaminate it.

Q. You did not enter any of the mines?

A. I tried to, but was refused permission.

Q. But that is what you had in your mind as a possible source of pollution?

A. Yes, sir, my authority was the statement of the foreman who had charge of one of the mines.

Q. That water when it finds its way to the mines is naturally pure water, is it not?

A. I judge it would be until contaminated in some way.

Q. Your visits to Dover and vicinity were in the summer of 1904, were they not, chiefly?

A. Chiefly so, yes, sir.

Q. And then you went once on July 4th, 1905?

A. Yes.

Q. And once on Feb. 16, 1906?

A. Yes.

Q. How many times did you go in 1904, in the summer?

A. Well, I should say four or five times; I have not all my dates at hand.

Q. You say that you found a number of drains apparently conducting the street wash from the city into the river, when was it you observed those?

A. On the visits during 1904.

Q. And how many did you observe?

A. There are about six bridges across the stream and my recollection is that there was practically one at each bridge.

Q. The surface drainage of the streets was into the river, as far as you observed?

A. That is what I was referring to, the drainage of the streets—the gutters, the street gutters.

Q. You think there was about a half dozen of those drains which carried surface water into the river?

A. Well, I think there were probably more than that, but that was what I had in mind, those that came in at the bridges there.

Q. Their drainage alone would account for some coli in the water would it not?

A. It might, certainly.

Q. Would it not account for all that you found in it?

A. I could not say.

Q. It might, might it not?

A. So far as mere numbers goes it might, but when I see other sources I naturally suspect that some of these came from other sources?

Q. Yes, we will come to the others, but the street drainage of these towns alone might account for all the number of bacteria you found, might it not?

A. I should not suspect that it would at those times. There was no street drainage running in those drains, those drains are operative only when there is rain and when we find the coli at other times, why I should judge they were of some different origin.

Q. You say that opposite Morris street you saw a sewer deposit what you thought was sewage into the river; when did you see that?

A. Almost every timethat I went to Dover I went down to look at that sewer; there were three or four times——

Q. Just tell us which side ofthe river the sewer that you refer to was observed?

A. On the right bank of the river.

Q. And you saw two sewers at that point, one carrying clear water—where was the other?

A. Right opposite, the two discharged almost at the same point; they were nearly parallel, but they drew together.

Q. How big were they?

A. Ten or twelve inches, I have forgotten the exact size.

Q. Pipes?

A. Iron pipes.

Q. You say you have a memorandum of one of them, according to these notes, you say your memorandum of one of them is at 99 East Blackwell street?

A. That wasn't one of those two; that was a drain that I saw discharging into the river opposite.

Q. That was in August, 1904?

A. 1904.

Q. That is the one which you have heard testified to here, that when a joint test was made it failed to show any result or connection with the house, wasn't it?

A. Well, that was one where I assisted in testing and where I obtained positive results. My recollection is that afterwards a joint test was made, which gave a negative result.

Q. Can you say that on the same day you visited Richardson & Boynton's Stove Works above Dover?

A. That was August 17th, you are speaking of.

Q. Yes. You spoke there of the arrangement of those closets; do you think they were so that they could find their way into the river except by filtration through the ground?

A. Well, I judge so; I did not see the culvert, as there wasn't time in my visit to look that up. Mr. Pierce was instructed to look into that, and I believe he did, and testified to that.

Q. Was the foreman there with you at that time?

A. Yes, sir.

Q. Didn't he call your attention to the fact that there was high ground between them and the river, and that they would not flow that way?

A. I don't remember that he did, but I saw the railroad embankment between the works and the river, and I was led to suppose from the size of the stream flowing along there that there must be an outlet for the stream to flow through some culvert.

Q. What led you to suppose that the contents of those closets could go into the river in view of the levels of the ground there?

A. Well, I know the general railroad practice in regard to putting in culverts wherever there are streams.

Q. You assumed there might be some culvert which carried the drainage through, although you did not see it?

A. I assumed it, and asked my assistant to ascertain the fact definitely, later.

Q. Did the foreman make any statement to you and point out the real situation at that time?

A. I don't recollect that he did.

Q. Mr. Lynde—do you remember Mr. Lynde?

A. Yes, sir, I remember Mr. Lynde going around there, and he was very kind and showed us around.

Q. Did not he show you how these were placed so that they would not go into the river?

A. I don't remember of his speaking of that fact, I remember Mr. Pierce and I discussing it.

Q. You say these closets were a few hundred feet from the river; how many hundred feet?

A. Which closets do you refer to?

Q. Richardson & Boynton?

A. I don't remember.

Q. And you say that at that time, August, 1904, you saw a number of houses all along the course of the river, which backed up on the stream—you mean the dwelling lot backed on the stream, don't you?

A. I mean the lot backed on the stream, but some of the houses were quite near.

Q. And where there were privies very close to the stream, although not immediately over it, you saw where the privies had been moved back from the stream to the place in which they were then?

A. I had the placed pointed out where they had previously been.

Q. They apparently had all been removed?

A. I assumed that they had been moved back some distance.

Q. How many feet were they back from the edge of the stream, where you saw them standing?

A. They varied in different instances, somewhere from five feet up to maybe fifty or a hundred feet, in some cases; I cannot say exactly.

Q. And they had vaults under them, did they?

A. I think most of them did.

Q. After those vaults were kept in order and the usual proper attention given to them, were not they perfectly safe, so far as the water was concerned?

A. I should say this in regard to them, that if the soil was perfectly water tight and if proper attention was given to them there would be not very much danger from contamination under ordinary conditions, but I have found that at times when those vaults are cleaned there is a rather critical time from the sanitary standpoint, and furthermore in times of heavy rains, when that region is flooded, there is likely to be contamination from them.

Q. Yes, if they over-flowed and did not get proper attention?

A. If they over-flowed, the attention would not matter much.

Q. You say if the earth were water tight; why what becomes of all the foul matter that is deposited all over the face of the earth, doesn't it get purified by percolation through the earth, all the water that is in it?

A. A good deal of it does.

Q. Is not that the ordinary process of nature. Is our only protection that it shall not be kept in water tight earth receptacles?

A. No, sir.

Q. It goes through the sand?

A. Yes, sir.

Q. And the harmful properties are removed by process of nature?

A. Yes, if there is an opportunity for that, that is, if the substance goes far enough through the ground, and the ground is of the proper character.

Q. Is not that the principal protection that we all have, all over the earth, where people dwell, from impurities which flow with water?

A. It is certainly a very good protection, yes, sir, I admit that, but a great deal depends upon the condition of course.

Q. There is a Board of Health in Dover, is there not?

A. I believe so.

Q. Suppose a closet is ten feet from the side of a stream and the leachings from it pass through ten feet of ordinary earth, is not the danger gone of contamination from that?

A. Well, if that soil is just the right character, a good sandy soil and no danger of any overflow, I should consider very little danger.

Q. I am speaking of the leaching, not overflow —the leaching makes it innocuous?

A. If the leaching is proper, it depends on the character of the soil.

Q. Well, the tendency of the water is to flow downwards and not sideways?

A. What water?

Q The water through these vaults, its tendency is to go down the middle and not pass over the surface or the sides?

A. That depends on the water table, speaking generally, it tends to pass down from the vault.

Q. You speak of Richard's abbatoir in the outskirts of Dover, where animals were being killed —that was in August, 1904?

A. Yes, sir.

Q. Did you trace any discharge from that place into the river or into any stream that would take it into the river?

A. I traced it on to a flat meadow where it was very evident that in times of heavy rain it would be washed in very easily.

Q. You did not see any washed in?

A. I did not.

Q. But went out upon a flat meadow?

A. Yes, sir, in a ditch, which ditch had a connection with the brook.

Q. You did not see anything go into the brook?

A. I did not.

Q. You did not visit that in 1906?

A. I did not.

Q. You say that you saw, I think you said in February, 1906, a large amount of sewage coming out of the sewer and discharging into the Rockaway river, larger in amount than you had seen before?

A. Yes, sir.

Q. And you said that that sewage was human excrement; where did you see any human excrement coming out of any sewer in Dover?

A. At the mouth of the Morris street sewer.

Q. The one you have mentioned before?

A. Yes, sir.

Q. Do you mean you saw it in the river in front of it, or that you saw it coming out?

A. Saw it coming out of the pipe going into the river, and what I brought in the bottle, I took out of the river.

Q. How long did you stay there observing this pipe?

A. I should think fifteen minutes.

Q. Do you know where it came from, the sewage?

A. Do you mean the excrement?

Q. Yes, the excrement that you saw coming out of the pipe?

A. I don't know where it came from, more than that.

Q. Was the mouth of the pipe under water?

A. If I recollect correctly, the water was about three inches I should say, up on the pipe.

Q. Is there a pool in the river where it empties or a flowing stream?

A. I have seen a pool at times, and there was a flowing stream, and the flow of this colored liquid could be very plainly discerned for a strip two or three feet wide, immediately below the point of discharge.

Q. Did you see anything else discharged from it but water?

A. I saw pieces of toilet paper and a burned match come out.

Q. You never went so far as to ascertain whether there was any sewer connection or any closet connected with that sewer?

A. Not on this date.

Q. Did you make an attempt once?

A. I gave instructions to Mr. Pierce and Mr. Bouton to make such investigations, which they did, as they have testified.

Q. Personally you did not?

A. Personally I did not.

Q. That was in August, 1904?

A. Yes, sir.

Q. And you knew when those tests were made that they all gave negative tests?

A. Yes, sir.

Q. They were all negative?

A. My recollection is that there was one positive test.

Q. Oh, yes, that is where the old lady lived?

A. I think it was.

Q. You, yourself made one test at 99 East Blackwell street?

A. Accompanied by Mr. Pierce.

Q. When was that?

A. I think it was August 17th.

Q. 1904, I don't care for the month?

A. 1904.

Q. The year is sufficient?

A. Yes, sir.

Q. Coming now to the building that has been called the jail or prison, that is the Dover lock-up, is it not?

A. I take it so, yes, sir.

Q. For persons arrested and temporarily detained?

A. My recollection is it is marked police station on the building.

Q. You spoke of it as having two rooms in it, practically two cells, isn't it?

A. Yes, sir.

Q. Concrete floor?

A. Yes, sir.

Q. And stands 15 or 20 feet from the bank of the stream?

A. About that.

Q. You found two rooms with bed cots and a concrete floor, and at the bottom of each there was a privy which led to a main drain; what do you mean by that?

A. Not privy.

Q. That is what the notes say?

A. A drain trough at the bottom of the concrete floor, passing through the two cells and discharging into the pipe drain.

Q. By trough do you mean a depression in the cement?

A. Simply that. I did not use the word privy, I am sure.

Q. There were buckets in those cells, were there not, for use?

A. I found one pail in one of them.

Q. How deep is this depression in the cement?

A. I should say perhaps four inches.

Q. Pretty nearly level?

A. Pretty nearly.

Q. Then fecal matter would not run out without flushing it out?

A. I should say not. Urine might, but solid matter not.

Q. And if anything was flushed out of it, it would drop on the bank 15 or 20 feet from the river?

A. It would flow out onto the bank or on the snow, when I saw it.

Q. And you saw something of that sort out on the bank, and you assumed therefore it had come out from that drain, didn't you?

A. Yes, sir, some of it was taken almost in the drain itself, within half an inch from it.

Q. And that laid on the bank 15 to 20 feet from the river?

A. Substantially that.

Q. And that is the sample you produced in court?

A. One of them.

Q. That was a sample of dry dung, that is what it amounted to, wasn't it?

A. Yes, sir, practically.

Q. And you also brought another bottle which you got under the bridge?

A. Yes, sir.

Q. A sample of something similar which you got under a bridge.

A. Yes, sir.

Q. Where somebody had evidently responded to a call of nature. Can you suggest any method of preventing people from responding to calls of nature under bridges?

A. You might put a fence across.

Q. That would be a practical way of doing it, would it not?

A. Yes, sir, I think so.

Q. That was at a bridge on West Sussex street where you made that observation?

A. Yes, sir.

Q. Now you spoke of Ford's brook near the railroad station; what was there about that which indicated anything wrong; you say you saw it first in 1904, and again in 1906?

A. The water was very polluted, and we saw there one or two houses where there was swamp water and sink waste discharging into that brook.

Q. I suppose some of the people that live along the brooks of that water shed do throw their slop waters onto the bank of the brook—dishpan water, is it not. Do you mean to say that is a serious pollution of the waters of that water shed?

A. I would hardly characterize that as a serious contamination.

Q. Do you know any way of preventing that sort of thing except by depopulating the district?

A. Not unless a sewer system were built so that people could empty the waters into that.

Q. Still, people are constantly throwing slop water out of their back doors, are they not?

A. Yes, sir.

Q. Poor people do that, don't they?

A. Very often.

Q. Was there anything about that brook any worse than you would expect in any brook flowing through a populated town?

A. Not worse than I would expect to see flowing through a place of the population that has, without any sewers.

Q. You saw no evidence of the connection of water closets with it?

A. I saw no evidence of it, no, sir.

Q. Do you know of any place in Dover now where there is any pollution of the river that is menacing to the public health of the people of Jersey City?

A. I think that sewer is decidedly.

Q. That sewer where you made observations?

A. Where I got the fecal matter.

Q. If you assume that there is a water closet connected with that sewer?

A. I assume that in some way the fecal matter which came out of it had gotten into it.

Q. Well, we will investigate that. Can you name any second place?

A. That and the town jail were practically the only places we looked at in Dover at the time of my last visit.

Q. Do you know of any place in Hibernia where there is any such menacing contamination of the water?

A. I have not made recently a careful inspection and I do not know at the present time of anything direct.

Q. Your examination then simply indicated that there might be washings across the surface of the earth which might in times of heavy flood carry something to the stream, was not that it?

A. Yes, sir, and there were chances where cess pools might have——

Q. Might overflow?

A. Might fill and overflow and run across the ground in ditches and through small brooks into the stream.

Q. And that was largely because of the low and disorderly character of the place, was it not?

A. Partly so, but the stuctural arrangements were not what they might have been in a great many cases.

Q. They were people who lived in a poor way and carelessly?

A. They were, yes, sir.

Q. I think you mentioned that the men were accustomed to go behind the barn and respond to the call of nature and urinate?

A. I did not mention it, I think some one else did, I understand such is the fact, however.

Q. It was that sort of thing you had in mind?

A. It was partly it.

Q. That menace, as far as it is any practically exists on every farm on the water shed, does it not?

A. I suppose that is very common.

Q. Now come to Mt. Tabor, the camp meeting place. That is right on the divide is it not, where the waters flow either towards the Whippany or towards the Rockaway, either as you happen to be on one part or the other?

A. Yes, sir, and I think the other side of the hill away from the Rockaway river flows somewhat on the water shed.

Q. Have you noticed for the past year their place of deposit of the sewage is on the Whippany side of the divide?

A. I have not been there since 1904, and I don't know what it is now.

Q. What you saw there was a compost pile where they were accustomed to deposit the cleanings from the privy vaults, was it not?

A. Yes, sir.

Q. Was that on the Rockaway side of the divide?

A. Yes, sir.

Q. They had earth mixed with it, didn't they or something?

A. Well, I didn't see anything of it at that time?

Q. Lime or what not?

A. I didn't see any lime.

Q. You just saw the pile of compost?

A. I just saw the pile of compost.

Q. How far was it from the nearest running water?

A. It was fifty or one hundred feet, if I remember rightly, from a ditch which extended up to that, the flow of water in that ditch, however, was apparently, under ordinary conditions, very slow indeed, it was not what I would call running water.

Q. Around the closets of these campers there, these campmeeting people, did you see anything that struck you as at all menacing?

A. No, sir; the general sanitary conditions of the camp appeared to be reasonably satisfactory.

Q. Now, seriously, do you assert that there was anything at all alarming about the situation at Mt. Tabor as you saw it in 1904?

A. I think the opportunities for the infection of the stream exist there.

Q. That is by washing it over the ground from this compost pile, is that it?

A. By washing over the ground from the compost pile and by the fact that the wash waters from laundries are poured out into the gutters of the town and go down the streets.

Q. I understood that you did not consider those wash waters from laundries a menace?

A. I think I stated this morning that if the clothing and bedding, etc., of typhoid patients was washed I would consider the water in which they were washed a menace.

Q. That would depend upon the temperature to which the water was raised that washed them?

A. Of course.

Q. But if they were washed in boiling water——

A. Oh, it is perfectly possible to make them harmless.

Q. Between the compost pile and the ditch you have mentioned was a ploughed field, was there not?

A. That I do not recollect.

Q. The slope towards the brook there was a very gentle one was it not, not steep at all?

A. By the side hill it was quite steep, towards the point of which we have been speaking it was more gentle.

Q. From the compost pile to the ditch you have mentioned it was almost level, was it not?

A. Almost level, yes sir.

Q. At Boonton, which you have mentioned, as I understand the drainage of many of the people and probably a considerable majority naturally flows to a point in the Rockaway river below the dam, does it not?

A. You mean the surface drainage?

Q. Yes, the natural drainage of the land?

A. The natural drainage of a large part of the town flows towards the lower level canal which discharges below the Boonton Reservoir.

Q. The thing you mentioned there as open to criticism was the fact that this drain, this concrete drain, which has been built down the incline might at high water overflow and some of the overflow go into the upper level or into stream, which would carry it to the reservoir, is not that it?

A. That is one criticism. Another is that the Rockaway river is not fully protected from the water of the lower level canal.

Q. I think one of the other witnesses thought there were evidences of a leak under the gates there, is that what you have reference to?

A. Yes, sir, I have seen the device they have there and there appears to be a gate.

Q. When did you see it?

A. The last time I went up, I think on January 31st of this year—no, no, February.

Q. February 16th was the date you mentioned.

A. No, a few days before February 16. February of this year I think is sufficiently accurate, I can get the date in minute.

Q. If there were a gate in the big gate you think that might allow water to flow in in a way that might be menacing, is that the idea?

A. I think it all depends on the relative levels of the water in the upper and lower levels; I can easily see how it might flow from the lower level into the river.

Q. The gates are intended to guide the water in the other direction?

A. It might be so intended, but it would operate to lead the water through either way——

Q. If the lower level should get higher than the upper level, the water would flow back you mean?

A. Yes, sir, and the day I was there, I think I detected evidences that there was some such action to some extent, not through the lower level gate, but perhaps through the arrangement of the upper gate which was a flap gate, and at the time I was there which was just before noon, I saw it with a ripple on the water on the side towards the river and there was a scum on the surface which had drifted up against these doors in the lower level canal indicating a slight flow from the lower level canal through the gate; just as I watched it, someone changed the gate in the flume and immediately thereafter this scum drifted away, showing that the flow had changed to the other direction.

Q. What gate in the flume was changed, the gate above you mean?

A. The gate in the flume which furnishes power to one of the lower mills with a slide gate.

Q. It is what you have described now that led you to call attention to this particular place, is that it?

A. That and the additional fact that there was a gate, a lower gate in this dam, if I may call it that, built between the lower level canal and the flume.

Q. Was not this arrangement of new gates in there made at the suggestion of yourself and engineers acting with you?

A. We suggested that some device be put in there to protect the Rockaway River from the flow in the lower level of the canal, we did not have anything to do with—at least I didn't, with the choosing of any such affair as they put in there.

Q. You don't know, then, that there was put in just exactly what was recommended?

A. I do not know, it certainly was not what I had in mind.

Q. What other engineer was with you?

A. Mr. Kuichling was there and saw the gates.

Q. Water has to be supplied to the lower level of the canal at that point, does it not?

A. Yes, sir.

Q. This Brook Street brook in Boonton which you have mentioned is ordinarily all carried by the cement drain which is there without any trouble, is it not, the ordinary flow?

A. I judge so, yes.

Q. Do you know the capacity of that drain?

A. I do not.

Q. It is very steep, running down the incline, is it not?

A. It is a pretty steep drain, yes sir.

Q. Would it not provide for everything that ever flowed there excepting in a severe freshet or the severest storm just as it is?

A. Well, that I am not enabled to state, but I should judge that such storms as it would not provide for might occur perhaps half a dozen times during the course of the summer.

Q. Do you know the extent of the water shed of that little brook?

A. I have estimated the area and if I remember rightly it was about a hundred acres, but I cannot speak exactly.

Q. The size of the drain I think you mentioned, about eighteen inches across and semi-circular?

I. I think Mr. Pierce mentioned that; it was substantially right.

Q. Did you intimate that there were any sewer connections with that drain?

A. Yes, sir.

Q. Where and what?

A. We made a test of one water closet connection in the Mansion House.

Q. That is the one spoken of by another witness?

A. I think so, and I think I also mentioned it myself.

Q. Don't you know that the Mansion House's connection with it was cut out long ago?

A. I have heard that it was, I don't know anything about it personally.

Q. You do not know personally about its being there, you got that second handed also, did you not?

A. No, sir, I could not say that because I saw the water closet and went into it and I either put some chemical down or the man who was with me did.

Q. You were there when the test was made?

A. Yes, sir, and I saw the chemical come out.

Q. Do you know of any other in connection with that drain?

A. Not from personal knowledge, no sir.

Q. Suppose that you learned that the capacity of that drain as constructed is eighty-four cubic feet a second or fifty-six million gallons daily, would you think that it is large enough to carry off the flow from that one hundred acres of land?

A. Well, I could not calculate that off-hand, I should have to pass that question.

Q. You mentioned the print mill, you know that has been done away with don't you?

A. I saw, the day I was up there recently, the same settling tanks that they had out in the yard and those were discharging a very foul liquid. I understood that the toilets in that building had been disconnected, but I do not know it from personal knowledge.

Q. You know very radical changes have been made, don't you, to prevent polluting the stream?

A. I understand so.

Q. There is nothing there now that you can say contaminates the water, is there?

A. So I have been informed; I have not investigated.

Q. You spoke rather of the conditions you found in the summer of 1904?

A. I was speaking then of what I found at that time; we recommended certain changes to be made and I understand they have been made.

Q. You did recommend at that time such changes as your investigation indicated, didn't you?

A. We recommended that they remove from the river the discharges from their closets—remove from the settling basins the discharges from their closets.

Q. You spoke of a rag mill at Powerville, one mile above Boonton; there have been changes made there, too, since you were there in the summer of 1904, have there not?

A. That I do not know; we have never been able to get access to that mill as we would like to in order to find out what was there.

Q. You made analyses of water both above and below the rag mill, didn't you?

A. Yes, sir.

Q. And you found it just as good in one place as in the other, didn't you?

A. I could not detect from my analyses anything that was added to the river by their discharges.

Q. The only criticism I understand you to make now is that there were piles of rags lying upon the bank not very far from the edge of the stream, is not that it, which you thought might result in some of them getting into the stream?

A. That is one thing that I mentioned.

Q. Is there anything else you can mention in connection with it?

A. I have seen from a distance a pile of cinders in which was the basin in which the liquors were formerly discharged. At the time I visited the plant the plant was shut down and I am unable to state whether or not they are still discharging any liquors there, but if that still exists I should criticise that.

Q. Your samples of water from Boonton, so far as you have testified about them were all intended to be taken from the flowing stream before the waters came to rest in the reservoir, were they not?

A. You refer to sample of the Rockaway River?

Q. Yes.

A. Yes, sir.

Q. I don't understand you have reported to us any taken from the reservoir itself?

A. I have not.

Q. Suppose some contamination got in in the upper part of this water shed way up at the mouth of the valley, towards Green Pond, when there wasn't a heavy flow of water, how long would it take for it to find its way down to the reservoir fifteen or twenty miles away?

A. You mean way up at the upper end?

Q. Anywhere along the valley?

A. Well, I can't say exactly, but perhaps a couple of days.

Q. You have never ascertained the flow of the streams, have you, along the valley, I mean the rapidity of the streams?

A. Not with any very great degree of accuracy.

Q. It may be four, five or six days in coming down, if the flow is light?

A. I don't think it would be as long as that. The streams in along the valley are rather rapidly running streams. I don't recollect what its velocity is at the present moment. I should say that even from the upper part of the stream it ought not to be more than two days.

Q. There are several dams intercepting the flow of the stream on the way down, are there not?

Q. And the tributaries have dams also?

A. Some of them.

Q. That retards the flow of the water somewhat?

A. Yes, sir.

Q. And those dams tend to produce precipitation of bacteria, don't they?

A. So far as they lessen the velocity, yes, sir.

Q. All this bacteria which you found in the water have a specific gravity greater than water?

A. Yes, sir.

Q. B. coli, which you have mentioned, they may come, as I understand it, from man, or any other warm-blooded animal?

A. Yes, sir.

Q. Pigs?

A. Yes, sir.

Q. Dogs

A. Yes, sir.

Q. Cows?

A. Yes, sir.

Q. Horses?

A. Yes, sir.

Q. Sheep?

A. Yes, sir.

Q. Those cattle all laid in the streams and in wading might leave droppings there which would furnish B. coli to the water?

A. Yes, sir.

Q. And those might show in your analysis at Boonton?

A. Yes, sir.

Q. And B. coli supplied by those animals would not have any typhoid germs in them?

A. I should not suspect that the discharge from such animals would have typhoid germs in them.

Q. It is the discharges of the human animal only, is it not?

A. Speaking generally, I believe you may yes.

Q. The one dangerous discharge is from man?

A. It is so far as typhoid fever is concerned, just what germs producing diarrohea and the like may come from animals I don't know.

Q. But the important thing to be avoided is the danger of contamination by typhoid, is it not, in this way?

A. Perhaps that is the most important; it certainly is the most striking.

Q. Asiatic cholera, you don't expect to get that?

A. No, sir, not very strongly.

Q. Now you have spoken in connection with your experience in New England, of phenomena which led you to think that typhoid was transmitted many miles on rivers in Maine, and you say that when typhoid got into the urine of man that the germs are found in very large numbers?

A. Yes, sir.

Q. Then in these streams in Maine, if a man recovering from typhoid fever and having those germs of typhoid in his urine should discharge his urine into the river Penobscot, you might find an epidemic from that down below?

A. If there were many of them.

Q. When you said that it was possible for a person recovering from typhoid fever to pass something like a billion?

A. Yes, sir.

Q. I think you said you found them more plentiful there than anywhere else?

A. Well, I could not speak, as—I know it is enormously large in the urine.

Q. They run into millions, you say?

A. Yes, sir, billions.

Q. Then that danger of contamination is ever present in every water shed, is it not?

A. So far as such material might have access to the water, yes.

Q. You spoke of Cleveland, and the 6,000 cases of typhoid seen there in a year, and you said that half of the people there allowed their drainage to go into the Cuoyga river?

A. Roughly speaking, yes, sir.

Q. That would be one hundred and fifty thousand people or more, wouldn't it?

A. Yes.

Q. In a population of that sort, in a dense city are there not, every day in the year, more cases of typhoid fever existing?

A. I presume that there are.

Q. Don't you presume that in the city of Newark and in Jersey City there are some cases of typhoid fever existing every day in the year?

A. It would not surprise me in the least.

Q. Coming from, perhaps, some outside source?

A. Well, it might come from various places.

Q. Well, any one of those cases may, under suitable, favorable conditions contaminate water so as to affect others, may it not?

A. Well, it depends upon the situation with reference to the water. Your question is a pretty general one.

Q. Then the danger of infection from typhoid through water is to a greater or less extent always present, is it not?

A. I suppose in any surface water there is more or less danger with infection.

Q. Well, is it confined to surface water?

A. Speaking generally, my answer would be, there is comparatively little danger of water supplies taken from the ground or the water supplies properly filtered.

Q. Suppose water supplies taken from the ground or those filtered were stored up in a reservoir for a few days, and a contamination came to them, the multiplication of bacteria would be even more rapid than with the other, wouldn't it?

A. No, sir, I should say not. Speaking of typhoid germs?

Q. Yes.

A. Because typhoid germs, so far as we know, do not multiply under ordinary conditions in natural waters.

Q. Natural waters, but I say don't they multiply in filtered water more rapidly than in others?

A. I don't think they would as much, perhaps; they don't multiply as much, perhaps, in natural water.

Q. They would be carried with equal facilities, in that water?

A. Transported by one water as well as by another, perhaps.

Q. You find typhoid germs also in water from deep wells, don't you?

A. Not ordinarily; I can conceive of cases where typhoid germs might have access to wells.

Q. You have heard of wells—

A. I have heard of wells contaminated through a crevice where the water runs in, but seldom through wells located in a sandy soil, where there would be such purification as you mentioned from the cess-pool.

Q. How many days will a typhoid fever germ survive in the waters of a river like the Rockaway?

A. I am unable to say exactly, but I should judge that the situation there would be something like this—basing my judgment on such experiments as I have made, and from what I heard of others being made, namely, that if we assumed a certain number of typhoid fever germs to be put into the Rockaway river water, they would die out somewhat rapidly at first; I mean many of them would die out rapidly, and some would live longer, others would live still longer, and a few might linger for a number of months, but the number that did so remain would be small, compared with the number that was put in.

Adjourned until Wednesday, February 28th, 1906, at the Chancery Chambers, Newark, N. J.

FIFTH DAY, FEBRUARY 28, 1906.

George C. Whipple resumes the stand.

By Mr. Vredenburgh: If the Court please, there are a few questions that I forgot to ask the witness, and if counsel will permit me I will examine him now in order that counsel may cross examine him.

Further Direct Examination. By Mr. Vredenburgh:

Q. Mr. Whipple, you have stated that under certain conditions typhoid fever germs in the water of the Rockaway River at Dover would reach alive those who drank the water in Jersey City. I want to ask you what you have to say on that same subject with regard to typhoid germs in the water of the Hibernia brook at the village of Hibernia?

A. Well, I should make the same answer to a question of that kind.

Q. And I will repeat that question as to Mt. Tabor?

A. It would be the same.

Q. And I will repeat that question, substituting for the germs of typhoid fever the germs of diarrhoea?

A. The same answer.

Q. And for Dover, for Hibernia and for Mt. Tabor?

A. Yes, sir, the conditions would be the same in all of those cases.

Q. And I will ask you the same question as to each of those places for the germ of dysentery?

A. The answer will be the same.

Q. And for the germs of cholera?

A. The conditions would be parallel and the answer would be the same.

Q. Are the waters of the Boonton reservoir at all times pure and wholesome and free from pollution deleterious for drinking and domestic purposes?

A. I should say not at all times.

Q. Is the water delivered at the termination of the aqueduct into the Jersey City reservoir called, I think, in the contract or specifications, as the Bergen reservoir, at all times pure and wholesome and free from pollution, deleterous for drinking and domestic purposes?

A. I should say not at all times.

Q. That is all.

Further Cross Examination. By Mr. Corbin:

Q. You said you checked up the work of these two young men who made the bacteriological examinations in your laboratory; now, in these presumptive tests, after they have once examined the gas, it is impossible to check it up, isn't it, from the tubes the gas is in, isn't it?

A. It would be unless I checked the work—the determination, as the work progressed, and that is what I did do.

Q. Well, in the presumptive test the thing perishes with the using, doesn't it, and it is impossible, five minutes later, to determine anything from the same things they have used, isn't it?

A. If he had made that whole test and I had not seen the operation until after the test was done, I couldn't have checked up the appearance of it.

Q. You spoke of checking up their clerical work, that is, you looked at the figures they put down after making their examinations?

A. Yes, sir.

Q. And all you could tell by that was whether it came out about as you had presumed, is not that all?

A. Well, that was simply to see if they had made any mistake in their calculations.

Q. You mean in multiplication, etc.?

A. Precisely.

Q. But in the presumptive test, to check up the real work you would have to be looking over the man's shoulder at the very moment?

A. Yes, sir, and that is what I intended when I made the answer.

Q. You sometimes did that?

A. Yes, sir.

Q. And the other checking up you did was the checking up of the clerical work in arithmetic, etc.?

A. Yes, sir, and in the chemical work, looking over the samples, in a general way, to see if their observations of turpidity, color, etc., was correct.

Q. To see if the color appeared to them as it appeared to you?

A. Yes, sir.

Q. And whether the smell appeared to them as it appeared to you?

A. Precisely.

Q. Now you spoke of measuring the percentage in the closed arm which the bacteriologist had found, that you could not do unless you were present at the moment, could you?

A. No, sir.

Q. You would have to measure it at the same time he did, practically, to make your measurement of any value as a check?

A. I would have to measure the gas before he made the subsequent operation on the same sample.

Q. Yes, it had to be done practically at the same time?

A. Yes, within a short time—in a few minutes.

Q. You said you went over nearly all Mr. Mayer's samples and corroborated them, but that you refer to the taste, smell and color, don't you?

A. I went over nearly all of those physical tests after him, and I also looked over and checked——

Q. Well, those are the——

A. And also checked up some of his bacteriological work in the manner I have just mentioned.

Q. The physical work you went over as to the matter of taste, color and smell?

A. The physical examination included the three you have named, yes, sir.

Q. You say you occasionally counted the plates after him. To do that you must be present at the very moment, mustn't you, to get anything like a similar result?

A. There would be no substantial change in the count, within a few hours—within an hour or two, at any rate.

Q. When you make these counts upon a plate you do it through the microscope, I suppose?

A. Hand lenses, not a microscope.

Q. A magnifying glass?

A. Yes, sir.

Q. How large an area upon the plate is under your observation when you are counting?

A. The plate is placed over a ruled grating, the squares of which are about one—approximately half an inch on the side, and that and a little more is under the eye of the observer at the time the count is made.

Q. And you count each one of those squares, do you?

A. We would count all of those squares on the plate; we would count one at a time and then move to its neighboring one and count that.

Q. How big is the whole plate?

A. Approximately four inches, I don't remember exactly.

Q. It was something like 250 squares on that plate there; you would not count them all?

A. It would not be as many as that on the plate because the plate is not square.

Q. How many would you count?

A. We would count them all.

Q. Count them all?

A. Yes, sir.

Q. And you get the average, is that the idea?

A. No, I get the total of the plate.

Q. Don't those germs move about from one square to the other?

A. No, sir.

Q. Don't they move far enough to interfere with each other?

A. No, sir; not the colonies, the colonies don't move about, the individual germs might move about a little in the colonies, but it is the colonies we count.

Q. And you find the same colony of germs in the same square all the time and it is the colonies you are counting?

A. Yes, sir.

Q. The effect of salt or what you call chlorine from the sea is felt as far inland as Boonton, is it not?

A. To some extent, yes, sir.

Q. Recurring for a moment to the matter of checking up this work of Mr. Mayer, how many times were you present during Mr. Mayer's work checking him up?

A. I can't speak definitely; I should say I was in the laboratory perhaps half the time.

Q. Were there not during that period days and even weeks when you were out of town on other business?

A. There may have been a week at a time, I don't know about that. I couldn't tell you without consulting my memoranda.

Q. You were engaged in other business at that time?

A. Yes, sir.

Q. And traveling about?

A. Yes, sir.

Q. Were you much in your laboratory during that time?

A. I was there a good deal.

Q. When you came home from your engagements you go to the laboratory?

A. Yes, sir.

Q. Now, in 1905, when Mr. Mayer was making his tests the same thing was true in regard to your engagements, was it not?

A. I don't remember just what engagements I had at the time, but I was in the laboratory a good deal during that time, as I recollect, about half the time, but I cannot tell you exactly without consulting my memorandum book.

Q. Was not there a period in 1904 when this work was going on in 1904 that you were at least two weeks gone—were away at least two weeks?

A. I don't recollect anything of the kind; I know I was gone part of the time during that work.

Q. Now, as to the salt found in the water in the neighborhood of Rockaway River, is it not a fact that two parts in one million is the amount ordinarily assumed by chemists as the normal chlorine in water?

A. At what point do you refer to?

Q. Well, say at the Boonton reservoir or the Rockaway River and its vicinity?

A. I don't know that chemists are agreed on any particular figure of that sort. I was not referring to the Boonton reservoir, but rather to the average, or perhaps to the central point in the water shed above the Boonton reservoir.

Q. You said the normal chlorine on the water shed of the Rockaway River above Boonton was 1.4 to 1.6 per million.

A. Those are my figures.

Q. That is not from the analysis, but from guess?

A. That is from analysis that I made at various times.

Q. You didn't try it in the Boonton reservoir?

A. That would not be a fair place to obtain the normal.

Q. Well, that analysis made at different times are those you have previously testified to?

A. Not fully. I have made analyses for chlorine—examined water in various parts in the State of New Jersey from unpolluted sources.

Q. Some brought from the head waters of the Rockaway?

A. Some near there, yes, sir.

Q. The Rockaway valley or Green pond or such places?

A. I don't remember just what weight I gave to those, but in order to get the best judgment as to the normal chlorine it is necessary to use only samples which are known to be free from pollution, and my figures are based upon such conclusions of those as were before me at the time I made this estimate.

Q. Were any of them between Boonton and Dover?

A. I don't remember that they were—do you mean the straight line between them?

Q. Well, on the river between them.

A. They may have. I think I had some which would be just about as far distant from the sea coast as some point between those two cities.

Q. Any above Hibernia?

A. Yes, sir; there was some in the northern part of New Jersey, near the Delaware River.

Q. Your percentage is made up, then, of various tests you made at various times of waters supposed to be entirely unpolluted from different points in New Jersey?

A. Yes, sir.

Q. (By the Court): How does this salt get into the water? Does it get in by dropping in from salt carried in the air or how does it get in?

A. Chiefly I think in this way: That the salt from the sea rises as a spray and is blown up from the sea and passes inland for a certain distance and is dropped on its way with the rain; further inland you go the less salt will be found in the waters, the nearer the sea coast the figures are considerably higher; it drops somewhat rapidly as it goes inland.

Q. Does some come from the soil and rocks?

A. In certain localities, yes, sir.

Q. (Further cross). Would you say that the Hibernia mine furnishes any?

A. Not that I know of.

Q. As I understand it, to the north of Boonton and Rockaway and Dover the rock is chiefly granite, is it not, or something equivalent to granite?

A. Something equivalent to granite, yes; I have not gone into the geology of it in detail.

Q. South of that is it still granite—are the hills back of Morristown, for instance, granite?

Mr. Vredenburgh: Boonton is the line of the red sandstone, your Honor, as laid down by Vermule; the rest is gneiss, gneiss and granite.

Q. What is the normal proportion of chlorine in the waters of Long Island?

A. Of Long Island?

Q. Yes, which would get the full benefit of the sea?

I think they are in the vicinity of three parts in the million and perhaps at times a little lower, three or four parts in the million would perhaps be a better average figure for the interior.

Q. I suppose, of course, you know what red sandstone is composed of?

A. Yes, sir.

Q. Does it contain any magnesium or sodium chloride?

A. No, sir, it does not.

Further Cross Examination:

Q. It contains some, does it not, some salt?

A. As a rule not excepting when subject to pollution and of course it might contain an amount comparable to the normal of the region.

Q. Salt or chlorine itself does not harm the water, does it?

A. No, sir.

Q. What happens to salt when it is taken into the human body when you eat it; does it undergo any chemical change?

A. Very little, I think; I am not a pathological chemist to such an extent that I could go into all the intricacies of that.

Q. Did you investigate the depth of the Hibernia mines?

A. I did not.

Q. Did you know that the bottom was below sea level?

A. I did not know it.

Q. Would not that have some effect on the question of the amount of salt in the Rockaway River if water from the mine was pumped to the surface?

A. I should not expect that it would, no, sir.

Q. The print works discharge chlorine into the river, do they not?

A. Yes, sir.

Q. That might account for some of the quantity you found at Boonton?

A. For some of it, yes, sir.

Q. Now, coming to the number of bacteria which you found at the mouth of the Rockaway where it enters into the reservoir, what was the average number which you found in 1904?

A. During the period from July 19th to September 30th of that year the average number was 37,892.

Q. Per what?

A. Per cubic centimeter.

Q. And during that period of 1904 what was the average number found in a cubic centimeter in Jersey City water where the water enters the reservoir on Bergen Hill?

A. 642.

Q. Then you found that some 98 per cent. of them had disappeared before they got to Jersey City, didn't you?

A. That would be the indication from those two figures alone, but that would not represent the conditions every day during the period.

Q. I am asking now for the average shown?

A. As far as those two figures are concerned, that is mathematically correct.

Q. It is 98.3 per cent. That is as high a rate of destruction of bacteria as you would expect to get in a filtration plant, is it not?

A. That is true so far as the average figures are concerned, but the conditions are not wholly comparable.

Q. Where do these bacteria go to?

A. I presume that some of them die what we may call a natural death.

Q. Where?

A. Between the two points mentioned, that is the place where the river discharges into the reservoir and the water comes out of the aqueduct.

Q. A good many of them are precipitated in that deep reservoir, are they not?

A. Undoubtedly.

Q. A good many would die a natural death because the water remained some time in the reservoir, would they not?

A. Yes, sir, in so far as the water remained in the reservoir there would be an opportunity for them to die.

Q. The water in that reservoir is not favorable to their health and prosperity, is it?

A. It may be to some of them, but it would not be to all.

Q. The twenty-two miles of pipe in the dark which carries the water thence to Jersey City is not favorable to their livelihood, is it?

A. I should not say especially favorable, nor on the other hand especially objectionable.

The Court: Unfavorable?

Witness: Unfavorable.

Q. You say it is favorable or not?

A. I say I should not expect it to be very favorable nor on the other hand very unfavorable.

By the Court:

Q. Suppose they are carried along, their specific gravity is not very different from that of water, suppose they are carried along and die, would they not appear dead on the plates to some extent?

A. No, sir; they would not for this reason: that they are so tiny that we would have no way of recognizing them and you will remember the only way we have of counting them is to let them grow; if they are dead they would not grow on the plate and we could not count them.

Further Cross Examination:

Q. They do not do any harm when they are dead, do they?

A. No, sir, one individual, I should say not; a great mass of them might make the water objectionable.

Q. That is just it, they come down from the reservoir into the water as individuals, do they not?

A. I should say in most cases; sometimes they probably come in little masses.

Q. And then they multiply when they get your Brooklyn rich culture that you have made on purpose to feed them with, don't they?

A. They multiply on the plates.

Q. Anl they multiply likewise in the human intestines when they get there?

A. Some of them will, yes, sir.

Q. Except in the culture gelatine and in the human intestines and perhaps in milk and one or two other things they do not multiply anywhere, do they?

A. Well, they multiply in many places where the food material and the other conditions are right for them to do so.

Q. Have I not mentioned the other conditions that are good for them?

A. I do not think you have exhausted the list.

Q. I am speaking now of the typhoid baccillus, not of all the baccilli, is not that about the extent of their feeding grounds?

A. The typhoid baccilli will multiply in culture media of various kinds.

Q. With cultures made by the bacteriologist?

A. Yes, and naturally.

Q. State the natural things in which they will multiply?

A. Milk is one.

Q. Not in water.

A. I have stated that I do not think they will multiply in water under natural conditions.

Q. Name anything else besides milk and the culture of the bacteriologist in which they will multiply.

A. They will multiply in sewage if it is sterilized; they will multiply——

Q. That is after the bacteriologist has made it a culture for them, is it not?

A. That is after something has been done to it, yes, sir.

Q. If the bacteriologist leaves them alone, they do not do much harm unless they get into milk and so into the intestines, is not that it?

A. Well, I would not state as definitely as that. They will multiply to a certain extent under natural conditions; they will multiply, for instance on potatoes and on various organic matters that might be mentioned—other vegetables.

Q. That is when they are deposited on vegetables?

A. When they are deposited on vegetables and possibly on bread and——

Q. That is when the conditions of temperature and other surroundings are favorable?

A. When the conditions of temperature and other surroundings are what they ordinarily be what they would likely be subjected to, and those would be favorable.

Q. These numerous bacteria which you have mentioned are not all B. coli, of course?

A. No, sir.

Q. Your tests were ascertained whether among them all there were any B. coli?

A. That was the object of the B. coli test.

Q. And many of your examinations showed negative results, that is, no evidence of B. coli and some showed positive results, that is, the evidence of the presence of B. coli, is that it?

A. Aat what point are you speaking?

Q. I am speaking of your analyses generally.

A. Many of them showed positive results, some of them negative results.

By the Court:

Q. As I understand the testimony of the witness the presence of B. coli does not necessarily or even ordinarily indicate the presence of the typhoid germ.

Mr. Corbin: I so understand it.

Q. And as I understand the witness no specific disease has been traced to the B. coli?

A. I think that is true so far as the B. coli introduced into the mouth is concerned; B. coli at times may assume a pathogenic form, we may say, or a pathogenic condition. For instance, injected into a guinea pig it may be able to cause death and it is associated to some extent with cases of appendicitis, but speaking particularly, and I think in the way in which you intend, I would not regard B. coli as pathogenic as we find it in water.

Q. Then I do not understand why the presence of B. coli is an indication of the pollution of water; I did not quite get that in my mind when you were being examined in chief.

A. The theory is this: Our bacteriological methods, as I have testified, are not able to tell definitely whether or not such pathogenic germs of typhoid fever, dysentery, etc., are there and we therefore come as near to them as we can and make tests that are reasonably satisfactory to determine the presence of B. coli, which is similar in origin to the germs of typhoid fever, that is to say, its natural habitat is the intestines of warm-blooded animals. When we find B. coli present in water it is a fair inference that they originated from the intestines of some warm-blooded animal and therefore that the water may bear the germs of typhoid fever and those other diseases mentioned should one of the persons contributing B. coli also contribute the germs of typhoid fever at a time when the person was ill with the disease.

Q. But then you have stated that B. coli, as I understand it, are normally present in the intestines of animals other than men?

A. Yes, sir.

Q. And that being so, what reasonable inference would that make that the presence of B. coli indicates the presence of animal fecal matter or the residuary animal fecal matter? That is what I don't understand. For instance, in a region like this, which is above Dover, a pastural region where there are a good many cattle and where there are a good many farms, we know that the habit of cattle is to go in the water, particularly in warm weather, and to stay there a good while; now, if B. coli are normally present in the intestines of those animals, you would expect to find B. coli in the water, wouldn't you?

A. To some extent.

Q. Then how can its presence in the water indicate the probability that there is also human fecal matter in it; of course there may be, but I don't quite catch the logical sequence?

A. The test, of course, is not a conclusive one, for the very reason that you have stated, and I never so regarded it, but in making the tests for the colon baccillus we are coming as near to getting positive tests as our bacteriological methods admit of, and that is why we place perhaps more stress upon that test than upon some others, and while it is true that in farming regions—grazing regions—we do find B. coli, and in fact find it in small numbers pretty generally in surface waters, that is if we test a large enough quantity, we nearly always succeed in getting a positive test, yet the broad fact remains that the result of our many thousands of tests has shown that the more coli we find the more danger there is of the water being contaminated with human excretia. I once made a series of observations in the Brooklyn water shed from one end of the water shed to the other, where there was a gradation in the number of people dwelling on the water shed per square mile, and in those regions where the population was sparse we did find some coli, but few; in those regions where the population was comparatively large we found a great many; therefore, in interpreting our results we take into account the number that we found, as well as the quantity of the test. The test in those cases is not a conclusive one, as your Honor stated, and I don't wish to be understood in any other way than that.

Further Cross Examination:

Q. Where you find a dense human population, you also find a denser population of other animals, don't you?

A. Not always so, no, sir.

Q. Well, that is the general rule?

A. Frequently it is the other way; grazing is more apt to be carried on in——

Q. Well, take such places as Long Island where there are more people there would be more horses, dogs and cattle?

A. There might be more horses and dogs, perhaps.

Q. And dairies?

A. There might be such, but as a matter of fact the farming lands not sparsely settled were very conspicuous, than lands where there were more people.

Q. No matter how great a number of B. coli you found in the sample, if you could absolutely exclude the presence of any excretia from the persons suffering from typhoid fever, and could absolutely exclude any human contamination, you would be free from typhoid baccillus, wouldn't you?

A. I should say if you exclude the excreta of typhoid patients you would be free to typhoid bacilli.

Q. So this human dropping you have mentioned comes, as the Court has asked you, and as you have indicated, at times from the cattle that are frequently in the streams; it might come also from the washings of their pasture where the droppings of the cattle are found, might it not?

A. It might to some extent, but we have to remember that the droppings are exposed to the sun and very quickly would dry, and the sunlight being a disinfectant, many of them are destroyed.

Q. Is not that equally true of the human droppings that are exposed to the sunlight?

A. I should say so, yes, sir, exposed to the sunlight.

Q. So that human dropping you have mentioned in your direct testimony back of the barns and other places on the surface are soon rendered harmless by the operation of the sun and wind?

A. That depends very largely upon whether the sun and wind have access to them; in certain cases it might, but in most cases I should say the action would be only partial.

Q. Any different in the case of human excretion and that of other animals?

A. No, sir, but there is some difference between dropping on an open field and dropping in the shade of a building.

Q. Now returning for a moment to the matter of the number of bacteria which you said you found at the rate of 30,000 per cubic centimeter, at the inlet to the Boonton reservoir; the most of those are perfectly harmless bacteria, are they not?

A. I should say that in all probability most of them were.

Q. Do they fight among themselves and eat each other up?

A. I don't know, I should say not.

Q. Don't you see the war going on among them under your microscope?

A. No, sir, I never have.

Q. Doesn't one species in one way or another deprive the other species of life?

A. Certain species, yes, but it is not true in the broad way in which you state it.

Q. They don't fight like horn cattle?

A. They don't fight like cats and dogs.

Q. What is the way you saw the war going on between them?

A. Well, in certain cases certain bacteria produce a substance apparently toxic to other forms.

Q. That is poisonous, is it not?

A. That means poisonous, and those conditions prevail usually when we have the species present in very large numbers, as we would in culture media, so that the toxic product would be sufficient to be potent.

Q. What is it that disposes of the ninety-eight and three-tenths per cent. of them after they get into the mouth of the Boonton reservoir and before they get to Jersey City?

A. Oftentimes that figure does not represent the condition—in many cases——

Q. Well, that is the average condition?

A. That is the mathematical average of those figures, yes, sir.

Q. Well, that is what I am talking of now—what is it that disposes of the great mass of them?

A. Many of them doubtless settle in the reservoir on those days when the water is quiet, because this specific gravity, as I have stated, is somewhat greater than unity. Some of them may be destroyed by algae present in the water; algae are vegetable forms, very much larger than the bacteria; many of which make the water objectionable from the standpoint of odor. These algae exert some destructive action on the bacteria of the water.

Q. The sunlight kills some?

A. The sunlight kills some, but the effect of the sunlight would be almost nothing below a depth of one or two feet—very slightly below the depth of a few inches.

Q. The water of a great lake like that is not favorable to their longevity, is it?

A. Under ordinary conditions, no; there may be conditions when we do get growths of bacteria, that is, if you are speaking of the——

Q. I am speaking of the ordinary conditions?

A. Well, you are speaking of the ordinary water bacteria, you are not limiting your question to typhoid.

Q. I am speaking of the 30,000 you found in the cubic centimeter.

A. That represented of course the various species.

Q. They are short-lived creatures, are they not?

A. Some of them.

Q. How about the B. coli?

A. I should say some individuals might be short lived, but many of them have the power of living for a considerable length of time—several months.

Q. As a rule, it is very short lived, is it not?

A. Well, I should say that most of them introduced into water would die in a comparatively small number of days, perhaps within one or two weeks. But we have always found in our experiments that some of them introduced in water were able to live for weeks or months.

Q. That is in your cultures, in the laboratory?

A. That is under laboratory conditions.

Q. But I am speaking of the conditions of the Boonton reservoir; how long could they live under such conditions with nothing fed to them by the bacteriologists?

A. We don't know exactly what happens in those reservoirs; but we know this: that some of them probably live a number of weeks.

Q. Well, with most of them it would be a matter of hours or a day or two, would it not?

A. I think in most of them it would be a matter of a few days, perhaps. You are speaking of B. coli?

Q. Yes, sir. Typhoid baccillus is still more tender and short lived, is it not?

A. Slightly more tender than B. coli, that is the numbers perhaps would drop off rather more rapidly at first, but some of them appear to live almost as long, if not quite as long, as B. coli under certain conditions.

By the Court:

Q. Do they live in the way that you have described? As I understand you their normal action is to split in two, and each half becomes an individual. That is their normal mode of propagation. Now, do you mean to say that when their baccillus lives they live and continue that propagation?

A. As to that, no one can say, because no one as far as I know, has ever observed continuously a single individual under those conditions. All we know is—the basis of our knowledge is simply this: we analyze water and test it and find them present; later on we test it again and find them in smaller numbers; later on we make another test and again find them; finally, perhaps, we make another test and fail to find them.

Further Cross:

Q. The laboratory conditions under which you observed them are more favorable to their life than the conditions under water, are they not?

A. That I don't know.

Q. Because you haven't observed them in water?

A. No one has had an opportunity to make the same observation in a large way as they can make in a laboratory.

Q. Well, you have reason to believe that is so, haven't you?

A. I should say not always; there are conditions in laboratories where experiments are made that are less favorable to longevity than in large bodies of water.

Q. I understand you to say that is a general proposition, they don't multiply in water under ordinary conditions?

A. You are speaking of multiplication?

Q. Yes.

A. That's true as far as the typhoid fever and B. coli is concerned.

Q. How long does the baccillus typhosus live in potable water under natural conditions, that is, exposed to the natural surroundings as opposed to laboratory conditions?

A. I don't believe that any one could answer that question exactly; so much depends upon what the different conditions are.

Q. You haven't made any observations which would enable you to give an opinion upon that, then?

A. I don't know of any one that has definitely; I have always thought that the conditions in the laboratory were, speaking broadly, fairly comparable with natural conditions. They are, of course, not closely so.

Q. Germs which you put in a culture prepared for them are put there so as to cause them to multiply and grow?

A. The laboratory conditions to which I referred are very different from that. I meant to refer to cases where they had taken waters or a water and introduced a certain number of typhoid fever germs and allowed them to remain in that water and then to make tests of the water at intervals to see how many were still there.

Q. Are you familiar with the investigation lately made in the Chicago drainage canal to determine the longevity of this bacteria?

A. Somewhat.

Q. That showed them to be quite short lived, didn't it?

A. Apparently they were under certain conditions, but some recent investigations made by others have thrown some doubt upon the accuracy of the determination arrived at by Drs. Jordan, Russel and Smythe, which is the investigation to which you allude, I think.

Q. Is not the latest learning on this subject to the effect that in water five days is about the limit length of their life, and ten days the extreme length of it?

A. I should say not. Experiments have been made recently which indicate those conditions, but I do not think sanitary science has accepted those limits by any means.

Q. In your opinion, in a reservoir like the Rockaway, what percentage of typhoid germs, if there were any there, would die in two days?

A. I could not answer that question exactly.

Q. How many in five days?

A. If I were to make any such general estimate, which would of necessity be only general, I should use the results of some compilations of experiments which I made a few years ago, and which I can look at if you would like to have me do so.

Q. Were those laboratory experiments?

A. Those were laboratory experiments.

Q. How many years ago?

A. Well, they ranged all the way from ten or twelve years ago up to two or three years.

Q. You may look them up, if you please, although I won't delay you now to do it; I suppose it would take some time, wouldn't it?

A. I think I have a few figures at hand; it wouldn't take me but a minute. Here are some figures that represent the average results under laboratory conditions, but in the different experiments the figures varied very widely from these, and these figures are only averaged conditions, and not representatives of what goes on at all times. But I find that on the average fifty per cent. of the typhoid fever germs introduced into water remained alive after a period of five days; twenty-five per cent. after a period of seven; five per cent. after a period of seventeen days, and one per cent. after a period of fifty days. Those are not limits; those are just average figures, and they may vary very widely from those under favorable conditions.

Q. The conditions of temperature in the laboratory are much more favorable to their life and growth than out in an open lake, aren't they?

A. That depends upon what temperatures are used under laboratory conditions.

Q. Oh, assuming you are using a constant temperature, with a view to their examination.

A. Well, in all laboratory conditions we usually control the temperatures in order that we may know what we are doing. Sometimes we keep the water in which they are placed near the freezing point, or at freezing point; other times we keep it at a warm temperature, and get different results.

Q. These experiments which you made, as I understand you, were kept at a uniform temperature which you mentioned?

A. I did not mention the temperature.

Q. One of your assistant, perhaps, mentioned it. A steady temperature is kept up, isn't it, for the purpose of obtaining the creation of colonies?

A. You have two different experiments confused. He was not speaking of the experiments of which I am now speaking; that was the temperature at which he kept the plates to determine the number of bacteria.

Q. Didn't you keep the water at a fixed temperature in the experiments which you described?

A. The waters were kept at different fixed temperatures.

Q. During different processes, you mean?

A. Well, different experiments were kept at different temperatures, and the figures represent averages of various experiments.

Q. In order to investigate and determine the efficiency of a filter, you do so by determining the proportion of the baccilli removed, do you not?

Mr. Vredenburgh: I object to that; what has that theory to do with this case? What is the materiality of that cross examination?

The Court: It would not be proper for me to limit the scope of the cross examination on this subject.

Q. (Question read.)

A. Yes, sir; at any one time. That is, we take the number of bacteria going into the filter—that is, the number of bacteria in the water applied to the filter—and then the number of bacteria in the water filtered at the same time, or at a sufficient interval thereafter to allow the water to pass through the filter.

Q. Well, if you had one of your filters at Boonton dam and passed all this water through it, and found on the average that 98.3 per cent. of all the bacteria were removed by it, you would call that a very successful filter, wouldn't you?

A. Speaking of average results, I say yes; but the conditions would not be wholly comparable to the percentage as figured out, as given in the previous question.

Q. What do you mean? That you would find a more uniform result with your filter than we do with our sedimentation, is that it?

A. I mean this, in case of our filter, or when your water is at its worst, that is, when the numbers of bacteria are high, your efficiency is usually higher; that is, the percentage of removal goes up. In the case of a river running into a reservoir, and where there is danger that the water may pass rapidly from the river to the outlet, then when the number of bacteria goes up, at those times you would expect the numbers at the outlet to be higher. And furthermore——

Q. With the natural sedimentation method we have, or with the filter, would you expect them to be higher?

A. I would expect the numbers in the outlet to be higher in the case of the sedimentation. That is, they would more nearly approach the condition of the raw water. And, furthermore, there is one thing that should be mentioned, that not all the bacteria in the filtered water goes through the filter. There is in filters a development of bacteria in the lower parts of the filters, and those bacteria gradually scatter out into the filtered water; so that some of the bacteria found in our filtered waters do not represent bacteria which were in the applied water——

Q. But they are there?

Mr. Vredenburgh: Let him finish his answer.

Q. Have you anything more to say to that question?

A. I think, so far as that question goes, I have nothing more to say.

Q. But the bacteria are there, after the water gets through your filter, no matter where they come from?

A. The bacteria are there; but those that I speak of as developing in the lower parts of the filter are harmless bacteria.

Q. Well, those developed in our reservoir are harmless, aren't they?

A. I should think those that grew in the reservoir are, probably, harmless.

Q. This 98.3 per cent. of removal of bacteria, as ascertained by your investigations, is the result of the whole three months' work in 1904, isn't it?

A. I have forgotten, I don't know whether your figures 98.3 are correct; I haven't figured that out exactly.

Q. Assuming that that is correct.

A. Assuming that that is correct, that is a comparison of the average number in the water going into the reservoir, and the average number in the water at Jersey City; it don't represent the average of the percentage of removal on any particular date. That is, we have not compared day by day, the percentage removal, and averaged those together.

Q. But the tables will show, won't they?

A. Yes, sir; that table will show that.

Q. And if the water were filtered you would make exactly the same comparison, would you, the raw untreated water, and the finished water furnished Jersey City?

A. We would not do it just that way; we would take the results day by day and find what the percentage removal was.

Q. Isn't that shown day by day in your tables here?

A. The percentage removal is not shown day by day. It is sometimes done, I would state, in the same way, but the better way is to do it as I have mentioned, day by day.

Q. Did you not report to Jersey City, after making those investigations, in these words: "These figures correspond well with the results obtained by many filter plants"?

Mr. Vredenburgh: I object to the reading of only one part of the report.

The Court: If he wrote that, of course, his attention can be called to it.

Mr. Corbin: I will read the whole paragraph, if it is desired; it is about this same thing we are talking about.

The Court: I think you ought to read his statement, with the qualifications.

Mr. Corbin: It is page 131.

Witness: Yes, sir; I made the statement that you——

Mr. Vredenburgh: Wait, wait, he is going to read it to you.

Mr. Corbin: Do you want the whole paragraph; it is the one at the top of the page?

Mr. Vredenburgh: The whole ought to be read.

Q. After making your investigations in 1904, did you not report to the authorities in Jersey City in these words: "The analyses indicate that the physical characteristics of the water, that is, those qualities which are evident to a person drinking it, were rendered unsatisfactory by storage in the reservoir at Boonton; on the other hand, the sanitary quality of the water showed decided improvement. Through sedimentation, the effect of sunlight, and the effect of the microscopic arrangements, the average number of bacteria was reduced from 37,892 to 642; a reduction of 98.3, while the number of red colonies on the lactos-litmus agar plate was reduced from 6,283 to 45, a reduction of 99.3 per cent. These figures correspond well with the results obtained by many filter plants." Did you not so report as the result of these three months' investigation?

A. Yes, sir; and I made a statement in the next paragraph which ought largely to be read in connection with your statement; my remark in regard to the comparison with the filter plant referred merely to the average figure which you have stated; I did not intend to mean by that that the water—that this method of purifying the water was as good as would be obtained by filter; it would not be, even if the average result for the period showed precisely the same figure.

Q. This reduction of red colonies on the lactos-litmus agar plate of 99.3 per cent. means the reduction of B. coli, doesn't it.

A. Well, it comes close to meaning that; it does not mean that exactly. Nothing has yet been said in this case in regard to these tests, but your general statement would not be far from the truth.

Q. You have, in your tables, claimed to have found B. coli in one cubic centimeter of water at Jersey City, isn't that true, frequently, of filtered water?

A. It sometimes is true of filtered water.

Q. Do you know about the Lawrence filter in Massachusetts?

A. Yes, sir.

Q. That is a good and effective one, isn't it?

A. It was fairly good at the time it was built, and was fairly effective so long as the water was not forced through it at too high a rate; it is now outgrown.

Q. Are you familiar with their reports?

A. Yes, sir.

Q. Are you aware that in that year, 1904 that in their tests of one cubic centimeter for the year, B. coli were found in 8 per cent. of all the tests?

A. I don't remember the exact figure, but I know the fact to be that in recent years the filter has been forced beyond what it should do.

Q. Did you build the filter?

A. No, sir.

Q. Do you know the percentage of bacteria removed by that Lawrence filter that year?

A. I don't remember it for that year, no, sir.

Q. Why do you say that the filter was overworked that year?

A. I have been so informed by the analysists of the Massachusetts State Board of Health; I have not seen the filter for a number of years.

Q. Suppose they removed 99.5 of all the bacteria that year, would you not call that a good average result?

A. It might be a good average result, but I don't know how it would be at certain times of the year.

Q. Well, suppose in no month it ever fell below 99.2, wouldn't you consider that good average result?

A. A good average result, yes, sir.

Q. Well, that is the way you judge every filter, isn't it, by its average results?

A. That is only the part of the way of judging a filter. So far as that average figure represents uniform conditions it is fair to judge the filter by that. If that average figure were made up of very different experiments, one of which was very good, and the other of which was very bad, then I would not consider that the filter was, as a whole, working satisfactorily.

Q. That is if it worked bad some days and good others?

A. I would not consider that a good state of affairs.

Q. Now, suppose I told you that in these months when the removal of bacteria was lowest, 99.2, 99.3, etc., that the tests in one cubic centimeter all showed negative results, none found at all, wouldn't you think the filter was working all right?

A. I should say when you got negative results the filter was working all right.

Q. These figures that I have given you, above

99 per cent., are as good as you expect to get in putting your filters in use, aren't they?

A. With an average condition; yes, sir.

Q. They frequently fall below an efficiency of 99, don't they.

A. Oh, yes.

Q. Fall as low as 95 at times, do they not?

A. Occasionally; yes, sir; but not often; ought not to, in a good filter.

Q. You are aware that the Boonton reservoir had been put in use for the first time on May 23, 1904, are you not?

A. I so understood, yes, sir.

Q. It had been completed, or put in use, a very short time before your examinations were made, had it not?

A. Yes, I understood so.

Q. Do you not consider that the results obtained in view of that fact were very good, with the Jersey City Water Works?

A. So far as the average condition, as the average figures go, I should say yes; but when I take individual results I find there were days when the results were not always good.

Q. Do you think it is reasonable to expect that Jersey City should ever, in any summer season, obtain a better average result than the removal of 99.3 per cent. of B. coli?

A. Perhaps you had better read that question. I did not quite catch the basis of it.

Q. (Question read.)

A. No, sir; I should not expect, on an average condition, that it would be as much as that.

Q. Is not that an excellent result, Mr. Whipple?

A. So far as the average figure goes, the result must be admitted as good; but in so far as the average figure does not reperesent conditions which should exist at any one time, that statement would be misleading.

The Court: I understand the witness to say this: That where there was a large flow of the water in the river, so that it entered the reservoir in large quantities, and the wind happened to be blowing in such a direction that this water shed flow would be carried to the outlet in the reservoir, that under those conditions the result as obtained at the Jersey City intake might be very different from the average conditions. Now, that is the way I understand it.

The Witness: That is exactly it, your Honor; that is my position, exactly.

Further Cross:

Q. That is, there might be exceptional days when the wind and waves were unfavorable?

A. There might be days when the water would go across the reservoir from the mouth of the river to the outlet so rapidly that we could not get anything like this ninety-nine and three-tenths.

Q. And there are days when the filter don't work up to a concerted pitch?

A. At times, but those days when the water is at its worst the filter does the most work.

Q. You mean when they have the highest percentage of bacteria, they get the highest percentage of removal?

A. Yes, sir.

Q. But there still would be more left of effluent in actual numbers than when the number is lower?

A. Precisely.

Q. The filters are a contrivance that requires constant and skilled attention, are they not?

A. Yes, sir.

Q. And their success is largely dependent upon that, is it not?

A. It depends much upon the filter, speaking generally, yes.

By the Court:

Q. They clog a great deal, don't they?

A. Yes, sir, and as a rule the more they clog the larger the percentage of bacteria removal, but of course when they do get clogged they have to be cared for, and the scum taken off, speaking now of sand filters.

Mr. Vredenburgh: My objection, I ought to have stated, was to the point that this contract clearly indicates an intention to have the pollution not go in, not to take the pollution out after it has gone in.

Further Cross:

Q. The numerical quantity of colonies of B. coli is the thing which is significant to the bacteriologist, isn't it, that is, there are few, it may not indicate anything wrong, and if there are many it may?

A. Speaking generally, your statement is correct, as I stated to his Honor, taking into account the number as well as their mere presence.

Q. Have you ever adopted the rule, and did you not thus state it in your report to Jersey City, page 119: "If the water regularly shows the presence of B. coli in ten cubic centimeters and not in one cubic centimeter, it may be safe for use; if it contains B. coli in one cubic centimeter and not in one-tenth cubic centimeter it may be considered as a doubtful quality; if it contains B. coli in one-tenth, but not in one hundredths cubic centimeter it may be considered as probably too much polluted to be safely used; if it contains B. coli in one-hundredth cubic centimeter the water is quite certain to be seriously polluted; apply this rule to the tests obtained above, it will be seen that during the greater part of August and September the Rockaway River at its mouth was seriously polluted." Was that your report?

Mr. Vredenburgh: You have not read quite enough of it; you cannot understand that sentence unless you read the sentence before it.

Q. I will read to you four lines immediately preceding what L have read, thus: "It is impossible to prescribe any definite standard for a drinking water which should not be exceeded, but the following is based upon a long personal experience in applying this test to waters which vary greatly in their sanitary quality." Did you so report to Jersey City?

A. Yes, sir.

Q. If a cubic centimeter of water shows five hundred B. coli, why would not one one-hundredth of a cubic centimeter show five B coli, if the germs are equally distributed among the entire mass of water?

A. I think it would.

Q. Then they are not in fact equally distributed, are they?

A. We assume that they are; I think perhaps the misunderstanding——-

Q. If they are equally distributed, why would not you be just as certain to find them in one one-hundredth of a cubic centimeter as to find them in a whole cubic centimeter?

A. I said you would. If I may be permitted to explain I will try to make the test clear.

Q. Pray do.

A. The reason for making this test in this way is because we have no convenient method by which we can tell the exact number of B. coli in a cubic centimeter. I have already referred, or Mr. Corbin has referred, to the red colonies, and that gives some idea, and because we have no such direct and convenient method we obtain an approximate idea of the number of B. coli present by testing different quantities of water, and we usually use for this purpose quantities which vary in a ten-fold manner, that is, we will test one cubic centimeter or one-tenth of a cubic centimeter or hundredth of a cubic centimeter or thousandth perhaps, and on the other hand, perhaps we would test ten or a hundred. Those which we use in these samples were usually four different quantities, varying from one-tenth to one-hundredth. Now if the B. coli were present in such numbers that there was just one to each centimeter, then if we take out from the water one cubic centimeter we would get a positive test, but of course if you take out ten cubic centimeters we would also get a positive test, and if we took out one-tenth of a cubic centimeter we would stand one chance in ten of getting a positive test, that is, we might take out nine cubic centimeters, I mean nine portions of one-tenth, and not get it, while the tenth one would give it, assuming a uniform distribution, which we do assume, and if we tested only one one-hundredth cubic centimeter of that water then the chance of getting it would only be one in one-hundredth. Now if we find positive tests——

By the Court:

Q. Well, that would be so, of course, if you assumed that there is only one there, but I don't understand that these tables indicate any such result?

A. Well, now, I was going to explain further, having started that——

Q. That is self-evident, of course.

A. If we assume that there were ten per cent., then we would, of course—I mean ten per cubic centimeter—then we would, of course, get a positive test, using ten cubic centimeter, and also a positive test using one cubic centimeter, and also a positive test using one-tenth of a cubic centimeter. If there were one hundred present per cubic centimeter then we would get positive tests down to the hundredth point. Now, in some cases we have results that show positive tests using ten cubic centimeters, and not using one. In some cases we get positive test using ten and one and fail to get it in the one-tenth. When we get those tests then we know that the numbers must lie between those limits, and that is all we can say for any particular sample of the test, but after having gotten a series of results for different samples then we can judge of the results as a whole, by finding the per cent. of the samples which give positive tests in one cubic centimeter, and in ten cubic centimeters and in the different quantities. Does that explain it, your Honor?

Q. (At this point the witness took his tracing containing figures and explained his previous answer to the Court.)

Further Cross:

Q. You say that the average of 37,000 odd bacteria which are found at the mouth of the Rockaway has been reduced to an average of 624 at Jersey City. Now you don't mean to say that those 624 at Jersey City were all B. coli, do you?

A. No, sir, I do not.

Q. What proportion of this 624 were B. coli?

A. A small proportion. I think you have already given it.

Q. Well, won't you indicate what percentage?

A. Well, of course I can't judge of the percentage of B. coli from the two figures which you have just mentioned.

Q. Well, from all you know from your long experience, what percentage of that 624 would be B. coli?

A. That I haven't figured out; I couldn't say that.

Q. Would there be as many as ten?

A. I would not want to give any figure for that.

Q. Would there be even six?

A. I don't care to give any figure for that. I have made no calculation of it.

Q. Now they are indicated to be B. coli by these presumptive tests, but there is no certainty that there are any B. coli at all when they reach Jersey City.

A. The tests that were made during 1904 were based wholly upon the presumptive tests and my experience with the use of this test in waters of this character, an experience extending over several years, has shown, in the majority of cases the test is a conclusive one; occasionally it fails, but taking it generally it is to be depended upon. In the cases of the samples collected and analyzed in 1905 the test was frequently made more conclusive and in fact made sufficiently conclusive so that I could say definitely that B. coli were there and the results which were incorporated on sheets were, as in the previous year, based upon the result of presumptive tests.

Q. Well, the best you can really say, then, is that to your mind there was a strong presumption that some B. coli reached Jersey City?

A. According to my judgment they were there.

Q. You don't pretend that you ever detected typhoid baccillus anywhere when you made any examination, do you?

A. In this work?

Q. Yes.

A. No, sir.

Q. I think you are quoted in pretty large letters in the newspapers as testifying here that you did find typhoid baccillus in the Jersey City water?

A. I so read.

Q. Well, what is the truth about that?

A. The truth is I didn't find it there and didn't try to find it there.

Q. Suppose there were forty-six careful, accurate and scientific bacteriological examinations made from the water at Jersey City at periods from May 24th to the end of the year, from the turning on of the water to the end of the year, and that the result was negative, that the results for the B. coli in every case with one-tenth of a cc. 6.6 per cent.

positive test in one cc. and 19 5-6 per cent. in 10 cc., would that to your mind indicate a safe supply of water?

A. Oh, I would not judge of the water from those figures alone, Mr. Corbin, for the reason that his Honor has already stated.

Q. Would you—(interrupted)

Mr. Vredenburgh: The witness should not be interrupted; he should be allowed to answer the question.

Q. Would you consider that a safe water; yes or no answers it?

A. I said I would not judge of the water from those figures alone for the reason his Honor has stated in regard to the dam.

Q. That is within your rule of safety as reported by you to Jersey City and to which I called your attention, is it not?

A. What page of my report is that?

Q. Page 119.

A. I don't think it is, no, sir.

Q. Don't think it is?

A. No.

Q. Well, perhaps you didn't hear the figures I gave you?

A. Shall I read from my report? (Reading). That if the water regularly shows the presence of B. coli in 10 CC. but not in 1 CC. it may be safely used." I should not say by those figures that the water regularly gave—did not show—the presence of B. coli in 1 CC. If I have the figures correct, 6.6 per cent. of the water sample positive results were obtained in.

Q. That is three times out of forty-six investigations?

A. Then on those three occasions it would not fall within my rule.

Q. Well, you used the word "regular"?

A. Yes, sir.

Q. Would you say when it occurred three times out of forty-six times it occurred regularly?

A. I should say that when it occurred three times out of forty-six times it was not regularly absent.

Q. When it occurs only nine times out of forty-six in 10 CC., would you call that a regular occurrence of it?

A. I would not call it a regular occurrence of it, but it would not be a regular absence of it.

Q. I understood you to say on your direct examination that the most influential circumstances induced you to speak in disfavor of these waters was not your analysis at all, but certain physical conditions that you found above Boonton, is that so?

A. I should give greater weight to my knowledge of the examination of the water supply than the mere results of analysis taken by themselves.

Q. And that examination is what you have described to us and what your assistants have described to us?

A. What I saw myself and what I saw through the eyes and reports of my assistants, yes, sir.

Q. It is those instances of contamination you have described is it?

A. In part those—as far as my personal knowledge goes it is confined to them, but I have knowledge also of the facts reported by my assistants and considered those in making up my opinion of course.

Q. After all in this latitude is not the real supreme test of the purity of the public water supply the death rate from typhoid fever in a city?

A. I think that when that extends over a considerable period of time that is one of the best indexes of the quality of the water, you cannot always depend upon that.

Q. Have you taken any pains to inform yourself in regard to what Jersey City's typhoid death rate has been since this water was introduced?

Objected to as irrelevant.

Objection overruled.

A. I have obtained figures showing the deaths from typhoid fever in Jersey City during that time, yes, sir.

Q. And how many deaths were there per one hundred thousand per year?

Mr. Vredenburgh: I object.

Q. Well, I will put the hypothetical question what would you consider the typhoid death rate in a city like Jersey City so large as to be indicative of an impure water supply?

A. That is impossible to answer that question with the exact figure because so much depends upon local conditions, and at any rate, with regard to typhoid fever your figure would represent only what the water had been, what it might be then.

Q. Then it is the future you have been talking about. It is the future that you think the trouble with the water may be and not the present time.

A. Well, I haven't stated anything of that sort, I am simply answering the question as to what the typhoid fever rate would indicate.

By the Court:

Q. You have said that you would regard death rate from typhoid fever as one of the best indications of the quality of the water used in a city?

A. What the quality of the water has been during that period that it was used, that is all I wish to say.

Q. Now I understand Mr. Corbin's question is framed on that statement of yours.

Further Cross.

Q. You don't find anything in the past records of deaths from typhoid fever to indicate trouble with this water do you?

The Court: You may ask him what percentage of deaths from typhoid he regards as indicative of pollution in the water.

Q. What percentage of deaths from typhoid in a city like Jersey City do you regard as indicative of polluted water?

A. It is impossible to answer that question exactly. I can give you certain figures which will serve as a general basis of my idea in the matter. Cities provided with water supplies known to be absolutely above reproach from a sanitary standpoint may have typhoid fever death rates as low as ten or twelve or fifteen per one hundred thousand inhabitants.

Q. Per year?

A. Per year. In some instances we even find death rates as high as twenty or even higher, but usually in those cases there are other sources of typhoid fever.

Q. You say—— (Interrupted.)

The Court: I don't think that the witness has completed his answer to the question.

A. I think I have.

Q. (The stenographer read the question to the witness.)

A. I stated that I could not answer that question exactly and I further stated in many cities where the water supply was above reproach, the typhoid fever death rate was as low as twelve or fifteen and in other cases the average rates may run from fifteen to twenty and in some instances they have been even above twenty, slightly above twenty. If I were to give rather more definite figures for cities in this latitude I should say that the typhoid fever death rate due to other causes than water would make the rate somewhere between fifteen and twenty per year per one hundred thousand.

By the Court:

Q. Then if I understand you anything above twenty indicates to your mind an abnormal condition of the water?

A. I might on an average condition, but it is not fair to use an average figure like that.

Further Cross.

Q. Those figures you have spoken of ranging from ten to twenty apply to towns that have an irreproachable system of water supply?

A. Well, I was speaking right along in that answer of towns that had such a water supply.

Q. Such figures as ten or twelve or fifteen that you mentioned are exceptionally low, are they not?

A. Exceptionally low in this country, it more commonly lies between fifteen and twenty.

Q. That is in these towns having a pure water supply.

A. Yes, sir; ground water and well filtered waters.

Q. But the great mass of the cities of the United States run thirty to a hundred, don't they?

A. Yes, sir; I should think that the average of the larger cities of the country were somewhere between thirty and forty, thirty-five and thirty-six; that includes cities supplied with waters of various kinds.

Q. You are familiar with the general average in the cities?

A. Yes, sir. Quite so.

Q. Do you know that in Connecticut they run about twenty-seven and a half in all their cities per hundred thousand per year?

A. I don't remember just the figures, but I should have to look them up, I have the figures in my office.

Q. And eighty in the District of Columbia?

A. I remember the figures are something in that vicinity, but I couldn't tell you exactly.

Q. And in Maine over forty-four?

A. In Maine they are somewhere near that—you are speaking of the whole state?

Q. The cities of the state.

A. I think that is true.

Q. And in Massachusetts over twenty-three?

A. As I say, I don't remember those figures exactly, but your general proportions are correct. Massachusetts is better than Maine.

Q. Massachusetts is practically the best state in the Union in that regard?

A. Yes, sir.

Q. In its sanitary administration?

A. Yes, sir.

Q. And its water supply?

A. Speaking generally, that is true.

Q. And in Michigan, thirty?

A. I don't remember those exact figures.

Q. And in New Jersey, do you happen to remember it?

A. No, sir; I do not.

Q. Twenty-one better, isn't it?

A. My recollection is between twenty and thirty, I don't know just what.

Q. And in New York, nearly twenty-three?

Objected to.

Q. Suppose the rate in a town like Newark or Jersey City were seventeen per hundred thousand per year, wouldn't you consider that an indication of good water—deaths by typhoid fever by one hundred thousandth per year inhabitants?

A. So far as that alone is concerned, if I knew nothing about the water at all, I should say that was within range of a good typhoid death rate.

Q. Well, such figures are indicative or rather inconsistent, are they not, with the bad water supply of that city?

A. When you have extreme figures, either very good, as for instance as low as ten, or when you number of bacteria with the water passing through this reservoir would be far less, as shown by the figures obtained during the present season."

By the Court:

Q. Well, that is a part of your report, is it?

A. It is.

Further Re-Direct Examination.

Q. Will you please explain why the conditions of a filter are not comparable with the conditions as they are found between the Boonton reservoir and the delivery at Jersey City?

A. Well, I should say that speaking in a very general way, the filter was always acting, while the influences tending to improve the water in the reservoir were not always acting, that is to say, when the condition was such that the river water is passing rapidly across the river to the outlet, the conditions favoring purification would not be marked.

Q. When you say outlet you refer to the effluent pipes and not to the overflow, or both?

A. I refer to both.

Q. You spoke about the mathematical average not being a fair average in connection with this question, what did you mean by that, your explanation was not clear to me at least?

A. Well, merely this, that at times the improvement in the water for certain days would not be as great as indicated by the average figure.

Q. That is to say then, upon different days under different conditions there would be different results?

A. Yes, sir.

Q. You spoke, Mr. Whipple, with regard to the life of the typhoid germ. I understand you made no tests to ascertain whether there were disease germs in this water or not, at either the place of entrance of the Rockaway river in the Boonton resof waters—the water of Jersey City, as to death rate or otherwise, is taken at a time when there is no typhoid fever in Dover or Hibernia or the other cities, then the death rate at Jersey City would be very small with respect to typhoid fever, would it not?

A. Well, I should expect it to be much smaller than if typhoid fever were common on the water shed.

Q. Would that be any evidence at all as to whether the water might not at any time become impure, speaking with reference to typhoid germs, whenever the typhoid epidemic did occur in Dover or in Hibernia or those other places?

A. I should say not, except as representing past conditions.

Q. In other words you would not likely have any typhoid fever from water in Jersey City if there was no typhoid fever in the source of supply at Dover or Hibernia?

A. No, sir.

Q. Then that follows?

A. I think so.

Q. In other words, you could not have typhoid fever, unless you have the germs?

A. That is right.

Q. I will read now from page 131, from which counsel only read part, following what Mr. Corbin read, and I ask you whether this was a continuation of that subject in your report: "During the season covered by this investigation, however, the conditions have been particularly favorable for this reduction to take place; no water has been running over the dam and the conditions for sedimentation have been good. Furthermore, the presence of micoscopical organisms exert a diminishing effect upon the number of bacteria in the water, so that these organisms, while they are the cause of bad odors are not at all unmixed evil. At other seasons of the year it is quite possible that the reduction in the would expect to find the rate at somewhere between fifteen and twenty. You might have a rate of sixteen in one case where the water supply was perhaps worse than it was in nineteen, and somewhere else, and I did not wish to confine myself to any stated figure like twenty, but that was about the range under existing American conditions.

By the Court:

Q. In other words, if you took up an authenticated statement and found in the case of any city that the cases were anywhere between fifteen and twenty, you would—having no other information to go by, having only that indication to judge by—assume that the water supply was good, is not that your idea?

A. Yes, sir, if I had——

Q. Of course I don't mean to say that these other indications might not point in another way, we all know about that, but having this indication—if the indication were, as I have assumed it to be, you would conclude from that, judging from that alone, that the water supply was good?

A. If the annual rates were regularly between those two figures?

Q. I say if they were regularly between those figures?

A. But if they fluctuated up and down, and fifteen were mere numerical average that would alter my opinion.

Q. I understand, if it were thirty one year and ten the next, your judgment would be different of course, but I am speaking of a uniform rate varying from ten, I will say, to twenty, that is the way I understand it?

A. Yes, sir, that is substantially correct, that the limitation that I have made.

Re-Direct Examination.

Q. Mr. Whipple, of course, if the examination have figures which are high, forty or fifty, then it is possible to make some statement which is within the bounds of accuracy, but when we are approaching that dividing line I cannot say very definitely just what the difference of a few units per hundred thousand would indicate.

Q. Are you a member of the American Health Association?

A. Yes, sir.

Q. And have been for some years?

A. Yes, sir.

Q. You have been on this committee investigating this very subject, haven't you, in times past?

A. Yes, sir.

Q. Mr. Whipple, don't you know that out of the 130 of the largest cities and towns in the United States, Jersey City in this regard stands fifth from the top?

Objected to.

Objection sustained.

Q. Suppose Jersey City at that rate is proved to be seventeen per hundred thousand per year, would not that bring it about fifth from the top of all the cities in the United States?

A. It would bring it very near the top, I don't remember just what.

By the Court:

Q. Anything under twenty, I understand the witness to say, would be ordinarily regarded as one out of many indications, perhaps, but as an indications of pure water supply, that is the way I understand this witness.

By Mr. Corbin:

Q. Is that correct, as the Court has put it?

A. I don't intend to convey that idea so sharply as that. The statement that I thought I made clear was this—that a city with a good water supply I ervoir, or at its discharge into the Jersey City reservoir?

A. No, sir, I made no such test.

Q. And your reason for not making any such test was what?

A. I didn't think that our methods of making such tests would give results which could be depended upon.

Q. Well, then you cannot tell when your result was negative as to B. coli, whether there were not disease germs there?

A. Not so far as my test goes, no, sir.

Q. You spoke of relying upon the reports of your inspectors and upon your observation of certain nuisances or certain discharges of fecal matter into the waters of the Rockaway river at Dover and other places; is that after all the main ground, upon which you have reached the conclusion that you have expressed to the Court?

A. Why it is not the only ground, but that was the main—I depended more upon the——

Q. What does the concentration of the population in cities like Dover have upon this question?

A. Why the concentrated population are more to be feared than the scattered population.

Q. What have you to say as to the dangers from the cities—the collection of individuals in cities and towns, compared with the country?

A. Why, I say it is the existence of these centres of population adjacent to the Rockaway river and the tributaries which constitute the most serious menace to the sanitary quality of the water.

Q. You spoke of examinations of the water in Long Island, in answer to his Honor's question. What was the result of your analyses of water at the outlet of the sewer, for instance at Dover, compared with—above it, as to the presence of B. coli?

The Court: The witness has stated that he made no analyses.

Mr. Vredenburgh: He was asked whether he did not make an analysis above Powerville.

Q. I will ask you whether you did make an analyses of the water of the outlet of Dover?

A. Well, the question is not wholly clear to me yet. You referred to some Long Island waters, and I don't know just what you mean.

Q. You spoke about the test in a stream in Long Island at different places, showing that as the number of population increased to the square mile, there was an increase of B. coli, did you not?

A. I remember what you mean; it was not one stream, it was a series of streams parallel practically. I understand now what you refer to.

Q. Now, I ask you whether you made any such test above Powerville near to the outlet of that sewer that would in any way throw light upon that question?

A. I made analyses of the water of the Rockaway river below Dover, and also below that sewer which shows the presence of B. coli.

Q. Well, which show it. Did it throw any light on the question of B. Coli coming from human beings at Dover—the two analyses, one above and one below the sewer at Dover, which showed the most coli?

A. They were somewhat more abundant than the one below.

Q. Now, did you make any other examination of the water between Dover and the point below Powerville that you spoke of?

A. Yes, sir, at several points between.

Q. Whereabouts below Powerville did you make the analyses to which you referred when asked by Mr. Corbin with reference to the rag mill?

A. I understand Mr. Corbin to refer to analyses of samples made immediately below and immediately above.

Q. Well, immediately below, where was that?

A. That was at the Cooper-Lord dam, if I remember correctly.

Q. How far was that below—confine yourself to below now; how far was that below Powerville?

A. Well, I should say a little less than one mile.

Q. And you compared the result you found there with the analyses of the water you made above Powerville, in order to answer the question whether the rag mill affected the water or not?

A. I did, yes, sir; those were the two nearest samples that I got there.

Q. I want you to compare the one you made immediately below Powerville with the one you made immediately below the sewer discharge at Dover, and ask you how those compare?

A. The sample that I was speaking of was made below Dover.

By Mr. Corbin:

Q. How far?

A. Well, it was approximately one mile below that sewer; about the same distance below that sewer that the other sample below Powerville was —below the rag mill.

The Court: He says he did not make one at the discharge, it was a mile below.

Q. Is that correct?

A. Yes, sir. I may say I made several; it was more than one.

The Court: I am a little mixed on the locality. I do not understand just where these different examinations or tests were made. The witness says he made several now, one he made a mile below the sewer discharge; where the others were made I don't know.

Witness: What I meant I made several at the same spot.

Q. Now, what point——

A. That was—the point below Dover was approximately one mile below Dover on the Rockaway river.

Q. Now, the one below Powerville.

A. The one below Powerville, where several were taken, was at the Cooper-Lord dam, which is approximately one mile below Powerville.

Q. Now, how did those two compare as to contaminations?

A. Taking the results of the analyses as a whole, and considering the several samples taken at those two points, I should say that that water was more contaminated in the river one mile below Dover, than it was one mile below Powerville.

Q. Well, in the examination of the water below Powerville, were the same analyses made as you made one mile below Dover.

A. The same kind of analysis, yes, sir.

Q. Is there any contamination that would be injurious to the water, coming from the rag mill, that you would not find in the water coming from Dover?

A. It is pretty hard to answer that, I should say generally no, although just what would be present in the washings of those rags I do not know, of personal knowledge; it might be somewhat different from things found in Dover.

Q. I think you said you made an analysis just above the sewer in Dover?

A. I made an analyses of the river water between Dover and Wharton, which was perhaps a mile above the sewer.

Q. How did that compare with reference to contamination, with the water that you analyzed one mile below Dover?

A. Oh, it was decidedly less.

Q. That is above Dover, it was decidedly less than below?

A. Decidedly less than below.

Q. And as to the number of B. coli?

A. There were not so many.

Q. I don't ask you how many, I mean how they compared, that is all.

A. Well, I answered that; not so many above Dover as below.

Q. Now, you spoke of the prison at Dover, and the stenographer has you down as saying—your answer, apparently, to the question, was that the exhibit that you took from the jail you found on the bank of the Rockaway River, fifteen or twenty feet from the river; did you say that?

A. I may have said it was inside of that distance; it was nearer than that.

Q. Have you a photograph here showing the jail and that discharge?

A. Yes, sir; that appears to be a photograph of the jail.

Q. Did you take that photograph?

A. No, sir.

Q. Does that substantially represent the jail and the discharge as you saw it?

A. I should say yes, excepting when I saw it snow was on the ground, and the discharge was on the snow, on the bank, on the sloping bank of the stream.

Q. Please tell us then, if you will, where you did take this exhibit which you produce, how near the river, how near the water of the river, and the character of the land between that and the water?

Mr. Corbin: All this has been gone into, and cross examined upon.

The Court: Yes, I thought we had gone over this. If the witness desires to correct his testimony, why, he may do that.

Q. Please correct your testimony.

A. I have forgotten just what the state was that I made.

Q. What is the truth?

A. As I recollect the facts, they were these: I testified that the police station, the building, was inside of 15 feet from the stream; I did not make any measurements, I stated that that pipe or drain, extended out from the building, towards the stream, and I collected the exhibit at the mouth of this drain, and that was within a few feet, perhaps five feet, speaking very roughly, from the waters, which, at the time that I saw the water there the stream being frozen, or the bank being frozen; at times of high water, however, it was very apparent that the water must come up to the mouth of the drain. I did not wish to convey the idea that——

Q. Was the land between where this was found, and the water, level, or how was it?

A. That is a bank, almost in the stream, within the lines of the wall which is there; it is a small steep bank.

Q. Well, which way does the land——

A. Sloping sharply towards the water.

Said photograph offered in evidence and marked Exhibit C 43.

Q. I show you another photograph of the same building, taken on a different day, and evidently different standpoint; do you recognize that picture also?

A. Yes, sir; it seems to be a photograph of the same building.

Q. When you were there was snow on the ground like that; was it frozen?

A. Yes, sir; there was snow on the embankment there.

Said photograph offered in evidence and marked Exhibit C 44.

Q. You spoke in your direct examination, and also in your cross, about the rag mill, at Powerville. I show you a photograph; do you recognize the building shown on that photograph?

A. Yes, sir.

Q. And you spoke of rags; do you see any rags there in that photograph?

A. There are piles of rags shown in this photograph in the foreground.

Q. How does that compare with the piles of rags as they were piled when you were there?

A. They seem to be practically the same as when I was there.

Said photograph offered in evidence and marked Exhibit C 45.

Q. In your cross examination you said something about the purification of the leeching of cesspools during their passage through the soil; what have you to say to that with reference to the vaults, privies and cesspools in Dover near the Rockaway river?

A. Well, from my observation of the conditions there I should not say that the purification of the leechings from the cesspools would be sufficient to render the material harmless by the time it reached the river.

Q. You spoke of sand as being soil that was favorable for leeching?

A. Some questions were asked and answered in regard to what purification might occur under favorable conditions of soil; I don't remember just what the questions were, or what the answers were, but as a matter of fact, the whole thing in regard to the purification of the leechings of cesspools depends upon the material through which the matter leeches?

Q. Did you observe the character of the soil where you stated in your cross examination, the privy vaults were moved to?

A. I did in a very general way; and in some cases I found the vaults were apparrently located upon what we may say, filled land, there being embankments along the river, apparently to keep the water back from the land, and the vaults being located there. Under those conditions it seems to me, in filling up the land for such purposes, the ground would be left in such a porous condition that any purification of the material leeching from the cesspools could not be depended upon to make it harmless. And, furthermore, in other sections of that valley, near the river, I found a generally gravelly structure, so that water would percolate through the soil very readily, and without such purification as I was speaking of the other day. In some cases, no doubt—well, that is all, practically.

Q. Is there any rule adopted by experts in your business, as to the distance at which cesspools and privies should be away from the water supply?

A. I don't know that there is any set rule which every one follows, because, naturally, it must vary with conditions. But I think that almost any sanitary man would hesitate about putting a well within 25 or 50 feet of a privy, on the ground of general danger.

Q. You say "well," we are speaking about the Rockaway River, now.

A. Or, I will go on and say, would allow a privy vault to be within that distance of a running stream used for water supply, which is not purified. And there are certain rules with which I am familiar, of governing the nuisances on the water sheds of the water supplies of New York City.

Q. Mr. Corbin, in his cross examination, spoke of a deposit in Hibernia, and then asked you whether such a deposit might not occur behind the barn of almost any farm house? What is the difference, from a sanitary standpoint, of those two facts?

A. Why, I think I stated that the act might occur behind any farm house; I don't know that I stated anything in regard to the effect. The difference, as I understand it, is merely this, that up in the place we observed in Hibernia there were many people doing that thing, it was a place where the ground had become trodden down, because there were many there; it was a general thing, apparently, whereas, in the case of a farm house, the ordinary farm house, I take it, it would be merely a matter of accident. Furthermore, the conditions at the point I had in mind were not favorable to a purification of the deposit, whereas, in the ordinary conditions, where those things might be deposited on loose soil, the conditions might be more favorable. That is, concentration of that sort of thing would be objectionable, whereas, a single one would not be.

Q. You use the word "objectionable"?

A. Would be a menace to the sanitary quality of the water into which that land drained.

Q. Are ten men in one house more dangerous from a sanitary standpoint than ten houses with one man in each?

A. I don't think I can answer that question definitely, but in a general way concentration of population always leads to more unsanitary conditions.

Q. Mr. Corbin asked you yesterday as to the effect or the result at the City of Bangor produced from the act of one person in the town above Bangor in which you said the typhoid fever originated. What is the difference from a sanitary standpoint again?

A. No difference, it is simply one of degree, of course there is more danger from a thousand people than there is from one.

Q. Mr. Whipple, I think you did not state at what time of the year this epidemic occurred in Bangor, what season of the year?

A. In the fall and winter and extending into the spring.

Q. And in Augusta, what season of the year?

A. Winter.

Q. Cleveland?

A. The epidemic there extended over the entire year, but was worse in the spring months.

Q. From your experience can you say whether one season of the year is any different in respect to danger of typhoid epidemic than another?

A. Well, yes, the amount of typhoid fever under normal conditions irrespective of water board typhoid occurs in the fall of the year, but I think that a very large proportion of typhoid epidemic due to waters occurs in the winter and spring.

Q. Does your analysis of the water of Jersey City point to any particular season?

A. I made no tests for typhoid fever baccillus and I don't know that that would have any bearing upon your question; of course as far as contamination goes there would be difference.

Q. I am now going to ask you a question which I omitted to ask on the direct examination. Do you know, Mr. Whipple, of the East Jersey Water Company's plant at Little Falls?

A. Yes, sir.

Q. Have you visited it?

A. Yes, sir.

Q. Have you had any occasion to analyze the water there?

A. I don't think I have.

Q. Can you tell us whether they have erected a plant to filter that water?

A. Yes, sir.

Q. And they supply what cities with water?

A. As I understand they supply Paterson, Passaic and some others.

Q. Have you recently been employed by the city of Paterson in any way?

Objected to as incompetent and impertinent.

Mr. Corbin: The East Jersey Water Company does not supply water to Paterson and never did.

Question withdrawn.

Further Cross. By Mr. Corbin.

Q. The analyses which you made of the water between Dover and Wharton show results materially different from those in the river a mile below Powerville?

A. Well, there is considerable difference between those two places.

Q. In what respects were they materially different?

A. The amount of chlorine was larger below Powerville than it was above Dover.

Q. How much?

A. The average figures of the samples collected between Wharton and Dover were or was, two and seven-tenths and below Powerville the average was 3.54.

Q. Any other substantial difference between the analyses?

A. The amount of nitrogen as albumenoid ammonia was a little higher.

Q. Where?

A. I mean it was higher below Powerville than it was between Wharton and Dover, the amount being .113 between Wharton and Dover and .124 below Powerville. Nitrogen as free ammonia was higher below Powerville than between Wharton and Dover, the figures being .021 between Wharton and Dover and .016 below Powerville. The nitrogen as nitrites was higher below Powerville, being .001 between Wharton and Dover and .006 below Powerville. The number of bacteria between Wharton and Dover was 1,825 and the average number of bacteria below Powerville was 18,717.

Q. And the time when your examination was made at Powerville the Liondale Print Works was still discharged into the stream—that had not been corrected?

A. Yes, sir.

Q. And they were a little worse above Powerville?

A. Yes, sir.

Q. That, I think you said accounted for some of the Chlorine found in the water?

A. Yes, sir.

Q. And in your report did you declare that the Liondale Print Works was the worst serious pollution in that whole water shed?

A. My recollection is that I stated that that was worse than any other single source, and my reason for that was on account of the discharge in connection with the water closets into the stream.

Q. Now, these privy vaults at Dover of the most part in boxes and vaults planned to be emptied, are they not?

A. Well, I could not say as to most of them, but some were.

Q. That is, they are built that way and do not depend upon leeching through the soil for their relief, do they?

A. My experience is that most of them do leak, as a matter of fact.

Q. Are they built so that they will leak?

A. Yes, sir.

Q. How leak?

A. Leak through the boards and cracks.

Q. At the reservoir, precipitation would always be there as a favorable influence, would it not?

A. You mean in the reservoir?

Q. Yes.

A. I should say it would be very slight at certain times.

Q. Sedimentation would be always active there?

A. Only when the water was quiet.

Q. You are speaking of the surface—it would be active below, would it not?

A. It would be active wherever the water was quiet, and if the water below was quiet, it would be active there.

Q. The spill-way from that dam is over the top of it, is it not?

A. You mean near the top of the dam?

Q. Yes.

A. Yes, sir, near the level of the top of the dam.

Q. And about three-quarters of a mile from where the water enters into the Rockaway River?

A. I should say perhaps a little less than that, perhaps nearer a half a mile.

Q. And a quarter of a mile beyond that is the gate house where the water is taken in for Jersey City?

A. Speaking roughly, yes, sir.

Q. And at the gates where the water is taken in you are aware that the water is down at a depth of twenty to fifty feet below the surface?

A. I know there are two gates through which they draw water.

Q. But those are the substantial depths, are they not?

A. Substantially.

Q. Then the current which you spoke of as possible to get from the Rockaway River to these gates would have to pass by this spill-way to get there, would it not?

A. Well, in a way it would have to pass by, but the amount and direction of the river—the water, where it leaves the river is directed towards the entrance of the gate house.

Q. You have not made tests to show that, have you?

A. Just to show the location.

Q. Why do you make the assertion that the current is in the direction you say it is?

A. Simply because the river points in that direction on—the outlet of the river.

Q. Have you made tests by floats or otherwise to show what the current is?

A. Not by floats.

Q. Or any other way?

A. Oh, yes, some of the analyses indicated that the water passed rapidly across.

Q. You mean that some of the analyses of the water at the outlet were worse than others—some of the tests were worse than others?

A. No, sir.

Q. What do you mean?

A. What I was referring to was a certain part of the analyses which in no way affected the sanitary quality of the water, but there were times when the color of the river water was increased after a rain, and that soon after that the color of the water in Jersey City also increased, my inference being that there was a rapid transference of the river water to Jersey City.

Q. During this whole period of time in the summer of 1904 when you were making your observations, were there not men working there on the dam, and at times upon the water, and agencies existing there which might affect the color of the water, which have not existed there since the work was done?

A. There were men at work there, but I don't think that would be likely to do anything that would influence the color of the water that I have referred to.

Q. They were laying stone on the top of that dam, raising it were they not?

A. Yes, sir.

Q. And laying them in mortar?

A. Yes, sir.

Q. And building up the earth banks on one side?

A. Yes, sir.

Q. And working around the shore?

A. Yes, sir.

RECESS.

Re-Direct Examination. By Mr. Vredenburgh.

Q. You said something about a joint test in your cross examination, do you refer by that to when your man Bouton and Mr. Gibson went up there together?

A. Yes, sir.

Q. That is the only joint test you know of, isn't it?
A. That is all.
Q. You called it a joint test; why did you call it a joint test?
A. Well, simply because these two men went together.
Q. That is all.

Thomas W. Constable resumed the stand.

Further Direct Examination. By Mr. Vredenburgh.

Q. Mr. Constable, when you were here as a witness before, you did not tell us from what source you obtained your samples of water from Jersey City, won't you please tell us where you got the water, how you got it and when you got it?
A. I got the water from the inlet of the reservoir No. 2, at Jersey City, as soon as I got back from Boonton.
Q. Yes.
A. And I obtained a——
Q. Was that your chemical or your bacteriological bottle or both of them?
A. I took a sample for both purposes.
Q. Do you recall about what time in the day you did that?
A. Usually about one o'clock.
Q. And then where did you go?
A. Then I went direct to the laboratory in Brooklyn, except on Wednesdays when I took a sample at the Pennsylvania Railroad depot.
Q. Well, where did you go from there—from the Pennsylvania railroad then where did you go?
A. Then I took the Brooklyn Annex and then to the laboratory.
Q. You went to the laboratory every day?
A. Yes, sir.

Q. On Wednesdays you stopped somewhere else to get another sample?

A. Yes, sir.

Q. Now these samples, after you got the water in the samples where did you put the bottles, I mean when you got it at Jersey City, what did you do immediately with the bottle then?

A. As soon as I got the sample I put it in my case and then left the place.

Q. And you did this every day when you took the samples from Boonton?

A. Yes, sir.

Q. That is all.

Further Cross Examination. Mr. Corbin.

Q. Did you carry your dress suit case from the Lackawanna station in Hoboken up to the reservoir?

A. Yes, sir.

Q. At what place at the reservoir did you get the water, where did you go close enough to the water to get at it?

A. Where the water was running into the reservoir I stood on the stone work there and lowered the bottle down into the water.

Q. Running out of the end of a pipe or over a dam or what?

A. Running out of a concrete pipe.

Q. A flat pipe?

A. Yes, sir; square or rectangular in shape.

Q. Was that a water fall there?

A. No, sir, not when I was there, the reservoir was high.

Q. You had to climb down the bank to go there?

A. No, sir; I stood on the cement work.

Q. Did you take it out of the flowing water that was going over or above or below?

A. Just lowered the bottle into the floating water.

Q. Above the water fall or below the water fall?
A. When I was there there wasn't any fall, because the water was high.
Q. There never was any fall?
A. No, sir.
Q. Well, was it in the reservoir you took it or from the concrete conduit that you took it?
A. It was in the reservoir that I took it.
Q. You took it from the reservoir?
A. Yes, sir.
Q. Let it down with a string?
A. A piece of wire.
Q. How far did you let it down?
A. Just enough to fill the bottle.
Q. You had this wire with you, did you?
A. No, sir, I obtained it from the man in charge at the station.
Q. Did you go in every day and get it?
A. No, sir, it was in the station, he had it for me.
Q. And you would go in every day and get that wire?
A. Yes, sir.
Q. And you would put it around the neck of the bottle?
A. Yes, sir.
Q. And then uncork the bottle?
A. Yes, sir.
Q. And then let it down in the water and then pull it out?
A. Yes, sir.
Q. What did you do with the cork when you were letting the bottle down with the wire?
A. I held it in my hand.
Q. Was it a glass stopper?
A. Yes, sir, in both bottles.
Q. How big was this cork that you had in your hand?
A. For the bacterial bottle the top was about an inch in diameter—had a flat top.

Q. When you were leaning over to get the water out from below, didn't you have to support yourself with your hand by hanging on to something?

A. No, sir.

Q. Did this cork touch your clothing some times?

A. I do not remember whether it did or did not.

Q. It touched your hand, of course?

A. Yes—I held it by this flattened part.

Q. The part that went into the bottle, didn't that some times touch your hand?

A. No, sir. The top of it protrudes so that your hand does not touch the part of the glass that goes into the neck of the bottle.

By the Court:

Q. Some one called it a mush-room top?

A. Yes, sir, I called it a mush-room stopper.

Further Cross.

Q. The top was larger than the part that goes into the bottle, was it?

A. Yes, sir.

Q. Where did you get it, in the Pennsylvania railroad?

A. I got it from the gentlemen's room upstairs, next to the barber shop.

Q. In the toilet room?

A. Yes, sir.

Q. How would you take that, describe it?

A. Out of one of the basins, I would let the water run and then I would after it had run for say a minute or so, I would take a sample of the water.

Mr. Vredenburgh: Well, those samples have not been used or mentioned.

Q. That is all.

Edward Kearney resumes the stand.

Further Direct Examination. By Mr. Vredenburgh.

Q. You were a witness a day or two ago, weren't you?
A. Yes, sir.
Q. During the time that you gathered water at Boonton, did you every day gather also water at Jersey City?
A. Yes, sir.
Q. Won't you state where you got the water at Jersey City?
A. At the aqueduct flowing into the reservoir, the water was flowing into the reservoir.
Q. Who showed you where to get it?
A. Constable.
Q. And what time of the day would you get it?
A. About one o'clock.
Q. And how did you get it?
A. The bacterial bottle I would tie a wire around it and leave it down through the running water, it was low tide then, I would only have to put it right under the water, as it was flowing over the top; and with the big mechanical bottle—the big bottle, I would put a piece around it and put it down into the water about five or six inches.
Q. When you took it out of the water what did you do with it?
A. Put the stopper in it and put the tin foil around the bacterial, and a piece of paper around the other one, and tied tags on them.
Q. Then what did you do with them—did you have the dress suit case with you?
A. Yes, sir.
Q. Then did you put it in that?
A. Yes, sir.
Q. What did you do with the dress suit case?

A. I brought it down to the laboratory and went right home.

Q. That is all.

Cross Examination. Mr. Corbin.

Q. When you took the bottle with the wire, what did you do with the stopper?

A. Had the stopper in my hand.

Q. Did you take that out before you put on the wire or after?

A. After I put on the wire.

Q. Then you held the stopper in one hand and let the bottle down with the other?

A. Yes, sir.

Q. Where did you stand while you were taking these samples?

A. On the concrete.

Q. Did you have to hold on to anything?

A. No, sir, it was level.

Q. How did you get down to this concrete?

A. It was level with the ground, the concrete, and you could put your hand right into the water.

Q. But you had to come down a sloping bank to get there?

A. No, sir; the concrete was level with the bank.

Q. Didn't you have to stoop over to get the water?

A. I had to kneel down and put my hand over the concrete.

Q. You had to kneel down and then reach over into where the water was coming?

A. Yes, sir.

Q. And then you let the bottle down with the wire?

A. Yes, sir.

Q. That is all.

Mr. Vredenburgh: I now offer those exhibits, the tracing and table.

The Court: Those papers have already been marked.

Harold Bouton resumes the stand.

Further Direct Examination. Mr. Vredenburgh.

Q. Mr. Bouton, did you go, on the 24th, after your testimony here, to Dover, and make some examinations there as to the sewers and drains
A. Yes, sir.
Q. I show you a photograph of a building called the Schwarz building, was that taken in your presence?
A. Yes, sir.
Q. Does that represent a building in Dover?
A. It does.
Q. Whereabouts?
A. A building situated near a bridge over the Rockaway river. I don't know what street it is; it is Sussex street, I think; I don't know the name of that street, though.
Q. When was that taken?
A. It was taken Saturday last.
By the Court:
Q. Well, how near is this building to the river?
A. Well, that other photo—it is right next to the river, your Honor.

Further Direct.

Q. I show the witness another photograph, and ask you what that is?
A. That is a photo of the rear of the same building; those photos were taken by young Mr. Griffin in my presence.
Q. On the 24th of February?
A. Yes, sir.
Q. Now the closet—did you go to the closet in the Schwarz building?
A. Yes, sir.
Q. Where was the closet?
A. The first floor apartments, one of the first

floor apartments—first floor up from the street.

Q. And did you put anything in it to show the color?

A. Yes, sir.

Q. What did you put in it?

A. I put a color known as urin.

Q. In this closet?

A. Yes, sir.

Q. Did that come out in the river?

A. It did.

Q. Can you show on the photograph where it came out in the river?

A. Yes, sir. (Witness makes a cross in ink on the photograph.)

Mr. Vredenburgh: I offer the photographs in evidence.

Marked Exhibits C 46 and C 47.

C 46 represents the front of the building, and C 47 represents the rear.

By the Court:

Q. The cross which you have made indicates what?

A. Where the discharge of this color was shown in the river.

Q. It came out in the river and not on the river bank?

A. Right immediately in the river.

Further Direct.

Q. What did it come out of in the river?

A. A pipe of about six inches in diameter.

Q. And is that pipe shown on the photograph? just about where I have made the cross.

A. Well, it is not shown but it comes out just about where I have made the cross.

Q. Does it come out above or below the water as shown in the photograph?

A. It comes right out in the water; the pipe was submerged.

Q. Now, how long did it take for that uranium when placed in the closet on the second floor of the Schwartz building to come out in the river?

A. About ten minutes.

Q. Did you speak to the owner of the building in regard to this closet?

A. I did.

Q. What claim does he make in regard to it?

A. That the whole building, and the numerous closets in the building, were connected with the cesspool which he pointed out to me in his back yard.

Q. Well, what claim did he make about this pipe?

A. I asked him what the—if that was so, what was this pipe? and, he said he didn't know. Just about that time the color commenced to show in the river, and I said—he began to show some agitation about it—I asked him where that came from, did he think, and he said he didn't know. Then he asked me if we had put coloring matter in the closet above, and I said yes, and he said, "Well, any way, it don't make any difference"; that the river was there for that purpose, but he didn't know where that came from.

Mr. Corbin: I haven't objected to all this evidence, but I don't suppose that what that man said can possibly be evidence against us.

The Court: I thought perhaps you preferred to have it in, as you did not object.

Mr. Corbin: Yes, we want to follow it up.

Q. Mr. Corbin asks that you mark on this where the cesspool was.

Mr. Corbin: I suggest he mark a "C" there.

A. All right. There is a stone over the top of it. I now mark with the letter "C" the spot where I found the cesspool.

Q. Now, did you go to any other place that day?

A. Yes, sir.

Mr. Corbin: Did he say who that man was that he talked to?

The Witness: Yes, sir; Mr. Schwartz; he said he owned all those buildings.

Q. Did he claim any right to sewer into the river?

A. He said the river was there for that purpose. He did not admit this matter came from the closets, but he said it was a natural sewerage system.

Q. You said you went to some other places in Dover. I call your attention, for purposes of speed, to No. 301 Richard Avenue, in Dover, and ask you if you went there?

A. I saw the result of that. Young Mr. Griffin made the experiment inside. I saw the discharge coming out of the pipe into the Hooey street brook, which runs to the river.

Q. What was the nature of that pipe; what was its size?

A. That was about a four-inch tile drain, I should think.

Q. This sewer from the Schwartz building, what was that, was that a tile pipe?

A. Yes, that was tile, I think, that was six-inch pipe.

Q. Now, I ask you whether after this experiment you attempted to put this uranium in the other closets in that building, the Schwartz Building?

A. I did. I asked Mr. Schwartz, I said, "If your closets discharge in this cesspool, and we claim that this green is coming from this closet we just tested in your building, you can have no objection then to our testing others in your building," and he would not let us do it.

Q. Were there any others in the building?

A. There were.

Q. Do you know how many?

A. No, I don't; I should say there were eight or ten families at least in that building, besides the store on the ground floor.

Q. Now, I call your attention to the grocery store belonging to Edward—that grocery store on Blackwell, which may be known as the Edward Jenkin store, did you make any experiments there?

A. Well, we saw a tile drain coming apparently through his yard, at least the pipe was there, and there was a very greasy accumulation at its mouth, right at the brook into which it would discharge.

Q. That pipe was what size?

A. That was, I should say, about six inches.

Q. What kind of pipe was it?

A. Tile pipe.

Q. And it ran along the ground from his building towards what?

A. No, it ran beneath the surface, it must have been beneath the surface; we saw a foot or so of it protruding from the bank at the edge of this brook, small stream.

Q. Now, did you see anything coming out of that sewer?

A. We saw this collection at its mouth.

Q. Where was its mouth with reference to the river?

A. Well, its mouth was right at a small brook which leads eventually to the river, the lower part of Dover.

Q. Now, go to 12 Hooey street, Dover?

A. Yes, sir.

Q. What experiments did you make there?

A. Well, I put some coloring matter in the sink of that place, and it discharged into the Hooey street brook in a short time afterwards.

Q. And does Hooey street run to the river?

A. Hooey street?

Q. Hooey street brook?

A. Yes, it does.

Q. Now, did you make any experiment at the church——

The Court: He has not told us the result of this experiment. He said that he put some coloring matter in the sink, but has not said what happened.

Q. What happened?

A. It discharged—a short time afterwards, this green color appeared in the brook.

Q. (By Mr. Corbin.) Is that 301 Richard avenue?

A. No, that is 12 Hooey street.

Q. (Further direct.) Now, the church; did you examine——

Mr. Corbin: What did he say he put that in?

Witness: I put it in the sink in the kitchen.

Q. Now, the church on East Blackwell street, did you do anything there?

A. Yes, sir.

Q. What?

A. Well, there is a large privy situated on the bank above the river, and I should judge 10 feet back from the wall, which supports that bank. Beneath this privy one can see the contents, because of the poor condition of the support to the house above; there is a large hole there on the riverside. I placed some coloring matter in there, and by means of a bucket of water obtained from the river right nearby, I washed this coloring matter down through there, and sometime afterwards green was coming through the chinks in the wall right into the river.

Q. Now, have you made any other experiments there, either that day or since?

A. Yes, sir; I have.

Q. State them, will you please.

A. I was to Dover yesterday, and tested the closet in Dr. Hunter's office on Blackwell street, on the rear of the hall on the second floor, with two different colors, both of which showed—the colors used sometimes one after the other—both colors showing eventually at the mouth, the outflow of the Morris street sewer.

Q. (By Mr. Corbin.) What did you put it into?
A. I put it in the closet. I might say that that color came out in the presence of Mr. Gibson.
Q. (Further direct.) Well, now, did you dose the water closet on the third floor of the Singleton Silk Manufacturing Company?
A. I did.
Q. How far is that situated from the Rockaway river?
A. I should think about 1,200 feet up the Granny brook from the river.
Q. Now did you get into the closets of that mill?
A. Yes, sir.
Q. Well, were you delayed in getting in there for any reason?
A. Yes, sir.
Q. What was the reason?
A. Two of the operatives were using the closets.
Q. Well, when you did get in what did you find?
A. I found human excreta in the trough that was used for that purpose.
Q. Now, did you dose that?
A. I did.
Q. What happened then?
A. The color appeared in the Granny brook below about ten minutes afterwards.
Q. And the Granny brook runs where?
A. Into the Rockaway river.
Q. Is it a brook of any size?
A. Yes, considerable size.
Q. Now, did you find out how many employees there were in that establishment?
A. Yes, sir.
Q. How many?
A. One hundred and sixty.
Q. Did you find out how many closets there were?
A. Yes, sir.
Q. How many?
A. Eight.

Q. Did you find any other privies or urinals there?

A. Yes, sir.

Q. Where?

A. They were outside the building, on a small tongue of land around which—on one side of which was the Granny brook, and on the other side another small stream, probably a part of this brook.

Q. I show you two photographs, companion photographs, and ask you whether those are photographs of this mill?

A. Yes, sir; they are.

Q. Taken when?

A. Taken yesterday.

Q. (By Mr. Corbin.) By whom?

A. By young Mr. Griffin, Weldon Griffin.

Q. (Further direct.) In your presence?

A. Yes, sir.

Q. They correctly represent the mills?

A. Yes, sir.

Said photographs marked Exhibit C 48 and C 49.

Q. Now, is the last privy you speak of shown on either one of these photographs?

A. Yes.

Q. And is the Granny brook shown on the photograph?

A. Yes, sir.

Q. Which of those photographs is it shown on?

A. C 49.

Q. (By Mr. Corbin.) That is the urinal you speak of?

A. That is one urinal and two closets.

Q. (Further direct.) Were they in use, those closets?

A. Yes, sir.

Q. Could anybody get into them that wanted to, or were they locked up in any way?

A. No, sir; they were open.

Q. Did you see evidences of their having been used?

A. Yes, sir.

Q. And the results went right into the brook—near the brook?

A. Yes, sir. I saw it there on this very narrow tongue of land which sharply descends to either stream floating at the base.

The Court:

Q. I notice on Exhibit C 49 there are two little buildings joined by a plank across, are they both closets?

A. No, this one is (indicating).

Q. You mean on the right?

A. Yes, sir.

Further Direct:

Q. Just mark that closet with a cross?

A. Yes, sir.

Q. Does the appearance of these closets indicate that they are of recent construction or not?

A. No, sir.

Q. And the appearance of this drain that you have spoken of, or drains, are they of recent construction or not?

A. Which drain?

Q. Any o fthe drains that you have spoken of—drains or sewers?

Mr. Corbin: Pipes, he called it.

Q. You have spoken of the various pipes at different places, not only at the silk mill, but at other places, are they apparently of recent construction or are they apparently old?

A. Old.

Q. Did you maye any experiments which furnished any results?

A. Well, we tried two places on Saturday and we don't know which of those two it is, but it is one of the two and we intend to try again; we could not tell which of the two places it was.

Q. Well, what did they do?

A. Flowing into the Morris street outlet.

Q. Have you mentioned what those two places were?

A. No, sir.

Q. Cannot you mention two places?

A. Yes, sir, I can.

Q. Mention them.

A. Moller's saloon.

Q. Yes, and the other.

A. On the corner of Morris street and the avenue running next to the railroad and one of the two places that I tried in 1903, 16 East Blackwell street.

Q. What did you do?

A. I put some coloring matter down.

Q. The coloring appeared but you couldn't tell from which closet?

A. No, sir. We dumped it soon after it went into the other and it came from one of those two places, but I don't know which one, it may have been both.

Cross Examination by Mr. Corbin:

Q. It appeared where?

A. In the river at the down stream end of the Morris pipe.

Q. You speak of these pipes as old, how could you tell they were old?

A. I could tell from my observations the pipes had been exposed to the weather or the elements.

Q. One of them you only saw the end of it submerged under water?

A. Well, I saw about a foot of it beneath the surface of the water.

Q. Is that at Schwartz's.

A. Yes, sir.

Q. Where he first denied there was any such a thing?

A. He didn't deny that there was a pipe; he denied that the coloring—he denied knowing what the pipe was. Any one could see the pipe.

Q. What kind of a place was it where you put this coloring matter in at Schwartz's place?

A. A closet in the back of the hall.

Q. On the first floor.

A. The first floor above the second floor of the building.

Q. What is the building occupied for?

A. Well, there are families on the floors above the store.

Q. The store is below?

A. Yes, sir.

Q. But this one of Dr. Hunter that you have mentioned is one that you reported on in 1904 and then afterwards made a joint test which failed?

A. The first experiment of that building hadn't been made, but it was one of those included in the joint test.

Q. And that showed negative results?

A. Yes, sir.

Q. The property No. 11 Hoey street, you merely put coloring matter in the kitchen sink?

A. Yes, sir.

Q. And it appeared in the pipe out on the ground?

A. It appeared in the brook?

Q. Coming from the pipe?

A. Well, there were three houses built on made or filled-in land above this brook and the color being put in the sink of the one nearest the river, the color showed at the first place where the brook again appeared.

Q. You found no water closet there?

A. No, sir, except the privy outside.

Q. Now you spoke of taking pails of water and throwing them into the closet of the church—what church?

A. I don't know the name of the church.

Q. Where is it?

A. It is down in the lower part of Dover on

Blackwell street, the name of the side street I don't know.

Q. And after you put water enough in you found colored water coming out through the chinks in the wall?

A. Not immediately.

Q. Well, some time afterwords, how long?

A. About an hour.

Q. How far from the river does that closet stand?

A. I should say ten feet, possibly twelve?

Q. Had you previously been to the Singleton Silk Mill?

A. Had I previously been?

Q. Well, before I go to that, was this a frame church or stone church?

A. Frame church.

Q. Now about the Singleton Silk Mill?

A. That is the Singleton Silk Manufacturing Company.

Q. Twelve hundred feet from the brook. How wide is the neck of land whereon this closet stands?

A. I should think six or eight feet wide beneath the closets.

Q. Is this the closet shown on C 49 in which you put the coloring matter?

A. No, sir, the coloring matter was put in the building.

Q. This is a vault closet, is it not?

A. Yes, sir.

Q. With a box?

A. Yes, sir.

Q. You didn't test it?

A. No, sir.

Q. What you did test, I understand you say had a trough?

A. It was a regular closet, but this trough ran underneath. There were two closets on each floor and the trough ran beneath these closets.

Q. What kind of a trough?

A. Cast-iron trough.

Q. Did you follow it up to see where that led or where it was supposed to empty?

A. Yes, the man who had given us permission to test it where that led to, whether it led to a cesspool or not and he said he didn't know. We asked him if it led to the river and he said he didn't know and we asked him where it led to and he said he didn't know.

Q. You didn't find out then?

A. No, sir, except as the result of our test.

Q. When you put in coloring matter you sometimes found it is the brook?

A. Ten minutes later.

Q. You didn't see whether it came out of a pipe or anything of that kind?

A. Well, if it was a pipe it must have been concealed by the stone work; it came out of a wall so that it might be called a blind drain.

Q. Wall of what?

A. Supporting the bank next the brook.

Q. Well, from the factory or privy building or what?

A. There is a roadway runs alongside of the mill made of cinders, I suppose, and in order to retain that and keep it from falling into the brook this rubble wall has been built.

Q. Retaining wall?

A. Yes, sir.

Q. What did you put into that closet?

A. I put urinine.

Q. What color is that?

A. Yellowish green.

Q. Powder or bluine?

A. Powder.

Q. And you saw evidence of some similar color ten minutes later in the brook?

A. Yes, sir.

Q. Coming through the wall?

A. Yes, sir.

Q. How far from the place in the building where you had put in this stuff?

A. We put it in on the third floor and I should think it would be about thirty or forty feet on a level with the base of the building.

Q. Laterally?

A. Yes, sir, laterally.

Winthrop W. Ruggles sworn for the plaintiff.

Direct Examination by Mr. Vredenburgh:

Q. Your profession is what?

A. Civil engineer.

Q. You have practiced that profession how many years?

A. Fifty.

Q. Have you ever been chief engineer of Jersey City?

A. Yes, sir.

Q. How many years, several years?

A. Several years.

Q. You are not chief engineer now, are you?

A. No, sir.

Q. But you are in the employ of the city in this matter?

A. Yes, sir.

Q. Did you make a profile map of the Rockaway River below the dam of the Boonton Reservoir?

A. Yes, sir.

Q. Will you please produce it?

A. (Witness did so.)

Q. This map is entitled, "Map showing riparian owners on the Rockaway River from Boonton dam to the Parsippany turnpike and water elevations." Now, on this map, Mr. Ruggles, I see there are the names of the various owners—of various persons, who are they?

A. They are the owners of the property fronting on the river.

Q. And their lines of ownership are shown in what way?

A. I think it is a red line.

Q. No, it is not red, it looks like a broken black line.

A. Yes, sir, it is a broken black line.

Q. The river is shown in blue?

A. Yes, sir.

Q. And the parallel lines represent a road?

A. Yes, sir, running across the river near the dam and then running down the river a little ways.

Q. Then some distance below there are two parallel lines crossing the river and near it is marked Courter's Bridge; now what road is that?

A. The road that crosses the river at what is called Courter's bridge.

Q. And the two parallel black lines that cross the stream near the—(interrupted).

A. Is the Parsippany turnpike.

Q. Now below that you have not the names of the owners?

A. No, sir.

Q. And some little distance below is shown the junction of the Rockaway River wth the Passaic River?

A. Yes, sir.

Q. And the Passaic River is marked Passaic River?

A. Yes, sir.

Q. What is the scale of this map?

A. One thousand feet to an inch.

Q. And the points of the compass are shown here?

A. Yes, sir.

Map offered in evidence and marked Exhibit C 50.

Q. Now, the profile which you have, will you please produce that?

A. This profile is marked "Profile and elevation of water in the Rockaway River from the waste pipe in Boonton dam to Parsippany turnpike."

Q. And the profile shows the elevations of the water on N. and E.?

A. North and east.

Q. The northeast side of the river?

A. Yes, sir.

Q. The elevations of the water shown on the profile is taken from what?

A. From the State data which is two-twelfths above mean high tide.

Q. I suppose that means two feet and twelve hundredths?

A. Yes, sir.

Q. Above mean high tide, vertical scale, six feet to one inch, horizontal scale, one thousand feet to an inch; now this profile was made by whom?

A. It was made by me.

Q. And is it accurate?

A. It is.

Mr. Vredenburgh: I offer this in evidence.

Marked Exhibit C. 51.

Q. Now, the elevation of the Rockaway River at the Boonton dam is shown on both the profile and the map?

A. Yes, sir.

Q. And how is it shown on it, by what color or figures?

A. Red, I think, it is red on the profile.

Q. It is red on the profile and seems to be red on the map?

A. Yes, sir.

Q. Now, take the first owner—the Firemen's Home—what is the elevation of their land, up-stream?

A. Two hundred and three feet and six-tenths.

Q. Now, what is the elevation of the river at its down stream line?

A. One hundred and ninety-six and three-tenths.

Q. How many feet on the river does it own?

A. I cannot tell you.

Q. And the owner on the opposite side of the river is who?

A. Estate of John P. Peer.

Q. And the ownership of that estate on the river is how much?

A. 2,875 feet.

Q. What is the fall?

A. Six feet and four-tenths.

Q. Now, going down on the same side of the river, the next owner is who?

A. Herman Beers.

Q. How much has he?

A. Nine hundred and ninety feet on that side.

Q. What is the fall between him—his property, between his upper line to his lower line?

A. Seven feet and two-tenths.

Q. And what is the next owner?

A. Catherine J. Davenport.

Q. And what is her riparian ownership?

A. Eight hundred feet.

Q. What is her fall?

A. One foot and three-tenths.

Q. What is the next owner?

A. John N. Peer.

Q. What is his ownership?

A. 1,070 feet.

Q. What is his fall?

A. Four-tenths.

By the Court:

Q. Four-tenths of what?

A. A foot. One foot and six-tenths, that is.

Further direct:

Q. Now the next owner is who?
A. C. J. Davenport again.
Q. What is the second ownership?
A. 2,785 feet.
Q. And what is the fall in the second ownership?
A. Four feet and three-tenths.
Q. And the next owner?
A. John N. Peer.
Q. And how much has he?
A. 1,465 feet.
The Court: Is not the witness reading from his own map?
Mr. Vredenburgh: Yes, sir.
Q. Does the map show the ownership and the fall of each owner's property on that riparian river, on both sides?
A. Yes, sir.
Mr. Corbin: May I ask a question right there?
By Mr. Corbin:
Q. Does it show those cases where a man owns one side of the river, and those cases where he owns both sides of the river?
A. Yes, sir, it shows both.

Further Direct:

Q. Now, what is the fall of the river from the line of the estate of John P. Peer, being the owner nearest to the Boonton dam, from his up-stream line, to the Parsippany bridge—what is the fall of the river?
A. Thirty-seven feet and one-tenth.
Q. Now, along that fall are there any dams?
A. There is one dam there.
Q. What dam is that?
A. That is a dam awned by Zabriskie.
Q. Is there any mill near the dam?

A. Yes, sir.
Q. What is the height of that dam, about?
A. About four feet.
Q. Now, is there any other dam—old dam?
A. There is an old dam below Starkey's.
Q. What fall has he, Starkey?
A. Four feet four, on Starkey's property.
Q. Now, is there any other dam site there?
A. Yes, a dam could be built on Herman Beer's property. He owns on both sides of the river.
Q. What size dam could there be?
A. It would be a dam about five hundred feet long.
Q. Well, what would be the fall?
A. Eight feet head.
Q. Now, at the Zabriskie, how much head can they get?
A. It has not over fout feet—I don't know what it is.
Q. Well, by building the dam higher they could get more fall, couldn't they, there?
A. Yes, sir, but they couldn't build it much higher.
Q. Now, the length of the river from these two points that you said the fall was thirty-seven and a half feet, is what?
A. Following the river it is about six miles.
Q. Along the river?
A. Yes, sir.
Q. Now the character of the banks in that six miles is what?
A. Well, most of the way it is low ground, not swampy, except in places; it is low, it is overflowed at high water a great deal of it.
Q. How far are the banks, the banks that don't overflow, are they different distances?
A. After you get below Mrs. Davenport's property there is no high banks except on the left hand side, as you go down, and after you get below Zabriskie's there is no high dam at all.

Q. Well, down at Sharkey's it seems to be banks?

A. They are not high.

Q. How high are they?

A. I suppose on one side six feet, and on the other about three.

Q. What distance are those banks apart at Sharkey's, we will say?

A. Oh, about eighty or ninety feet there.

Q. When you get on the top of those banks, how is the country then, is it rolling or what?

A. On the right hand side going down it rises gradually; on the left hand side it is all the way from two hundred feet to a thousand.

Q. How is it when you come further up at Zabriskie's?

A. Well, the ground rises both ways from the river, a little—very slight.

Q. Now as to the improvements, the houses, are any of them on the stream or near the stream?

A. Zabriskie's house is the nearest to the stream of any of them.

Q. How near is his house?

A. Across the road, and the river is one side of the road; perhaps sixty feet from the river.

Q. How high is he above the river?

A. Possibly three feet.

Q. Well, now the other properties, are they most of them built on?

A. They are all built on, I think.

Q. And the dwelling houses are near the streams, where they can see the stream?

A. After you get below Sharkey's two or three sections, no.

Q. After you get below Sharkey's?

A. Yes.

Q. Sharkey's is one of the lowest down?

A. Well——

Q. How it is above Sharkey's?

A. Here is Sharkey's here, and down to the bridge there is not a house, but one over near the river.

Q. Well, now the nature of these meadows on each side of the river, speaking agriculturally, is what?

A. Meadow land.

Q. Grass land?

A. Grass land.

Q. Cultivated, any of it?

A. There is considerable snow on there, I don't think there is any of i tcultivated down near the river; it overflows near the river.

Q. That is all.

Cross Examination: Mr. Corbin.

Q. The only one of these places that is now improved is Zabriskie's?

A. Yes, sir.

Q. And that is in operation?

A. No, sir, not now.

Q. But it is fighting?

A. Yes, sir.

Q. Were you aware that was owned by the Jersey City Water Supply Company and not by Zabriskie?

A. No, sir.

Q. You did not know that?

A. No, sir.

Q. And when I say owned by it I mean were you aware that his mill rights and water rights were owned by that company?

A. No, I was not.

Q. These different falls that you mentioned on the different places cannot be obtained as a practical matter without throwing the water back on the man above, could they?

A. No, sir.

Q. And in many of these instances shown on your map, the owner owns only one side of the stream, does he not?

A. There is only one case, I think, where a man owns both sides.

Q. Only one man that owns both sides, who is that?

A. Herman Beer.

Q. And you think Herman Beer to build a dam five feet long could get a head of eight feet?

A. Yes, sir.

Q. Would that flow water back on the man above him?

A. Yes, sir.

Q. He couldn't even do that, then, without throwing the water on the man above him?

Q. Is there any one of these owners, within the limits you have mentioned, outside of Zabriskie and Starkey, that controls any head and fall of that river worth developing?

Mr. Vredenburgh: I object; it is not material, for this reason: That any time before the twenty years are up one man may own it all, and then he is the man we have to deal with; whether they own it now is of no importance.

The Court: If you can show by this witness that this water right is of no value to anybody, it is competent, but I cannot try this question in the absence of owners, for they have a right to be heard as to whether their water right is valuable.

A. I think Mt. Behr does.

Q. How much head could he get on his own property?

A. On his own property? Seven feet three inches. I said he was the only man that owned on both sides the river; the Sharkey estate owns a little strip on the other side of the river, and A. C. Courter at Courter's bridge.

Q. This 37.1 of fall which you find in six miles of the river is rather gradually distributed throughout the whole of it, isn't it?

A. It falls more rapidly as far down as Sharkey's above than it does below.

Q. There are no other places on the river that you would think of as a water power at all, except Zabriskie's, Sharkey's and Behr, are there?

A. That is all.

Q. Is there not quite a substantial brook emptying into the river at Sharkey's?

A. Yes, sir.

Q. And some smaller brooks above that, between that and the dam?

A. Yes.

Q. How far is Starky from the dam, measured along the river?

A. About two miles and three-quarters along the river.

Q. Does that profile map show the ownerships at the various points?

A. No, sir.

Q. Can we, by superimposing it on the other, find out?

A. Well, I hardly think you could.

Q. When was your examination of the stream made?

A. A week ago last Saturday.

Q. How did you find out about the ownerships?

A. I took them from the deeds on file at Morristown; I got the list from the assessor of each township.

Re-Direct Examination:

Q. Mr. Ruggles, aren't there many places along that river where, is there was a full flow of the river, there could be rams installed for the purpose of forcing the water into dwelling houses of the owners along the stream?

A. Yes, sir; that could be done.

Q. Fall enough for that in many places, isn't there?

A. There are nine houses between the dam and Starky's that water could be rammed up, I suppose.

Q. Well, a good many places where there are no houses along there; more than nine?

A. Yes. That is all there are now.

Q. I mean in the future, houses could be put all along there and the water used for domestic purposes, couldn't there?

A. Yes.

Q. Are you experienced in rams?

A. No, sir.

Mr. Vredenburgh: That is all.

Garwood Ferris sworn.

Direct Examination: By Mr. Vredenburgh.

Q. Mr. Ferris, you have lived in Jersey City how long?

A. About forty-two years.

Q. And your business has been what?

A. The engineering and construction of Water Works.

Q. From what source did Jersey City obtain her water prior to this new water supply?

A. Prior to the temporary supply for Jersey City, do you mean?

Q. Yes.

A. By pumping water from the Passaic at Belleville.

Q. And do you know why the Belleville supply was abandoned by Jersey City?

A. On account of the badly contaminated condition of the water, due to sewage from the cities along the Passaic, and also possibly in dry times by the diversion of water above Paterson.

Q. What water was at that time diverted from above Belleville?

A. There was a supply for Newark and Paterson and perhaps other places, smaller places.

Q. Amounting to about how many million gallons a day?

A. Well, Newark at that time, according to the State geological report, was using about twenty million of gallons of water a day, and Paterson thirteen, making thirty-three million of gallons of water.

Q. What did the works cost, Mr. Ferris, that Jersey City had to abandon?

A. The bonded debt of Jersey City, representing approximately the cost of the plant——

Objected to.

Q. We don't care about the bonded indebtedness; we want your judgment; they say the bonded indebtedness is not evidence; we want your judgment on what the works cost which this new supply caused it to abandon?

A. Oh, caused it to abandon?

Q. Yes.

A. Well, I should think the portion which had to be abandoned by Jersey City was somewheres between two and three millions of dollars, the cost.

Q. Were you appointed to any official position by the Mayor and Aldermen of Jersey City in connection with this new water supply?

A. I was.

Q. When?

A. In May, the year subsequent to the contract, the 25th of May, 1899.

Q. Did you state what the position was?

A. Supervising engineer of the construction of a new water supply.

Q. Were you familiar—had you made a study at that time of the Rockaway River?

A. I had both by personal observation and by consulting the State geological report from 1892.

Q. Will you describe what fall there is from the Passaic River to the Parsippany bridge?

A. From the Passaic River to the Parsippany bridge I should say there was hardly any fall at all. According to my memory, in the State Geological Report it says the first six miles up the stream from its junction with the——

Q. Well, you have the report there, you better see the report.

A. For six miles about its junction with the Passaic the fall of the Rockaway is two and three-tenths feet per mile, thence to old Boonton two miles up is thirty-two feet per mile; just what I stated before.

Q. Thirty-two feet per mile?

A. Yes, sixty-four feet I said in the two miles.

Q. Well, now, then, go above Boonton?

A. And then from old Boonton up to Boonton itself, Boonton Falls is a mile and a half, and the fall in that is two hundred and forty feet, that brings us up to Boonton Falls, above Boonton——

Q. Well, you are stating from memory the book, are you not?

A. I am speaking from memory.

Q. Well, you better look at the book—if there is no objectin to that?

Mr. Corbin: No, only this lower part we have an actual survey of, and it doesn't quite agree.

A. From Boonton to old Boonton, one and a half miles, the total fall is two hundred and forty feet For eleven miles above to Dover, the fall is but seven and three-tenths feet per mile, and thence to Woodsock, twelve miles by the stream, it is sixteen feet per mile.

Q. Now, Mr. Ferris, going to the Watchung tunnel, has that Watchung tunnel been constructed in accordance with the contract?

Mr. Corbin: I object to the form of the question.

Mr. Vredenburgh: He can say yes or no to that.

The Court: You have not shown that he is competent to speak about that.

Mr. Vredenburgh: Well, he was the supervising engineer under this contract.

The Court: You do not know whether he has actually supervised the contract at this point or not. The witness will have to show his competence to speak upon this question.

Adjourned until Thursday, March 1st, 1906, at the Chancery Chambers, Newark, N. J.

SIXTH DAY, MARCH 1, 1906.

Garwood Ferris resumes the stand.

Further Direct Examination:

By Mr. Vredenburgh:

Q. Mr. Ferris, I think you told us last night that you were appointed as engineer?

A. Yes, sir; supervising engineer.

Q. And you have remained in that position until the present time?

A. Until the present time, yes, sir.

Q. Did you pursue any other business except this?

A. No, sir.

Q. The specifications require this, page 36: "Copies of all plans and working drawings prepared by the contractor for use on the work shall be filed with the engineer before such plans and drawings shall be used in construction; if such plans and drawings do not conform to the specifications they may be rejected by the engineer, and after such rejection they shall not be used on construction." Now I will ask you whether the plans of the Watchung tunnel in accordance with that part of the specifications were filed with you?

A. There was a plan filed with me prior to October, 1900, of the cross-sections of the tunnels as they proposed to build them, under the contract. I examined that drawing plan and filed it away as unobjectionable.

Q. Have you got that plan with you?

A. I have.

Q. Now, what experience have you had which enables you to understand the plan which they submitted?

A. Well, I have been doing nothing else for the last forty years but building and constructing water works.

Q. Will you produce that plan?

A. There is the plan and tracing of the same.

Q. Well, just the plan first?

A. (Witness produces same.)

Q. Which of these two is the plan?

A. This is the one that was filed with me, signed by Mr. Harrison.

Mr. Vredenburgh: I offer the plan in evidence.

Marked Exhibit C. 52.

Q. The tracing, Mr. Ferris, that you produce with this exhibit was made by whom?

A. By Mr. Ruggles from that drawing.

Q. And is it an exact copy?

A. Yes, sir.

Q. And you desire that left in place of the original?

A. Yes, sir.

By Mr. Edwards:

Q. You better have this with you at all times?

A. I want to keep this.

Q. Yes, but we want it with you when you are here in the court room?

A. Yes, sir.

By the Court:

Q. You must have it ready to produce to counsel whenever they want it?

A. Yes, sir.

Mr. Vredenburgh: I offer the tracing, may it please your honor.

Mr. Edwards: This drawing is not complete.

Mr. Vredenburgh: My only purpose is that that can be handled a little better than the drawing, and Mr. Ferris is a little particular to keep the original.

Mr. Edwards: Yes; well, let me ask you one question, Mr. Ferris. I see on the tracing you have but three cross-sections; on the plan you have four. Why did you leave out one?

Witness: Because that is not called for under the specifications.

Mr. Edwards: The fourth one is not called for?

Witness: No, sir.

Marked Exhibit C 52 substitute.

Q. The one cross-section that you say is not called for is which one on the original?

A. Is the one—the lower right-hand one.

Q. Now the Watchung tunnel extends what distance?

A. The total length of the tunnel?

Q. Yes.

A. About seventy-four hundred feet—seventy-four hundred and four feet.

Q. Which part of this cross-section is the invert?

A. The vertical portions are called the side walls, the upper portion is the arch, and the lower is the invert.

Q. Now, was the invert constructed in accordance with that plan?

A. It was not.

Q. Is that exhibit a plan or a working drawing?

A. Well, it might be both; it is both a plan and a working drawing.

Q. In what respect was it not constructed in accordance with that plan?

A. The plan exhibited calls for a smooth invert constructed either of rock or with the inequalities of the rock as excavated filled in with concrete, and surfaced with pure Portland cement, that being the construction that is called for under the specifications.

Mr. Edwards: I object. That is your conclusion, Mr. Ferris. We deny that fact, and only want it to appear that that is your insistment.

Witness: Oh, yes.

Mr. Edwards: I object to his making that conclusion. If he adds to that, according to my insistment——

The Court: Let him say then, that is my insistment.

Witness: That is my insistment, yes.

Q. I will read, Mr. Ferris, to you, a part of the specifications, and ask you if you referred in your answer to that part of the specifications, page 53, line 20. "Where the tunnel is in rock, if the bottom consits of sound and solid rock, it may be leveled up and smoothed and made uniform throughout with Rosendale cement concrete surfaces, with a layer of two inches thick of Portland cement mortar, where the tunnel is in earth of unsound rock brick invert sixteen inches thick shall be laid at the bottom." Now, will you please tell us when they commenced to construct this invert, and you determined that it was not being built in accordance with the drawing and specifications, what you did?

A. In the first place, I think it was in January of 1904, they presented an amended plan of construction, which I rejected under the power vested in me by the inspection clause; subsequently, in April, I became informed that they were constructing it in accordance with that rejected plan, and I gave them a formal official notice that the city would not accept it——

Mr. Edwards: I object. We want that notice.

Witness: A copy of which I have here.

Mr. Vredenburgh: The original would be better, if you have it, Mr. Edwards.

Witness: I have copies of both letters here rejecting the method of construction.

Q. Please read your letter to them and their answer to you?

A. I haven't any answer.

Q. Is this your letter to them?

A. The first one.

A. (Reading): Jersey City, January 16, 1904. Mr. E. W. Harrison, Chief Engineer, J. C. Water Supply Co., My Dear Sir: Yours of 12th inst. was received yesterday in the which you enclose blue prints showing of proposed modifications of the plans as originally submitted for the lining of Watchung tunnel. I regret to inform you that the modifications do not, in my judgment, fulfill the full measure of your obligations as to construction called for by the specifications under which your P. H. Flynn bid was tendered. Unpleasant as it may be to me, I feel there is no alternative but that I should notify you that I am compelled to reject the modified plans you now submit as not conforming to the specifications inasmuch as the surface of the invert you propose will not be smooth and free from projections. Yours very trly, Garwood Ferris, Engineer in charge.

Q. Now, you have a second letter dated when?

A. That letter I have just read was dated January 16th and there was a good deal of work to be performed there in the way of preparing for the invert—rock excavation, and that went along until I understood the work was being constructed under the rejected plan, and I thereupon wrote the following letter: Jersey City, April 8th, 1904. Mr.

E. W. Harrison, Chief Eng. J. C. W. S. Co., My Dear Sir: As the City's Supervising Engineer over the construction of the New Water Supply for Jersey City, by the Jersey City Water Supply Company, I hereby formally and officially protest against the form of construction now being proceeded with of the invert for the Watchung tunnel for the reason that the specifications require that the invert shall be leveled up and made smooth and uniform through out with Rosendale cement concrete surfaced with a layer 2 inches thick of Portland Cement Mortar, and further hereby notify you in your capacity as Chief Engineer of the J. C. W. S. Co. that the city of Jersey City does not accept the construction of said invert as now being proceeded with as a compliance with the specifications and waives no right whatever under its contract to call for a different method of construction. Yours very truly, (Signed) Garwood Ferris, Eng. in Chge.

The letter of which the above is a copy (from my letter book) was prepared with the co-operation of the Corporation Counsel and approved by him, and the original was delivered by me personally to E. W. Harrison on the 9th day of April, 1904.

Garwood Ferris.

Mr. Vredenburgh: I offer those two letters in evidence, may it please your honor.

Same marked exhibits C 53 and C 54.

Q. What plan have you now in your hand?

A. The plan submitted to me in January which I rejected.

Mr. Vredenburgh: I offer that plan in evidence.

Same marked Exhibit C 55.

Q. Now in what way did they construct the invert to this tunnel?

A. Oh, yes; they went right straight ahead building it of course substantially in that way.

Q. The way shown on this plan Exhibit C 55?

A. Yes, sir.

Q. What is the difference in the cost of constructing the invert in accordance with the contract and specifications and the cost of constructing it as they did construct it?

Mr. Edwards: We object to that because that assumes that we did not construct it according to the plans and specifications.

The Court: The witness has not stated yet what the construction was. Had he not better state what the construction actually was.

Q. Please state what the construction actually was.

A. The bottom of the excavation was in rock uneven; they leveled it down as fairly well as they could and then filled in the gravel over it. That is all the work that was done.

Q. That is all they did?

A. Yes, sir.

Q. What, according to your construction of the specifications, ought they to have done?

A. They ought either to have made the invert of brick or else have filled in all the inequalities in the rock with Rosendale concrete and surfaced it with two-inch Portland cement mortar so as to give a smooth, true, even surface for the flow of water and one that could be easily cleansed.

Q. Have you made an estimate of the difference in cost between the way that they did do it and the way that you insist they ought to have done it?

A. I have made no estimate of the cost of the way they have done it, but I have made an estimate of what it would cost to properly do the work. What it cost them to do it I haven't any idea; I made no estimate of that.

Q. Have you made an estimate of what it would cost excluding that part of the cost which would be due to the presence of water there?

A. Yes, sir; I made an estimate in that way.

Q. You have?

A. Yes, sir.

Q. What is your estimate of it?

A. About $2.50 a running foot, for the 7,400 feet, aggregating about $18,500.

Q. (By the Court.) You mean that is the amount of money which it would cost to now put the tunnel in the condition called for by the specifications?

A. No, sir. You would have to remove all that gravel first; how much that would cost I don't know. Besides that, there is a great deal of water there.

Q. (Further direct.) The removal of the gravel would be in addition to that?

A. In addition, yes.

Q. You say that it would cost them to have built this invert as they agreed to this sum that you have mentioned; you do not tell us what it would have cost them to put the gravel there as they put it.

A. I don't know, sir; I haven't made any estimate.

Q. Do you know how many loads of gravel they put there?

A. No, sir; I have no means of knowing anything at all about it.

Q. Subsequently a bill in Chancery was filed, Mr. Ferris, to restrain them from building it in this way, do you know?

A. I don't know when it was filed.

Q. You know it was filed?

A. I know there was a bill, that was the one where Vice Chancellor Pitney gave his decision, was it not?

Q. Yes.

A. Yes.

Q. Now, outside of the difference in the cost of this invert, do you say that it is unobjectionable as built?

A. You mean what points do I consider objectionable as built?

Q. Yes.

Mr. Edwards: Not under the specification, he does not mean, but as a matter of fact.

A. Why, I consider—see if I understand it correctly—why I consider the invert as built is objectionable in connection with that conduit, is that the question?

Q. Yes, as compared with the way it should have been built.

A. Yes. Well, in the first place, this wide breadth, the invert, nearly 9 feet long, is simply covered with gravel, instead of having a smooth, even surface, and it acts as an inducement to the deposit and retention of sediment. That is the first point; the second is that it is very much rougher than what is called for by the rest of the work, and while there has been a little bit larger area than called for on the original plan, 2 inches wider on the side walls, and the radius 2 inches greater, yet, working it all out, I would expect that it would have such an effect that the increased roughness was not compensated for by the increased area, and I should look, on a test of that work properly made, that it would fall short a little of its estimated capacity, 70,000,000; I deduce that. And in the next place, it would be impossible to clean out that conduit with this gravel there, without shutting off the supply for an unpermissable period from Jersey City. If the conduit had been constructed as I contend that it should have been under the specifications, the period when it would have been necessary to clean it, would have been postponed, put further off, and when it was necessary to clean it, it would be possible though perhaps a little bit inconvenient, to perform it under present conditions of Jersey City's water supply.

Q. Why would it be impossible to do that as built?

A. Well, I don't know how it could be cleaned out very thoroughly without removing all that gravel, and I think it would take some time to do it.

Q. What is the dirt that you refer to which makes it necessary to clean the tunnel?

A. Oh, any sediment that may be in the water, that is about all. Deposit sometimes forms—it does form.

Q. Is there not also an aquatic growth?

A. Well, I don't know how that would be in the dark tunnel; I don't know. There might be—you mean a vegetable growth?

Q. Yes.

A. At first I thought there might be, and I don't know but there might be. I would not like to place myself on record on that subject without knowing a little more about it.

Q. Now, as to animal growth, such as spongy—

A. What?

Q. I do not mean to confine it only to vegetable animal life such as spongy——

A. Yes, there would be that growth there which would necessitate cleaning; we know that perfectly well. I thought you meant vegetable growth.

Q. Well, is such growth hindered by having the bottom smooth rather than rough?

A. Well, I should apprehend that it did not make very much difference.

Q. Now, what was constructed as a conduit for this water from the dam at Boonton to Jersey City?

A. You mean the whole line?

Q. Yes.

A. Do you wish it in detail?

Q. Yes.

A. We start from the gate house, I presume?

Q. Yes, at the gate house.

A. Leaving the gate house—the receiving chamber there below the dam—there is a concrete conduit No. 1, constructed, and a gate house at the end of it of 4597 and 51-100 feet.

Q. And that is what?

A. That is a concrete conduit.

Q. Of what size?

A. Eight feet six; these conduits are all that size.

Q. Then what is the next?

A. The next is what we call the seventy-two inch steel pipe No. 1, 8508 and 14-100 feet. Then comes what we term concrete conduit No. 2, two gate houses, 3731 and 90-100 feet.

Q. In length?

A. In length.

Q. And the same size?

A. The same size, yes.

Q. What is the next?

A. And this embraces the eleven hundred feet tunnel through Hook Mountains.

Q. Then eleven hundred feet of the distance that you have given consists of the tunnel through Hook Mountains?

A. Yes, sir.

Q. Known as the Hook Mountain tunnel?

A. Yes, sir.

Q. What is the next?

A. Steel pipe line No. 2, seventy-two inch, 22,597 and 68-100 feet.

Q. Go on.

A. Then concrete conduit No. 3, with two gate houses, 9797 and 62-100 feet. Then seventy-two inch steel pipe line No. 3, 3467 and 90-100 feet. Then concrete conduit No. 4, two gate houses, 11,147 and 71-100 feet. This embraces 7404 feet of the Watchung tunnel.

Q. Of that last conduit No. 4, about 7,400 feet is the tunnel known as the Watchung tunnel?

A. Yes, sir; and there is 72 inch steel pipe line No. 4, 56,460 and 21-100 feet. The summary being concrete conduits of eight and a half feet, 20,870 feet; conduits, 8,404 feet, and 72 inch pipe 91,033 feet, making a total of 120,308 feet and a fraction. I have here a rough sketch of the line if you wish it.

Q. Made by whom?

A. Made by myself. Copied from my notebook.

Mr. Vredendburgh: I offer it in evidence.

Marked Exhibit C 56.

Q. This sketch showing conduits, line intake and delivery point, C 56 has figures upon it—to what do they refer?

A. The lower figures represent the invert, the upper figures represent the hydraulic gradient.

Q. Of the conduit?

A. The conduit and on the next pipe, too.

Q. Well, the perpendicular figures commencing at 210 and running to 260 are what?

A. Those are the elevations.

Q. It means feet of elevation?

A. Yes, sir.

Q. Above what?

A. Above mean high tide.

Q. The difference between mean high tide and the datum line of Jersey City is how much?

A. Well, I don't know the difference between the datum line of Jersey City and mean high water, but that is the elevation according to the contract above mean high tide, the state map.

Q. Oh, the state datum is different?

A. Yes, sir.

Q. What is the difference between this and the state datum?

A. 2.12 lower; their level being taken from the sea level and ours from the mean high tide.

Q. These figures are all taken from mean high tide?

A. The figures over the top represent the length in feet.

Q. The figures on the other part of the sketch representing feet, the different sections of conduit and of pipe?

A. Yes, sir. I should like to state, Mr. Vredenburgh, that those figures which I have of lengths are all from the contractors' surveys and profiles which they have given me.

Q. Do you know the difference in cost between the steel pipe of 72 inches diameter and the steel pipe of 76 inches diameter?

A. Of like thickness of steel about 83 cents a foot.

Q. Running foot, do you mean?

A. Yes, sir. Perhaps I ought to explain, but I took the general average of the same lengths of pipe that there is embraced in this contract exclusive of the pipe under the rivers, which are of different grades; but exclusive of that, taking the same thicknesses of pipe and the same lengths of pipe, the difference as I figure it would be about 83 cents a foot.

Q. Does that mean delivered on the ground?

A. No, sir; that means constructed.

Q. Put in place?

A. Put in place. If 76-inch pipe, however, was laid under our specifications—I might add, it will be under a different head. On pipe line No. 4 there was quite a lot of it that would have to be of the heavier weight—thicker pipe—and that would bring it up and make a very substantial difference.

Q. More or less?

A. More.

Q. Was the dam No. 1 of the reservoir built where it was stated that it would be built in the proposal?

A. Where it was shown on their plan?

Q. Yes.

A. No, sir.

Q. Annexed to the contract. Which plan do you refer to?

A. Plan No. 1. I think it is down on the Kingsland property.

Q. The proposal says on page 68, Map No. 1, Map No. 2 and Profile No. 1; now, on which of those maps were the dams shown?

A. There was a large geological map of the state, you know; and that had the pipe line and the dam shown upon it. What the number was I don't remember.

Q. Now the proposal on page 65 speaks of dam No. 1, and somewhere—I can't put my hand on it—as dam No. 2; which of those dams do you refer to as having been changed?

A. Why, on their original tender they showed us a dam that was to be located upon the Kingsland property, and in investigating——

Q. What was that dam known as? Dam No. 1 or dam——

A. Dam No. 1, of course.

Q. Now, where was dam No. 2?

A. In their proposal?

Q. Yes.

A. Why, I believe they had to have a dyke at the back.

Q. That is marked on the map annexed to their proposal as dam No. 2, isn't it?

A. Well, that would be it then; it is a dyke—what we call the Parsippany dyke.

Q. Dam No. 1 was not built at the place shown on the proposal?

A. No, sir.

Q. Now, was dam No. 2 built where it was shown?

A. Approximately; I think it was, yes.

Q. Approximately, yes?

A. Yes.

Q. Dam No. 2 is what has been spoken of as the Parsippany dyke?

A. Yes.

Q. Mr. Ferris, I show you a letter directed to you, signed P. H. Flynn, Jersey City Water Supply Company, M. J. Kennedy, vice president, and ask you whether you received that?

A. It is marked there that I received it October 21, 1899; it is a copy.

Q. Was that letter received by you?

A. Well, whether I received the original or the copy I cannot tell now.

Q. Is that a true copy, so far as you know, of the original?

A. So far as I know—yes, sir.

Mr. Vredenburgh: Is there any objection to it, that it is not a true copy—if so I won't put it in.

Mr. Edwards: We don't object to it as a copy, but want to show by and by that there is some mistake in the signatures.

The Court: It will go in subject to correction by the original.

Q. Will you please read that letter, Mr. Ferris?

A. (Reading.) "Brooklyn, N. Y., October 7, 1899. Garwood Ferris, Esq., Supervising Engineer, Jersey City, N. J. Dear Sir: Since my letter to you of June 28th, 1899, in reference to a change of site for the dam, from the Kingsland site as proposed in the plans accompanying my bids, to a site upstream on the lands of John and Edward Banta, my engineers have been engaged in making careful surveys of the dam site therein proposed and the reservoir site above, with most gratifying results.

I am now in position to present to you absolute data as to the capacity of the Banta site, and a close approximation of the comparative cost and advantages of the two sites. The results of the surveys show that no deviation from the original plan of one storage reservoir, capable of being increased from a capacity equal to a delivery of fifty million gallons, to a capacity equal to a delivery of seventy million gallons per day, upon the formula required by the specifications, need be made, as was feared at the time of my last communication and referred to therein. Thus an additional storage reservoir in the Longwood Valley will not be required.

I now propose a dam at the location pointed out to you on the Banta properties, where extensive excavations have demonstrated to the satisfaction of my engineers the practicability of securing a good and substantial foundation. The area of tributary watershed above this dam is 121.5 square miles.

The dam, as constructed for the delivery of fifty million gallons per day, will have a height to full water level above the present bed of the river, of one hundred feet. The elevation of top water weir being 302.42 feet above high water by the official Jersey City Base (Wards), the bottom of the effluent pipe will be placed at an elevation of 256.60, same base.

The area of the lake formed by this dam will be 852 acres, and the storage capacity above bottom of effluent pipe will be 7,190 million gallons. To increase the capacity to secure a delivery of seventy million gallons per day, the water level must be raised to an elevation of 320.98, which will give a reservoir with a storage capacity of 12,660 million gallons. There are no engineering or other difficulties in the way of accomplishing these results. My engineers estimate that the cost of increasing the reservoir's capacity at the Banta site will exceed the same cost at the Kingsland site, about $53,000, based on prices of to-day.

This increased cost at the dam and reservoir site, however, is more than made up by saving in the cost of the additional pipe line required for a supply of seventy million gallons per day, by reason of improvements which detailed surveys show can be made in the pipe and conduit line, by reason of this location of the dam. These improvements are generally as follows: As determined by the survey of my engineers as far as developed.

The original acqueduct, as proposed in my bid, was made up of three miles of conduit in tunnel, with a capacity of seventy million gallons per day, and 19 miles of steel pipe with a capacity of fifty million gallons per day, and in order to increase the capacity of the whole line to deliver 70 million gallons per day, 19 miles of steel pipe, with a capacity of thirty million gallons per day, would be required by the specifications.

The changes in the alignment of the aqueduct, developed by reason of the dam site as now located and more extensive survey, will make the aqueduct consist of about two miles of tunnel and three and one half miles of masonry conduit, both on the hydraulic gradient and capable of delivering by the formula stipulated in the specifications, with a water surface one foot below the inside of the crown of the covering arch of the tunnel and conduit, 70 million gallons per day. The steel pipe portion of the aqueduct will be reduced from 19 miles to 17 miles, thus making a saving, when the works are increased to a capacity of seventy million gallons per day, of two miles of pipe worth, at present prices laid $150,000. The tunnels and conduits will, at the outset, be constructed to carry seventy millions as required by the specifications. Subtracting from this sum the estimated added cost of raising dam and reservoir $53,000, shows a net saving of nearly $100,000, by the revised plan.

This saving, based on present prices of steel pipe, will in all probability be reduced somewhat in the future; but even at the lowest prices of steel ever known the saving will be very substantial. In addition to the monetary saving, I would call your attention to the immense practical advantage to the works, as a permanent engineering construction, of increasing the proportion of masonry conduit and tunnel running without pressure and reducing the proportion of steel pipe, and also to the very gratifying fact that the new reservoir will have an average depth of water above effluent pipe, when full, of 26 feet against the average depth of 23.8 feet in the reservoir on the Kingsland site.

My engineers will be pleased to submit for your inspection and verification, the data as to elevation, areas and quantities on which the statements herein made are based.

The elevations herein mentioned are based upon the difference between the base of the State Geodetic Survey and the official Jersey City base as determined by adjacent bench marks in Jersey City. Careful levels now being run from tide water to Boonton may change the figures to the extent of two or three inches, but not the absolute heights.

On receipt of your approval of the site herein proposed, I will have detailed plan at once prepared for submission to you, of the dam and appurtenances, and will at once proceed with work on the site. I have already developed a large granite quarry for the necessary stone, and have about secured direct railroad communication from the quarry to the site of the dam.

This railroad will be about three miles in length, all of the lands save one tract have been secured therefor, after much litigation, and more than half of the track has been laid. Since the final decision of the Supreme Court in the McEwin suit, the work has been prosecuted with all possible vigor, although I am still hampered by the scarcity and increased cost of materials.

(Signed) P. H. FLYNN,
Jersey City Water Supply Co.

(Signed) M. J. KENNEDY,
Vice-Pres.

Mr. Vredenburgh: I offer it in evidence.

Marked Exhibit C 57.

Q. Now, Mr. Ferris, have you a map of the reservoir as built?

A. I have.

Q. And you produce that map?

A. I do.

Q. That map was made by who?

A. Made under my supervision.

Q. State what was done with regard to its acceptance by the contractor.

A. This map was made in order to determine the storage capacity of the site above elevation given by the contractor, and the contractor had given us a map, but I thought in the interests of the city it would be proper for the city to make a survey on their own account. According to the contractor's map the flow line should have been of an elevation of 304½——(interrupted)

Mr. Edwards: I object to this.

Mr. Vredenburgh: Let him go on and tell the story; you will all agree to it.

Q. Proceed.

A. This survey was made and accepted by the contractor and the height of the spillway was changed to correspond with this map 305.25, which we found would be necessary in order to impound the necessary quantity of water.

Q. Then this map shows the reservoir as constructed by the contractor—is that it?

A. It shows the contours of the reservoir basin from which the contents—storage contents—can be calculated.

By Mr. Edwards:

Q. Before the dam was constructed?

A. Yes, sir, it doesn't show any dam.

Q. Or any reservoir?

A. It doesn't show any dam. If this basin was filled up to a certain level it would hold a certain quantity of water.

Further Direct.

Q. Was this map shown to the contractor?

A. Yes, I have shown it to the contractor, but he never had a copy of it; but he accepted it and changed the level of the spillway in accordance with this survey.

Mr. Vredenburgh: I offer it.

Defendant's counsel objected to the map on the ground that it was not shown to have been made by them or that the contractor never accepted it.

Q. State, Mr. Ferris, what you mean by saying that the contractor accepted it.

A. With the elevations shown on the map which was submitted to me by the contractor there would not be quite the quantity of water that was called for by the contract; in fact, it would be 138,-000,000 gallons short. The spillway then would have been at the elevation, 304½, I think it is, as shown by that map, and it was necessary to raise the spillway—raise the dam or raise the spillway from 304½ feet to 305.25.

By Mr. Edwards:

Q. Nine inches?

A. Yes, sir; whatever it was, it was all shown on that map what the difference is.

Q. (By the Court.) You have said that this map was accepted by the contractor; they are not satisfied with your statement that it was accepted; they want you to show how it was accepted.

A. According to the map which was tendered to me, their spillway would have been at an elevation 304.7 feet. After showing that map and the table of capacities to the chief engineer, Mr. Harrison, the elevation of the spillway was changed from 304.7 to its present height 305.25.

Q. Well, who changed it?

A. They changed it.

Q. Mr. Harrison?

A. Yes, sir; the water supply changed it in order to correspond with that survey.

Mr. Edwards: What has the map got to do with all that?

The Court: The map was the foundaton upon which this witness proceeded. He apparently demonstrated to the contractor that unless the spillway were raised 9 inches——

Mr. Edwards: 6¼ inches.

The Court: Well, 6¼; whatever it is, it would not hold the number of millions of gallons which it ought to have held.

Mr. Vredenburgh: I will tell you what I want this map for. The sites where the dams are, and all those things—we have no map here which explains anything.

Mr. Edwards: If Mr. Harrison says it is correct we won't object to it.

Further Direct:

Q. Does not this map show where the dams are situated substantially correct?

A. I believe so, yes, sir.

Q. And doesn't it show the reservoir as now filled with water, substantially?

A. That is what my understanding is, yes, sir.

By Mr. Edwards:

Q. All these roads have been taken out?

A. Oh, yes, of course; it only shows the original location of the roads.

Mr. Vredenburgh: The real purpose of the offer of the map is to show the reservoir.

The Court: Well, do you object to the map being offered?

Mr. Edwards: Yes; Mr. Ferris did not make this map.

The Court: The map has not been proved yet, and cannot be offered.

Further Direct:

Q. Mr. Ferris, how much land is there in the reservoir as built?

A. Do you mean in the water surface?

Q. Yes.

A. At the elevation of the spillway?

Q. Yes.

A. 773.69 acres.

Q. Mr. Ferris, is the acreage that you gave us of the reservoir—is that the acreage for the fifty millions or for the seventy millions gallons daily?

A. Oh, for the fifty millions.

Q. And what is the acreage for the seventy millions?

A. The water surface for the seventy millions would be 976 and a fraction—.48, I think it is—acres.

Mr. Vredenburgh: Now, may it please your Honor, looking at page 64 of the bill of complaint, which is the proposal: "This intake reservoir, which is also preserved for the storage reservoir, will have an area for the fifty million gallons delivered of 949 acres." In the letter of October 7, 1899, Exhibit 57, it reads as follows: "The area of the lake formed by this dam will be 852 acres, and the storage capacity above the effluent pipe will be 7,190 million gallons. To increase the capacity to secure a delivery of seventy million gallons per day," and so forth. So the area of fifty millions was to be 852 acres. Now, as actually delivered, it is 763 acres. The difference between 763 and 852 we claim.

Q. Now, Mr. Ferris, you have told us that the dam was moved some distance up stream—dam No. 1—how far up stream was it moved?

A. About four thousand feet.

Q. Well, be more accurate about that; it was more than four thousand feet, wasn't it?

A. Well, that is as near as I can state it; perhaps it might be forty-two hundred feet, something of that kind, but approximately that distance. Their own letter states that it is four thousand feet.

Q. Haven't you had it measured?

A. No; I scaled it off on the map the other day.

Q. Which map?

A. The state map that I have down in my office.

Q. Any map that is an exhibit in this case?

A. No, none that is an exhibit in this case. It won't vary very much from that, Mr. Vredenburgh.

Q. I take you now to dam No. 2, known as the Parsippany dyke, and I refer you to the Exhibit C 22, which was read the other day. Have you the blue print referred to in there, as dated November 11, 1899?

A. I have.

Q. Where is it?

A. (Witness produces same.)

Q. From what source did you get that blue print?

A. From the contractors' engineering department; I cannot state now; it came to me in the regular course.

Mr. Vredenburgh: I offer that in evidence.

Mr. Edwards: I object. It don't appear that it is signed by anybody or that it is an official map in any way, shape or form. Where is the letter of transmission? It seems to be marked comparative cross-section dams under their improvement for seventy million gallons, but it does not seem to have been official. May I ask the witness a question about it?

The Court: Yes.

By Mr. Edwards:

Q. Did you get this from Mr. Harrison?

A. I think not; I think I got it from the engineering department at Boonton. The map had been shown me prior to that time, and I received this some time in November. I think that was after the change had been made. The map shows the Kingsland dam and the Banta dam, also the dyke.

Q. It was not sent to you officially with any letter, was it?

A. Well, very seldom I got any letter. It is so long ago that I cannot say whether I got it personally, or whether I got it by letter, or how I got it.

Q. Or whether you got it officially?

A. But I got it officially, I know that; and you know there was quite a question as to the change of the location of the dam. Of course if it was to be enlarged by the contractor it did not make much difference; but if it was thereafter to be enlarged by the state it did make a difference; and I wanted to know what was going to be the enhanced cost of construction at the different places. I got full statistics on that, also I was shown a map similar to that, and afterwards I got that map.

Q. Well, this doesn't seem to have been a plan for building at all; it was simply made for comparative estimates.

By the Court:

Q. Can you state which engineer of the Water Supply Company you got it from?

A. I cannot at this time.

Q. Did you get it from one of the engineers of the Water Supply Company?

A. Yes, one of the engineers connected with the department, I am confident of it; of course I took it as official and filed it away as official.

By Mr. Edwards:

Q. How do you account for the fact that it is not signed?

A. Well, Mr. Harrison wasn't chief engineer then.

Q. It has not been signed by any engineer?

A. Not signed, but it was——

Mr. Edwards: We claim this was simply a map made up, not for building purposes, but for making comparative estimates, and just a tentative sketch in order to show the difference in certain prices, and it was never delivered to Mr. Ferris nor in any wise transmitted to the city.

The Court: The evidence is it was delivered to the witness by one of the engineers.

Mr. Edwards: But it wasn't the chief engineer of the water supply company.

The Court: It can go in as one of the papers produced by this witness.

Marked Exhibit C 58.

The court called attention of counsel to the fact that there was written on the face of the map the words superceded Aug. 1, 1900—referring to the bank of the dam.

The Witness: I might explain that when I received the first official notification from the contractor of his intention, if he built the dam at the Kingsland location, that that was his official intention. At the Banta location I received this official notification that that was the dam he would construct up to this limit if it was for fifty million gallon supply and if ever afterwards he had to build for a seventy million gallon supply that this was the method of construction he would adopt in raisi ng it. I objected very vigorously to that method of raising it and the question that was asked here by his Honor as to its being superceded arose in this way: After the contract of March 31, 1902—I think that was the date—when the East Jersey Water people came into the control of the company they changed this contour of the dam——(interrupted)

Q. Which dam?

A. The Banta dam.

After some discussion between counsel as to the witness' answer and which dam he was referring to he was asked as follows:

Q. What is shown on that exhibit, Mr. Ferris?

A. In the first place, taking it in sequence, there was a profile of the Kingsland dam as they expected to build it given to me as the way that they would have proposed to build it for fifty millions and also as the way that they would raise it for seventy millions.

Mr. Edwards: There is nothing on the map to show that.

By the court:

Q. The one being indicated by an unbroken line and the other by a dotted line?

A. Yes, sir.

Further Direct:

Q. The upper drawing is a section or sketch that they at that time proposed to build it under for the fifty million dam at the Banta location?

A. Yes, sir; and the dotted line shows how they intended in case they had to raise it in order to provide for the seventy million gallon storage. The third drawing shows the big dyke of the so-called Parsippany dyke as they would construct it for the fifty million gallon supply and as it would be raised to the seventy millions.

Q. On the map it is called Western dyke?

A. Yes, sir.

Q. Now, where are those words written about being superceded?

A. Over the Banta dam, Superceded, Aug. 1, 1900.

Q. Now, at the date of that map had any work been done?

A. No, sir; that is, no construction work on the dam.

Q. No construction work on either one of the dams—either dam No. 1 or dam No. 2?

A. No, sir.

Q. Now, Kingsland dam wasn't built at all?

A. Never was built, no, sir.

Q. The Banta dam was built?

A. Yes, sir.

Q. Now, dam No. 2, known as the Parsippany dyke, at that time no part of that had been built?

A. No, sir.

Q. Now, when that was built, had you any correspondence with regard to the depth that dam was being built?

A. Do you mean the depth of the core wall?

Q. Depth of the core wall, yes.

A. Well, there was quite a little discussion about it. I would have to——

Q. Now, Mr. Ferris, when you speak of anybody say who it is, so that we may know. Now go on and tell what you were about to say.

A. At the location or approximately near the location where the dyke was subsequently constructed, a series of test pits were dug under the directions of the chief engineer. I never had any copies, any records of what was encountere din those test pits from the contractor, but my assistant gave me one, and from that one I deduce that the indications in going down might be defective as to the impermeability of the strata, that while a footing might be reached in an impermeable stratum that underneath that there might be a permeable strata, and from that I deduce that the depth of the core wall there ought to be much greater than was being built at the time I examined it. They were then going down with the core wall at that place between ten and twelve feet, and I had some correspondence with Mr. Harrison about it.

Q. Is that correspondence here?

A. Yes, sir.

Q. Well, produce it.

A. I have my letter to him, his letter to me in reply—the core wall was started some time early in April.

Q. What year?

A. April, 1903.

Q. Go on.

A. On the 24th day of April—this was after several conversations—on the 24th day of April I wrote Edlow W. Harrison, Esq., Chief Engineer J. C. W. Supply Co., "Dear Sir: Under our specifications for 'Earth Dams' (p. 41) is the following: 'The core walls are to extend from the high water level down into the material underlying the embankment to sound rock or some other impermeable material. As regards the Parsippany dyke, at the time the contractor dug his test pits (through Mr. Hall, for the contractor has never filed result reports with me) I understood that the character of the excavations indicated that in places it might be necessary to go down 22 to 23 feet to get through permeable material to an impearmeable base. Recently, as heretofore verbally reported to you, I found that the core wall (at that point about twelve feet in depth), on orders from the Paterson office, was being started in sand instead of on impervious material. In response to my inquiry Mr. Hall stated that to the best of his recollection a test pit was dug near there (Sta. 114-116) was one of those indicating the advisability of the greater depth above indicated. On inquiry at the Engineer's office Mr. Sproule informed me that if I wished information as to the materials encountered in the digging of the test pits that I had better apply to the Paterson office or to you. From the information I now have I wish to state emphatically that if the work was entirely in my hands and I was solely responsible for results that, taking into consideration the great quantity of water impounded, about 2,400 million gallons in the upper ten feet, I would not be led by consideration of a moderate saving in construction cost away from the inferences deducible from the test pits, but that I would direct excavation through the strata of permeable material to where I had found an impermeable footing. Admitting that it is to a certain extent a matter of judgment, I do not wish (by acquiescence) to participate in the slightest in the credit due to the succesful installation of an economy in construction, and just as strenuously I do not wish in the slightest degree to be considered responsible if, when the basin is filled, imperfections requiring time and money to correct are developed. Having placed myself on record in the matter, I respectfully request that I be furnished with a statement showing the location of each test pit, as referred to the dyke locations, and the characteristics and depth of the material found in the respective pits in order to place same on file with this letter. Very respectfully yours,

(Signed) GARWOOD FERRIS,
Engineer in Charge.

Said letter offered in evidence and marked Exhibit C 59.

Q. Did you get an answer to that letter?

A. (Reading) April 29, 1903.

Mr. Garwood Ferris,
Engr. in Charge New Water Supply,
City Hall, Jersey City.

Dear Sir:

In reply to yours of April 24th, in the matter of core wall in the Parsippany dam, the specifications call for core wall to extend from high water level, to sound rock, or some other impermeable material. In the case you speak of in which the part of the core wall was carried down into a wet compact sand, and of which you complained, and asked for an explanation, I will say that I have made an investigation of this case and find the facts as follows:

The surface of the land is a stiff, impermeable clay, of a depth of about six feet. Careful examinations made of the bottom of the reservoir to the north of the core wall failed to find any place in which the sand strata comes through the surface; in fact, the clay becomes stiffer as we recede from the dyke. On the south side of the Parsippany road the basin is of the same character. The sand is not a running sand, and, in itself would make a very good bank if made of the proper width to allow of the water slope within it.

The united opinion of the engineers of the company is that this sand is an isolated strata left by the glacier, and covered throughout the whole basin of the reservoir, with clay, and it is doubtful if this particular sand is anything more than a pocket. If it is a strata, it comes out far above the water level on the other side of the watershed of the reservoir.

Under these conditions, if the core wall has been founded on the overlying clay, it would have been within the specifications, and, in my opinion, safe. As it is, we have gone down into the sand for the standard depth of from ten to twelve feet, and I am well satisfied that there is no possibility of any danger of leakage through this strata, and that there is no way in which the water from the reservoir can reach it through the stiff clay on top.

You will remember that the back dyke at the new Clinton reservoir is founded upon the same character of strata, and Mr. Stearns took into consideration the friction which the sand will offer to the water percolating through, and tailed out the bank accordingly.

In our case we do not need to widen the bank, as we already have the impervious covering of clay.

I have arranged to get you the profile on the center line, and a memoranda of the test pits. As far as these last are concerned, I do not wish them to be considered as governing the depths of the core wall, as we shall govern this by the much better examinations which we are able to make by the trench being open.

Very truly yours,

E. W. HARRISON,

Chief Engineer,

J. C. W. S. Co.

Mr. Vredenburgh: I offer that in evidence.

Marked Exhibit C 60.

Q. Now, after that dyke was built, did it leak?

A. After the dyke was built and filled with water the space between the toe of the bank and the Parsippany turnpike, one hundred and fifty feet in places, I should think three or four hundred feet, the dyke being a little bit irregular in shape. We came to places where there was evidences of small springs and afterwards that followed up to a greater extent, so that nearly that whole area became saturated with water.

Objected to as incompetent.

Overruled.

Q. Is that the end of your answer?

A. No, sir.

Q. Well, go on with it.

A. It was found necessary to ditch this, and to carry it off at first through one pipe, fifteen inch pipe over to the brook—I don't recall the name of the brook now.

Mr. Edwards: The Troy brook.

A. Yes, ditched over to Troy brook. At times it appeared to be worse than others, and last season it was pretty thoroughly ditched, and in addition another pipe was run over to Troy brook, so that from these series of ditches there are two fifty inch pipes that empty into Troy brook. I made quite a number of measurements during the last season, of the flow off. Of course its being a considerable area, the rainfall will naturally have certain influences upon the discharge, and I have all along thought that possibly some of the seepage might be rainfall, but the greater portion of it, I think, was from the reservoir itself.

Q. Are you through?

A. No, sir.

Q. Well, then, go on.

A. During the last season I have made a series of measurements of the flow off there, and fortunately we had quite a dry period, and according to my expectations the flow off was greater during the wet period than it was during the dry. The maximum measurements there was a little bit less than 500,000 gallons a day, and during October and November they were quite dry months. October the rainfall at Dover was only three and thirty-five one-hundredths of an inch, and in November, I forget what it was, but two-thirty or something of that kind, less than three inches, and it was a very dry time, and I think it was on the twenty-first day of November, the rain not having occurred for several days before—I think nine—I made a test there, which I think defines the seepage, and that was 341,000 gallons per diem; with that rate of flow off perhaps it would be fair to assume that the third of a million gallons a day was seepage; that is, in my judgment, seepage from the reservoir.

Q. What do you mean by seepage?

A. In this case I think it is water that passes underneath the core wall and comes out on the ground back of the dyke; it does not apparently come through the walls of the dyke, but it apparently comes out underneath. I can see no evidence of its going through.

Q. Who owns the land or part of the land immediately opposite the Parsippany dyke?

A. Who owns it?

Q. Yes.

A. I don't know.

Q. Do you know a gentleman there who owns some by the name of William G. Righter?

A. I know of some land there that has been pointed out to me as being owned by Mr. Righter. There was a suit he had——

Q. Mr. William J. Righter?

A. I don't know his name, but I have understood that that was the name.

Mr. Vredenburgh: Now I offer the transcript of the record of a suit brought by Mr. Righter against the Jersey City Water Supply Company. This is the first suit.

Mr. Edwards: I object to it as not proper evidence in this case.

The Court: I will hear the counsel.

Defendant's counsel then argued in support of their objection.

The Court: (To Mr. Vredenburgh) What do you propose to show by this offer?

Mr. Vredenburgh: I propose to prove that there is a gentleman claiming at the present time, and whose claim is established by the judgment of the Supreme Court that an easement which it is necessary for these gentlemen to turn over to us has not yet been acquired; that they have allowed the water to run over his land, an easement which can be obtained by condemnation.

The Court: I will admit the offer subject to your objection and deal with the objection hereafter.

Marked Exhibit C 61.

Mr. Edwards: This is not even a final judgment and I object to it on the further ground that it is not a competent record; it only contains the rule of the judgment and is not a final judgment.

Mr. Vredenburgh: You admit the judgment in your answer?

The Court: I have allowed it to go in in the manner I have mentioned.

Q. How much higher must that dam be raised in order that the reservoir may hold a seventy million gallons a day supply?

Mr. Corbin: I object to that as not competent or pertinent evidence. There is no such issue in this case. The contract and specifications gave the city the option during certain periods to call upon the contractor to raise the dam at a certain time. Instead of that they exercised their option to buy the property so that all that part of the contract is obsolete.

After some discussion by counsel Mr. Edwards suggested that they ask Mr. Ferris the question; that probably he could give them the information they were in doubt about.

By Mr. Edwards:

Q. Mr. Ferris, the Parsippany dyke was that built——

Mr. Vredenburgh: Let me ask the question; I don't want you to ask it.

Further Direct.

Q. Mr. Ferris, will you please tell us about the Parsippany dyke, what you insisted upon and what Mr. Harrison insisted upon, and what was done with respect to making it wide enough so that nineteen feet could be put upon it when required for the seventy million gallons supply?

A. I don't know whether I have anything to illustrate that with me or not. Yes; I have a tracing here that will show it.

Q. (Showing witness a small tracing attached to some written papers.) This shows it, too, doesn't it? There is the core wall for the dyke as he proposed it?

A. Yes, sir.

Q. And this is the core wall as you required it built, and as it was built?

A. Yes, sir.

Mr. Corbin: Mr. Vredenburgh is only deceiving everybody by this testimony.

Mr. Vredenburgh: Well, if I am, I am deceiving myself.

Mr. Corbin: Certainly, I really don't think you do know it. The core, instead of being in front of the dyke, was pushed back.

The Court suggested the matter might perhaps be cleared up during recess, and that the court take a recess now.

RECESS.

Garwood Ferris resumes the stand.

Further direct examination.

By Mr. Vredenburgh:

Q. How much will that Parsippany dyke have to be raised, when it is needed to supply the seventy million gallons a day provided for by the contract?

Objected to as immaterial.

Admitted.

Q. Answer the question.

A. Nineteen and one-tenth feet.

Q. When the additional amount of water is so impounded, what effect will that have on the seepage under this core wall?

A. It would naturally increase any seepage under the core wall, in proportion to the additional head.

Q. Now, Mr. Ferris, I have here the maps annexed to the original contract; will you please point out to the Court where this Boonton reservoir is shown, and will you show us the dam that you call the Kingsland dam and the Banta dam as built?

A. (Witness does so.)

Q. Who was the chief engineer of the contractor when you were appointed engineer under this contract?

A. I understood that Mr. Hulme was the chief engineer, assisted by Mr. Godfrey.

Q. He was succeeded by Mr. Godfrey?

A. Assisted by Mr. Godfrey.

Q. And how long did he remain chief engineer?

A. Well, I cannot tell you that, sir; I cannot answer that. I don't know when Mr. Harrison succeeded as chief engineer, definitely. I know he was employed as the consulting engineer, and when he actually succeeded Mr. Hulme, I don't know the date.

Q. Was it before or after the contract of 1902, when the East Jersey——

A. Oh, before.

Q. Before that?

A. Yes, sir.

Q. How long before that?

A. Well, I cannot answer that question—I cannot answer it definitely.

Q. Mr. Ferris, did you, in February, 1904, give any notice to the contractor as to the condition of the water?

A. I did, sir.

Q. February 4th?

A. In February, 1904.

Q. Have you a copy of that notice here?

A. I have this copy, sir (producing same).

Mr. Vredenburgh: Mr. Edwards, will you produce the original, dated February 4, 1904.

Q. This notice, Mr. Ferris, was given by you upon whom—to whom did you hand this notice?

A. Mr. Harrison.

Q. The chief engineer?

A. Yes, sir.

Mr. Vredenburgh: I offer it in evidence, and will read it (reading):

February 4th, 1904.

Mr. E. W. Harrison,
Chief Engineer, J. C. W. S. Co.

My Dear Sir:

Last week you informed me that the sluice gates at dam would probably be closed in a few days, in order to impound water for flushing and cleaning the conduit lines. In conformity to this notification I am advised that the sluice gates were shut down on Monday and Tuesday of this week. Of course, Jersey City cannot object to such impounding as limited to the above use. The inspection of the watershed now in progress (duplicate of all reports having been sent to you), while showing that the conditions of large areas are unobjectionable, also demonstrate that a good deal of work is necessary in order to do away with present sources of contamination and also to remedy what might be sources of pollution in high water.

As none of this remedial work has as yet been performed, and to prevent any possible misunderstanding, it seems only proper to notify you, and I am directed to so notify you by Commissioner Heintze, chairman of the committee of New Water Supply, that a water supply for this city taken from the flow of the Rockaway as it now is, or from the flow as (under existing conditions) it might be in time of flood or high water would not be considered as a compliance as to quality with the requirements called for under the Flynn contract as specifically set forth:

1st in the specifications.
2nd in P. H. Flynn's tender.
3rd in the final contract.

Yours very truly,
(Signed) GARWOOD FERRIS.
Engineer in Charge.

Marked Exhibit C 62.

Q. Did the contractor, Mr. Ferris, build any sewers or sewage disposal works to prevent pollution or to carry off pollution existing in the watershed?

A. No sewers; he built a small drain alongside of the plane at Boonton, that is all; no sewage disposal works or sewers.

Q. Who represented Mr. Flynn, if you know, at the time this proposal was before the Board of Works?

A. Mr. Henry Beldon.

Q. Were you present before the contract was signed when the Board of Works went to Dover with Mr. Beldon, or went over the watershed, and especially Dover, with Mr. Beldon?

A. Yes, sir; I accompanied them.

Q. Now I am coming to the conduits, Mr. Ferris; do you know whether the conduit known as conduit No. 4 is of sufficient size to transport seventy millions of gallons of water daily?

Mr. Corbin: I object to that question, as there is no evidence here about the conduit.

The Court: I haven't heard anything about it yet.

Mr. Vredenburgh: Conduit No. 4 is a long conduit, part of which I think is the tunnel—Watchung tunnel forms a part of conduit No. 4. There are four conduits numbered arbitrarily one, two, three and four. No. 1 is the conduit nearest the dam, and then they go in regular order.

The Court: What is a conduit?

Mr. Vredenburgh: A cement pipe of a size supposed to be large enough to convey seventy million gallons daily, and so far as it has been built outside of the tunnel it takes the place of the 76 inch steel pipe; instead of building the 76 inch pipe they substituted in certain places a cement conduit.

After some discussion the Court said:

The Court: Perhaps you had better have this witness explain.

Q. Will you explain what the difference is between a conduit and a tunnel?

A. They are slightly different—cross-sections slightly different. What we term a conduit proper or a concrete conduit is built of reinforced concrete; the tunnels are lined with brick, that is to say, the side walls and the arches are brick and the bottom of the tunnel is surfaced up as we think the Watchung tunnel should have been fixed.

By the Court:

Q. I don't understand under what circumstances a conduit not being a tunnel, under what circumstances you put down a conduit and under what circumstances you would put down a steel pipe.

A. That would be governed by conditions—elevation; the conduits are not under pressure; they run with one foot clear of space, whereas the pipes are all supposed to be under pressure.

Further Direct:

Q. The question was as to what tests had been made as to the capacity of conduit No. 4 to carry seventy million gallons of water daily.

A. The only tests in which I participated came to nothing; that was in October, 1904. I received digests of the results from all the other sections of the work, but an apology for No. 4; because their observations were either incorrect or contradictory, and I had no reports from that. Since that I have suggested a number of times that tests be made of the whole line, including that conduit; and I never have had the tests made, though I have received two reports of tests which were made in the following spring. But I had no notice of them and was not present—don't know who made them, don't know anything about them.

Q. Now, when the tests of the conduits Nos. 1, 2 and 3 were made, who was present?

A. Mr. Kitchling and myself witnessed the methods, and I had a representative down to take the pressures and read the discharges.

Q. Who furnished the machines showing the pressure, or device?

A. The whole test was made by the water company, and I was notified to be present, and to participate, to satisfy myself that everything was done in a manner that would be acceptable to me.

Q. Who made up the computations by which you would know whether it was such?

A. The computations were all made up by the office force of the water company's engineers; I received nothing but the results in a tabular form.

Q. Mr. Ferris, do you know whether the Jersey City Water Supply Company has deeds for the land in the reservoir, and in the right of way?

A. Of course I don't know what they have now; but last July we had a meeting in which it was supposed that all of the deeds would be exhibited to us, covering the reservoir basin, and the right of way into Jersey City, in sequence; and we went over that, and there were properties there which they stated they had no deeds for.

Q. Will you please tell us what those properties are?

Mr. Edwards: Who stated, I would like to know?

Q. Who stated that? Who was present? Who stated it?

A. Mr. Harrison.

Q. The Chief Engineer?

A. Yes, sir. There was one plot of land in the reservoir basin that belonged to the Morris & Essex Railroad Company, I think it was represented to me, for which there was no deed given; or some railroad company—the Delaware and Lackawanna—I don't know strictly.

Q. One minute, Mr. Ferris; let me ask you another question. Did the chief engineer then produce a map of the property?

A. Yes, sir.

Q. Was it given to you?

A. There was a map that was to be marked so the plots in the reservoir should correspond with the numbers we had on our list; that map was afterwards given to me.

Q. Did you mark on that map?

A. I didn't do it; no, sir.

Q. Didn't you make any marks on that map?

A. No, sir.

Q. Well, somebody made marks on it?

A. Yes, sir; Mr. Spraul, I believe, made the marks on it.

Q. Who was Mr. Spraul?

A. Engineer for the contractor, who was present at the meeting.

Q. Well, what marks were made on those maps?

A. Numbered so that they could be checked off with the list corresponding, so that we would know what numbers they were, see if we got them all in, that was it.

Q. Well, you marked each block with a number that corresponded with a number on your paper?

A. Yes, sir.

Q. To see whether you had it all in?

A. Yes, sir.

Q. Now, did you take the map away with you?

A. I think that I did, sir; I think on the last day I did; yes, I think so.

Q. Where is the map now?

A. It was borrowed and never returned; I have asked for it, but I could not get it.

Q. Who borrowed it?

A. I think it was Mr. Smith borrowed it.

Q. Did you send for it, did you go for it?

A. Yes, I asked for it.

Q. More than once?

A. Yes.

Q. Have you been able to get it?

A. No, sir.

Q. What answer did they give you?

A. Didn't think it was proper to give it to me, under the circumstances.

Q. Who said that?

A. Mr. Harrison.

Mr. Vredenburgh: I make a demand now upon counsel for that map.

Mr. Edwards: If we have it we will hunt it up.

Q. Now, you say there was one piece that was marked on the map as belonging to either the Delaware, Lackawanna or the Morris & Essex railroad —what was the size of that?

A. Not having the map, I cannot give you any information about it. All I remember is that there was no deed produced for that piece of land.

Q. Was that within the line of the reservoir?

A. So I was informed.

Q. Informed by whom?

A. By Mr. Harrison and Mr. Spraul.

Q. What was the next piece?

A. Well, that includes everything in the reservoir, I believe, that was not shown me. Do you wish me to call off where deeds were not produced?

Q. Yes.

A. Well, from station 14 plus 20, 25 plus 01, Van Duyne, deed not produced.

Q. What do those figures mean?

A. Stations along the line.

Q. So many feet, doesn't it?

A. So many feet, fourteen represents hundredths.

Q. Go on.

A. The next one was 181 plus 06.50; 193 plus 18, Stewart Hennion. Next one is 196 plus 88, and 197 plus 85.8, Stewart Hennion. Next one 227 plus 65.35, 228 plus 80.70 Sarah N. and Alva Van Ness. The next was two, in the name of Frank Stanley, 422 plus 64.11 to 430 plus 51.28, and 422 plus 91.01 to 430 plus 78.27.

Q. Two pieces or one?

A. Two pieces.

Q. What is the next?

A. There were a number of proceedings that were called condemnation which I have not called off. Do you want me to call attention to those?

Q. No; omit the condemnation. You said there were a number of condemnations there?

A. Yes.

Q. Well, omit those and go on to the next.

A. Well, then, there was one piece, 595 plus 51.25, to 595 plus 81.51, N. J. Land Company, Valley road. The west half was not produced.

Q. Well, now pass on to 123.

A. There was another case here, Georgiana C. Moore, where there was a deed produced; but I have a note in the margin that additional deeds were required for extra width after condemnation —I couldn't make that out. The second piece is 595 plus 81.51 to 608 plus 13.79.

Q. Did you notice 577, Greenwood Lake Railroad—was that produced, 577 to 579, Greenwood Lake?

A. Well, I will come to that later.

Q. Go on.

A. 790 plus 66.10 to 790 plus 77.30, Mill race. 804 plus 03.34 to 808 plus 77.58, A. P. Fisher. 829 plus 74.48 to 834 plus 24.48, Riparian Grant. 898 plus 02.76 to 908 plus 86.58, Greenwood Lake Railroad, I think it is.

Q. D. L. & W. Railroad, isn't it?

A. Yes, Delaware, Lackawanna & Western Railroad. 910 plus 01.90 to 925 plus 85.23, D. L. & W. R. R. 925 plus 85.23 to 944 plus 64.63, D. L. & W. R. R.

Q. No deeds produced?

A. No. 975 plus 50.63 to 1012 plus 68.63, D. L. & W. R. R.

Q. No deeds produced?

A. No, sir. 1012 plus 68.63 to 1020 plus 73.63, Jeannette P. Goin.

Q. Any deeds produced for that?

A. Jeannette P. Goin?

Q. Yes.

A. No. 1020 plus 73.63 to 1021 plus 49.63, D. L. & W. Railroad.

Q. Any deeds produced?

A. No. 1021 plus 49.63 to 1029 plus 89.63, Riparian Grant. No deeds produced. 1058 plus 94.96 to 1067 plus 10.41, D. L. & W.

Q. Any deeds produced for that?

A. No. 1067 plus 10.41 to 1070 plus 79.39, heirs of Abel I. Smith, not produced. 1080 plus 33.04 to 1092 plus 63.83, Hudson Realty Company. Not produced. 1092 plus 63.83 to 1093 plus 63.37, Erie Railway Company. Not produced.

By Mr. Edwards:

Q. Is that Erie Railroad?

A. Oh, no—Erie Land Company.

Further Direct:

Q. Well, from 1092 to 1093 was the Erie Railroad Company?

A. That was the Erie Railroad Company.

Q. Now 1093?

A. 1093 plus 63.37 to 1094 plus 73.40 is the Erie Land Company. Now we will go back.

Q. Go back for what?

A. There are two or three more pieces. 530 plus 59.73 to 531 plus 69.45, N. Y. & Greenwood Lake. 535 plus 52.60 to 536 plus 99.55, Caldwell Branch grants. 577 plus 99.37 to 579 plus 0.16, Greenwood Lake Railroad, I suppose.

Q. I call your attention to 1182, 1185 on the last, I think, Daniel C. Moran; do you find the deed from Daniel C. Moran to the Mayor and Aldermen of Jersey City?

A. Yes, I have got it here, 1182 plus 19.37. I have got it marked deed.

Q. Yes, from Moran to Jersey City?

A. Daniel C. Moran.

Q. Mr. Ferris, you said that the Watchung tunnel was made a little wider; do you know the reason why that was done?

A. Yes, I know the reason.

Q. Will you state the reason?

A. The side walls were built and they had to be backed in with cement. There is danger sometimes of their sliding in, in which event there will be a diminishment of the area of the specification size, so they were laid out so as to be 8 feet 8, instead of 8 feet 6; that is to say, to be two inches further apart as a measure of safety, that is all—and very prudent, too.

Q. Won't you please, Mr. Ferris, state that more fully; we don't quite understand the answer, and you will have to state it so as to get it on the notes.

A. In lining the tunnel the first thing to do is to build the side walls on either side up to the spring of the arch; these walls are put up in line right straight through the tunnel, and, the excavation being very uneven, the back of the brick wall has to be filled in with concrete, and there are sometimes danger of their sliding in somewhat, so in order to prevent any condemnation of the work by afterwards finding that there was less area there, they made it a little bit wider than was called for so that it should measure from face to face of the side walls instead of 8 feet 6, 8 feet 8. The danger was only while the work was green; there is no danger afterwards.

The Court: In point of fact, what might have occurred did not occur at all.

Mr. Edwards: Did not occur at all, no, sir.

Q. Now, Mr. Ferris, will you please tell us about the completion of this work. I am going to ask you a question about the completion of the waterworks. So far as the physical construction of the dam known as Dam No. 1 is concerned, when was that completed?

A. Well, I considered it complete on the 21st day of November, 1904, that being the day when the water first passed over the spillway—when it first started—when it first had its maximum test. There was some little work yet remaining to be done around the reservoir and around the grounds, but in my own mind I assumed that November 21st was the fair day for considering the physical construction of that dam as being complete.

Q. Now, what day was it that there was sufficient water for the first time in that dam so that seventy-five per cent of the area of the dam should be at least eight feet in depth?

A. The area of the whole reservoir, you mean?

Q. Yes, the whole area of the reservoir.

A. Well, that was the day, of course, when the reservoir first filled and when the water surface there was at its greatest expanse, and it could not be there until the water got up to the top of the spillway, which was November 21st, 1904.

Q. Now, Mr. Ferris, I will take you to another question. What have you to say as to the fences—did you make any demand as to the building of a fence around the reservoir?

A. Oh, yes, I made several requests.

Mr. Corbin: I object to the relevancy of that; there is nothing in the contract about a fence.

Q. Is there any fence around the Parsippany dyke?

A. No, sir.

Q. And the length of that dyke, I think you have already said is about 2,400 feet, was it? What was the length of that dyke?

The Court: Well, it was about that as I recall it.

A. I haven't a memorandum here of the length.

Q. Did you make any requisition on them to build a fence?

A. I have requested it several times.

Q. Now, as to that dyke, is it such that—what is the surface of it towards the road? What is to be on the surface of that dyke towards the road, grass or what?

A. Grass on the slope.

Q. Well, is the slope of such a steepness that cattle can go ——- it?

A. Well, it is tolerably steep; a man can go up it very readily.

Q. A man can walk up?

A. Oh, yes; cattle can go up, I suppose.

Q. How near is the public road to it?

A. It varies; perhaps 125 feet the nearest.

Q. Is there anything to prevent cattle from going from the public road up on this thing?

A. Not a thing.

Q. Now, in other places than the Parsippany dyke——

The Court: Where do you think it ought to be fenced—on top or below?

Q. Where ought that to be fenced in order to protect this slope from cattle?

A. Well, I think that, owing to its proximity to a town, being built up gradually around there, access of population, everything of that kind, from general sanitary reasons there ought to be a fence around the whole; I mean a tight, barb wire fence.

Q. Now, I am referring to Parsippany dyke. Where do you say the fence ought to be built there, in order to protect that dyke from cattle, or from anything else?

A. Well, I suppose it ought to be built along the public road, or, at least, on the exterior line of the property that is owned by the water company there; a fence along the public road, and running up, so no one could get up on the dyke.

By the Court:

Q. Then, as I understand, that at the dyke it ought to be fenced at the bottom of the slope?

A. Yes, I think so, all the way around.

Q. Why is it, Mr. Ferris, that you insist that there should be a fence around that part of the reservoir, in addition to the dams?

A. Well, I think it is more important around the reservoir than it is on the dam; it is quite near the public road, the new road that has been run through there, and boys and men can get there readily, although there are notices up around, boys and men could get there readily along the shore, and create a great deal of damage, nuisances and things of that kind, go fishing there—it is almost impossible to keep them out; people go there and wash dogs, things of that kind; I have had that reported to me. And there ought to be, for hygienic reasons, sanitary reasons, particularly upon that side where that public road is—I think there should be a tight barb wire fence around the whole length; it is only about seven miles all the way around it; it is not specifically called for in the contract.

The Court: Might there not be another reason? I suppose the City of Jersey City owns this property, in its character of a property owner. Now, the law provides that there shall be line fences. What is to prevent the farmers in that neighborhood from insisting that there shall be a line fence?

Mr. Edwards: We own all the property outside of it, and our road bounds it now.

Mr. Vredenburgh: Are you going to own it forever? You may sell it to somebody, and he may insist on a fence being put up.

Q. Now, Mr. Ferris, as to the distributing reservoirs, leaving out the Newark reservoir, which I understand has no fence, what is your information as to the fencing of distributing reservoirs? What do you know about it?

A. Well, I suppose——

Mr. Edwards: This is not a distributing reservoir; it is a collecting reservoir.

The Court: Well, leave out the word "distributing" and say "reservoir."

A. Well, some reservoirs are fenced, and some reservoirs are not. It depends entirely upon the location, I suppose, that is, the kind of fence that I mean. Way up in the woods, a reservoir located 'way up there, a storage reservoir, where there was no possible chance, or no probable chance of pollution, it would not be so necessary to go to such an extreme. I think they ought all to be fenced, but I think this ought to be a wire fence. I think a person is bound to fence off his property.

Q. The reservoir in New York, for instance?

A. I was looking at the Croton basins not a great while ago, and they were putting a stone fence all around it, and it was an immense area; ours is no comparison with that area.

Q. Have you ever been at the reservoir for Hackensack at New Milford?

A. No, sir; I have never been on their works at all.

Q. Have you ever been at the East Jersey's reservoir?

Mr. Edwards: The one built for Newark.

A. The East Jersey reservoir at Newark?

By Mr. Edwards:

Q. Newfoundland, Oak Ridge, Macopin?

A. Yes, sir; I have been up there.

Further Direct:

Q. Any fences?

A. Nothing but farm fences. I don't know but that they may have changed it.

Mr. Edwards: Well, they don't enclose the reservoir with those fences.

Mr. Vredenburgh: I think that finishes my examination of this witness, excepting one subject, and I desire to examine him upon that when Mr. McDermott is present. He is not here to-day. With that exception I have finished with the witness.

Mr. Corbin: We will cross-examine him after the direct examination is completed.

The Court: Then you will call another witness.

EMIL KUICHLING, sworn.

Direct examination.

By Mr. Vredenburgh:

Q. Mr. Kuichling, you reside where?
A. At present in the city of New York.
Q. And what is your age?
A. 58.
Q. What is your business?
A. Consulting engineer—hydraulic engineer.
Q. Where is your office?
A. 52 Broadway.
Q. Will you please tell us what your previous experience has been with respect to waterworks?

A. Municipal waterworks, I began in 1873, first on the Rochester, New York, Water Works, and I remained on those works as assistant and principal assistant engineer until 1885. Then I became a member of the Executive Board of the City of Rochester—that is equivalent to Commissioner of Public Works—and had charge of the waterworks department along with other city departments. Then I became connected with various other works—waterworks—in private practice from 1887 until 1900, and then I became Chief Engineer of the Rochester Waterworks, or, rather, that should have been 1890, instead of 1900. I became Chief Engineer of the waterworks and remained in charge as chief engineer of the waterworks until 1900. I was also, from 1880 until 1892, consulting engineer of the New York State Board of Health, and in that capacity I had to pass upon waterworks projects for various villages and small cities in the

State of New York, the law requiring plans for waterworks to be submitted to the State Board of Health for approval, before construction was undertaken. I also designed waterworks for several cities, small cities, in the State of New York, also for some in Ontario.

Q. Any in this State?

A. I have designed waterworks, extensions, in Perth Amboy, in Atlantic City, and had to do with the Jersey City Water Works; Charleston, South Carolina; Pittsburg, Pennsylvania; Fredonia, Mt. Morris, Geneseo, Fultonville, New York, Geneva, Cortland, Canandaigua, New York, the Craig Colony at Sonyea, State Institution. A project for new waterworks for Pittsburg, Pennsylvania, new waterworks for Wellsville, Ohio, and a number of other places that I don't now remember.

Q. Now, when were you employed by Jersey City first?

A. In the fall of 1902.

Q. What were you employed for?

A. I was employed to investigate the stability of the proposed dam at Boonton, and the capacity of the watershed to furnish the amount of water named in the contract, and various other questions that were connected then with the water supply existing—both the existing and the new supply.

Q. Are you familiar with the construction of the Parsippany dyke—the dam or dyke at the Boonton reservoir?

A. I know something of its construction.

Q. What is the depth of the water at that dyke, when the reservoir is full?

A. When the reservoir is at the level of the spillway of the main masonry dam, the levels indicate that there are about twenty-four feet of water as the maximum depth at the Parsippany dyke. From that it varies to where it runs out on to the original ground, so that the depth of water, Parsippany dyke, ranges from nothing to about twenty-four feet when the water is just about at the overflow level.

Q. Do you remember the construction of the core wall in that dyke?

A. Yes, sir.

Q. Did you examine the question spoken of by Mr. Ferris, as to the location of the core wall?

A. I did.

Q. Will you explain what the object of the core wall is?

A. The object of the core wall, in an earthen embankment is to make the embankment water-tight, and also to prevent the perforation of the earthen embankment by burrowing animals.

Q. Why was it necessary, in your judgment, to have that dyke built, where it was built, rather than where it was proposed to be built by Chief Engineer Harrison?

Objected to.

Objection sustained.

(Question withdrawn.)

Q. Have you been at the Parsippany dyke?

A. Yes, sir.

Q. Were you consulted at the time with regard to this change of the location of the core wall of the dyke?

A. Yes, sir.

Q. Will you please state what you saw of the building of the core wall?

A. I saw the core wall constructed of concrete masonry, extending from——

By the Court:

Q. How thick?

A. The core wall is about three and a half feet thick at the top, and is a little thicker as we proceed downward from the top, and I think it is something like six feet at the base. I have forgotten the dimensions.

Q. What is the interior of the core wall composed of?

A. Wholly of concrete masonry, that is, Portland cement, sand and broken stone or gravel material all united together by means of the Portland cement. The wall was built in sections about forty or fifty feet long. These sections representing a day's work, about, in construction.

Q. Well, I suppose it is just like this new wall that lines the D. L. & W. tunnel in Newark, isn't it?

A. Yes, sir; it is of similar construction.

Q. Except that it is a great deal wider, of course?

A. Yes, sir.

By Mr. Edwards:

Q. Monolith?

A. No, not exactly monolith.

Further Direct:

Q. Now you said you saw the construction of it, and Mr. Edwards suggested that it is monolith; will you please state the result of that construction as you saw it, as to its being monolith?

A. The wall was built, as I stated, in sections, about forty or fifty feet long; each section is therefore a monolith, when not broken by internal force acting upon the material; but these sections are not continuous, and were not intended to be continuous except by the adhesion of the mortar and the cement between the sections. They were made and designed to be made with a slip joint, so that they should not be continuous or monolithic.

Q. Did you notice whether the joints were tight or not?

A. The joints were not tight, when I saw it at one period of its construction, because they had torn apart by contraction due to changes of temperature, and at the end of every section there was from one to two cracks, anywhere from one-sixteenth of an inch to three-sixteenths of an inch wide, extending wholly through the wall, for the entire exposed portion.

Q. Well, where that crack was the wall would not be water-tight, would it?

A. No, sir.

By the Court:

Q. Well, you say that it was not intended to be monolithic; now, if it was not intended to be monolithic, I suppose that was to give greater elasticity to the structure, wasn't it?

A. Yes, sir.

Q But doesn't that defeat the very object of the core wall which is intended to guard against percolation?

A. Not necessarily, sir.

Q. Won't you explain that? I don't understand it.

A. These different sections were supposed to be connected similarly as matched boards are connected by one portion overlapping the other, thus allowing each section to contract and expand, and have the ends slide over each other at the lap. In that way there would be merely a plane of motion or sliding or contact between the two portions without an appreciable distance between them, and it was designed to adopt or secure just such a motion, instead of having the walls tear apart by contraction, due to change of temperature.

Q. Please explain what you mean by saying that it was not tight; why wasn't it tight?

A. Instead of these ends, these overlapping ends of the sections being free to move, they had, in the process of construction, become cemented together. When contraction, due to a change of temperature in the mass, takes place the adhesion of the surfaces that were intended to be free, was so great that it was greater than the strength of the mass of the material, and contraction occurred and tore the material through and apart.

Q Now, in how many sections did you observe that?

A. In nearly every one that was exposed, and I think I saw on this occasion upwards of one thousand feet in length.

Further Direct:

Q. Now, Mr. Kuichling, when the additional water to make seventy millions of gallons is in that reservoir, in your judgment, how much will the leakage which is shown now be increased; if there is a leakage there now, how much will it be increased by this increased amount of water?

A. If the water level is raised nineteen and one-tenth feet the leakage or seepage may be increased at least two-fold, and several times more than two-fold, depending upon circumstances or conditions of the sub-soil on the territory that is not yet covered with water.

By the Court:

Q. Well, is it your theory, then, that the leakage in this case, assuming that there is a leakage, is due to the percolation through these cracks that you have described?

A. No, sir; I did not say that, sir, at all. I assume that these cracks that I have described contribute little, if any, to the seepage that has been described by the previous witness, Mr. Ferris.

Q. Well, then, what is their significance—what is the significance of these cracks?

A. The significance of the cracks is only in answer to the question that was asked as to the condition of the core wall, and there may be through those cracks in the cold season of the year—there may be a small amount of leakage, that will, of course, depend upon whether these cracks have become filled with earthy matter or not; but as to the leakage direct through those there is little evidence or no evidence, because had there been water issuing through cracks of that magnitude, the earthen backing behind would have been carried away; so I do not attribute any particular significance to the cracks that I have described. It is only fair to state that.

Adjourned until May 16th, 1906, at the Chancery Chambers, Newark, N. J.